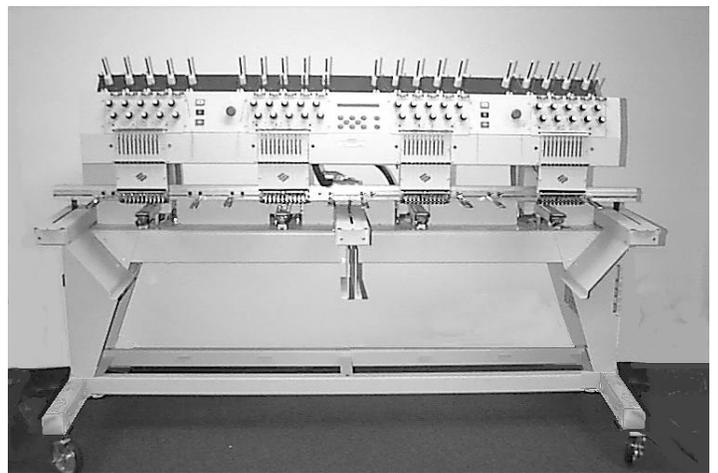


Technical Manual for the EMT 10/4T embroidery peripheral



- Four Melco Embroidery Heads
- Tubular Goods Hooping
- 10 Needles with automatic color change
- Automatic Trimmer Option
-  Compliant

Part Number 110279-01, Revision B

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1. Introduction

Scope Of Manual

The EMT 10/4T Embroidery Peripheral Technical Manual is a guide for performing repairs and adjustments that go beyond routine operator maintenance.

These procedures are best understood and performed by professional service technicians in conjunction with specific factory technical training. However, much of the information in this manual may be useful reference for others who might possess appropriate technical aptitude and skills.

If any information in this manual is not fully understood, however, you are advised to contact your local Melco equipment service organization for assistance. You will find they are professional service technicians trained on Melco equipment, who have acquired technical expertise through experience and other general technical training. Additionally, Melco equipment technicians routinely receive up to date servicing information that continually enhances their product knowledge.

This technical manual is presented in four Sections: 1) an overview of general information useful in understanding the manual and various service requirements, 2) service maintenance of all the machine areas except the embroidery head, 3) embroidery head maintenance (excluding trimmers), and 4) service maintenance on the embroidery head trimmer area. Sections 2, 3, and 4 address mechanical disassembly and replacement of the major components of the embroidery peripheral, and any related machine adjustments.

Standard Conventions Used In Manual

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

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.

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, the key in question is simply referred to, for example: Press the Enter key to initiate the application.
- A key on the peripheral keyboard is represented by a pictorial of that key.
- Typing with the computer keyboard is referred to in **BOLD** letters, for example: Type: **run** and press Enter to start.

- To indicate that two or more keys must be pressed to obtain a desired result, each key is indicated with commas between them. An example is: Press Shift,8 to type an asterisk (*).

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 attention to the user that the procedure following must be performed with care and accuracy. Failure to use care and accuracy may result in possible damage to property or personal injury 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 or other property 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 equipment. A glossary of these terms is located in the operation manual.

Maintenance Philosophy

The maintenance philosophy used in this manual, and practiced at Melco, is to isolate potential problems within the system to a "practical" replacement assembly. Components are typically not repaired, but rather, a circuit board or mechanical "assembly" may be replaced. In the process of isolating problems in the machine, the person performing the trouble shooting must also practice good trouble shooting techniques. Good trouble shooting techniques include, but are not limited to: guarding against static electricity causing further damage to machine components, and only replacing one part at a time to enable identification of the defective part after the machine is repaired.

Good Maintenance Practice

The procedures in this manual 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.

WARNING! Personal injury may result if proper precautions are not observed. Remove rings, watches, and any other metallic objects from hands and wrists before servicing the machine. Remove metallic articles from shirt pockets to prevent them from falling into the machine. Do not place hands under the needle or needle bar. Do not allow loose clothing to come in contact with moving parts of the machine. Under certain conditions of machine failure the moving parts of the machine may not be controllable by normal means. At these times the machine may operate without notice.

Static Electricity

As with all computerized equipment, the EMT 10/4T Embroidery Peripheral is sensitive to static electricity. Any time work is performed inside covered areas of the embroidery peripheral, the person performing the work MUST be using a static grounding strap.

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

Grounding Strap Use

A grounding strap must be connected properly to insure that static charge on the person's body is neutralized to the chassis ground level of the embroidery peripheral when working in the electronic areas under the covers. Proper connection is at any bare (unpainted) metal surface or any other surface (such as a ground screw head) that is known to be an earth ground.

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 danger of exposure to dangerous voltages. It is recommended that the static strap be checked during daily use for proper resistance protection.

Warranty Considerations

Many areas of maintenance in this manual require factory trained personnel to assure proper service. Any service that is improperly performed may cause the warranty to be voided.

Electrical Grounding

WARNING! It is very important that the 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 System, electrical failures may result.

Physical/Functional Arrangement

The EMT 10/4T may be divided into several distinctive physical and/or functional areas as shown in Figure 1-1.

One of these sections is where the keyboard is located. This area is appropriately called the keyboard section and is located between the tensioner assemblies of the middle two heads (#2 and #3).

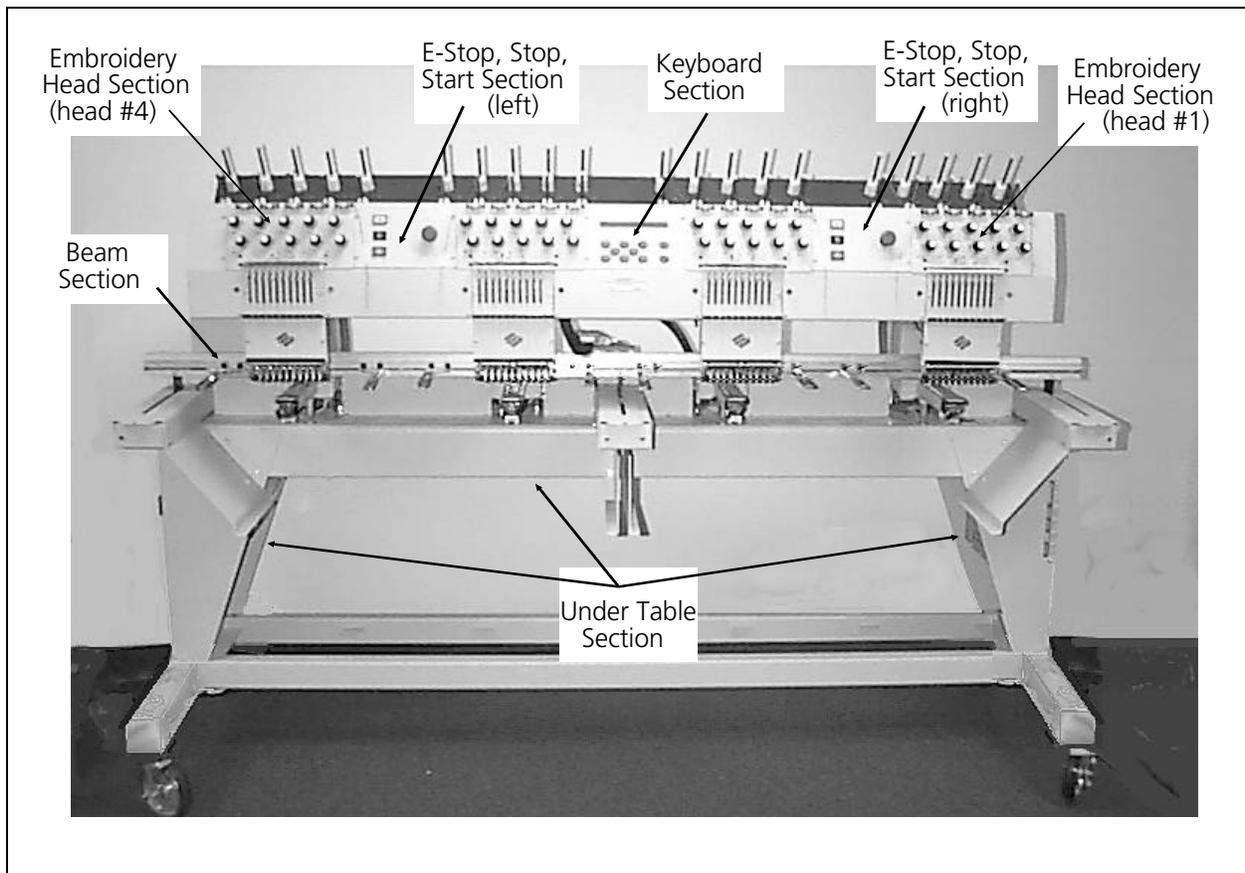


Figure 1 - 1

Another distinct section of the EMT 10/4T is the embroidery head section. This section consists of each of the 4 heads, the Z drive motor and associated head drive mechanics and trimmer devices.

Another area, the beam section, consists of the mechanical devices that hold the garments and move them forward and backward (the Y axis), and left to right (the X axis). The beam is located just above the table top and positioned under the embroidery head arms. This section also contains the X motor, various drive belts, pulleys, and shafts, and other mechanics and electronics. The Y motor that drives the beam forward and backward is an integral part of the beam section, but is physically located in the under table section.

The under table section is described as that area under the embroidery head platform and within the frame support legs. The Y motor (although a functional part of the beam section) is positioned directly under the embroidery head platform between the middle two embroidery heads (#2 and #3). The under carriage section also contains the XYZ motor drive amplifiers, the computer electronics, and the power distribution section.

Configuring the EMT 10/4T

During the operation of the EMT 10/4T, certain situations may arise when the peripheral does not respond to keyboard commands.

You may usually recover from this type of situation by performing what is called "Configuring" (or Re-configuring) the embroidery peripheral. (When this type of situation happens with a computer, you are usually asked to perform a "soft reboot" [Ctrl], [Alt], [Del].)

You must also configure the peripheral any time you install a new CPU (Central Processor Unit) printed circuit board.

Configuration is initially set at the factory. However, if for any reason the configuration is not set properly, or if you have replaced the CPU board, you should know how to set the configuration.

NOTICE: Re-configuring your EMT 10/4T will clear the power fail rescue function for the current situation.

There are two items that must be set in each EMT 10/4T Embroidery Peripheral before it is used in the Melco system for the first time.

First you must set the Peripheral Program. The CPU PCB used on the EMT 10/4T Embroidery Peripheral may also be used in other embroidery peripherals produced at Melco. Therefore, you must tell the CPU board what peripheral in which it is being used.

If the CPU PCB is ever replaced, you must reconfigure the peripheral before using it again.

CAUTION! If the EMT 10/4T is not configured with the correct Peripheral Program, it will not run properly, and may become damaged.

The second configuration item is the Network Address. The address must be different for each peripheral attached to an EDS II or EDS III computer or network. There may be up to 64 (16 if using EDS II software) total embroidery peripherals attached to any one computer, and each must have its own unique identification. The EMT 10/4T uses an Ethernet network card that allows the address to contain the numbers 0 through 9, all 26 English letters, three symbols (-, /, and *), or any combination of these characters. The maximum number of characters that can be used in the network address is sixteen.

Configuration Procedure

Refer to the operation manual for the procedure to configure or re-configure the EMT 10/4T Embroidery Peripheral.

Troubleshooting LEDs and Test Points

At the front of the EMT 10/4T, on the right frame support leg, is a metal cover plate over a variety of indicator LED lights and a series of test points for checking voltages with a multimeter. This area is provided for observing various machine conditions, especially while troubleshooting various machine malfunctions. To access this area, remove the screws holding the cover and flip the cover over so the lettering on the cover is visible (as shown in Figure 1-2). Then reinstall the cover in the same holes but to the right of the LED opening. The lettering on the flip-side of the cover is a brief title for each of the LED and test point locations. You may also refer to Figure 1-3 for this information.

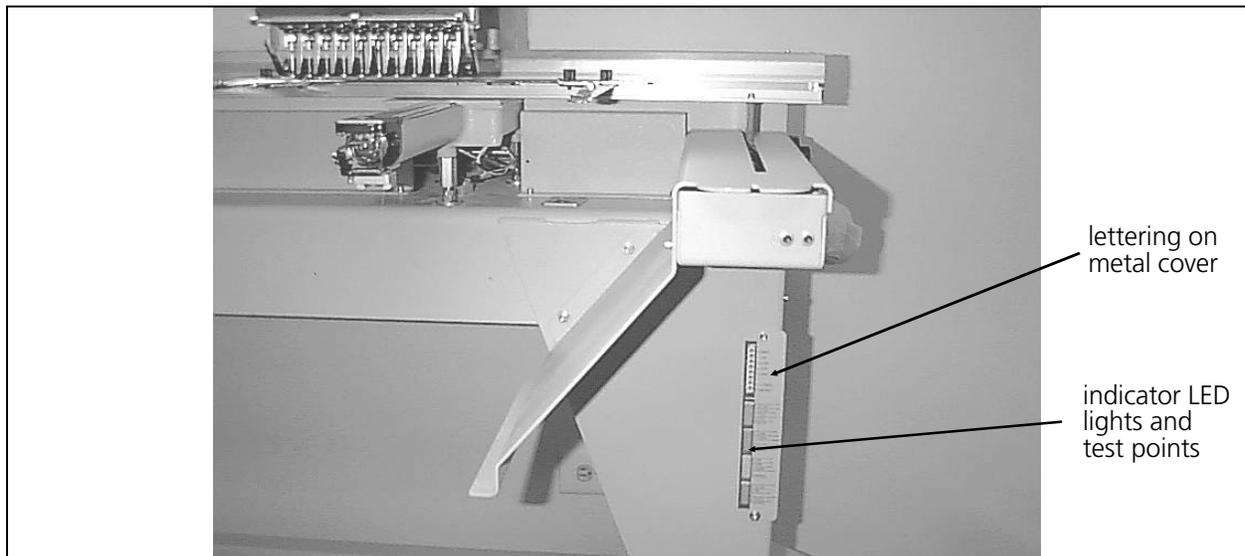


Figure 1 - 2

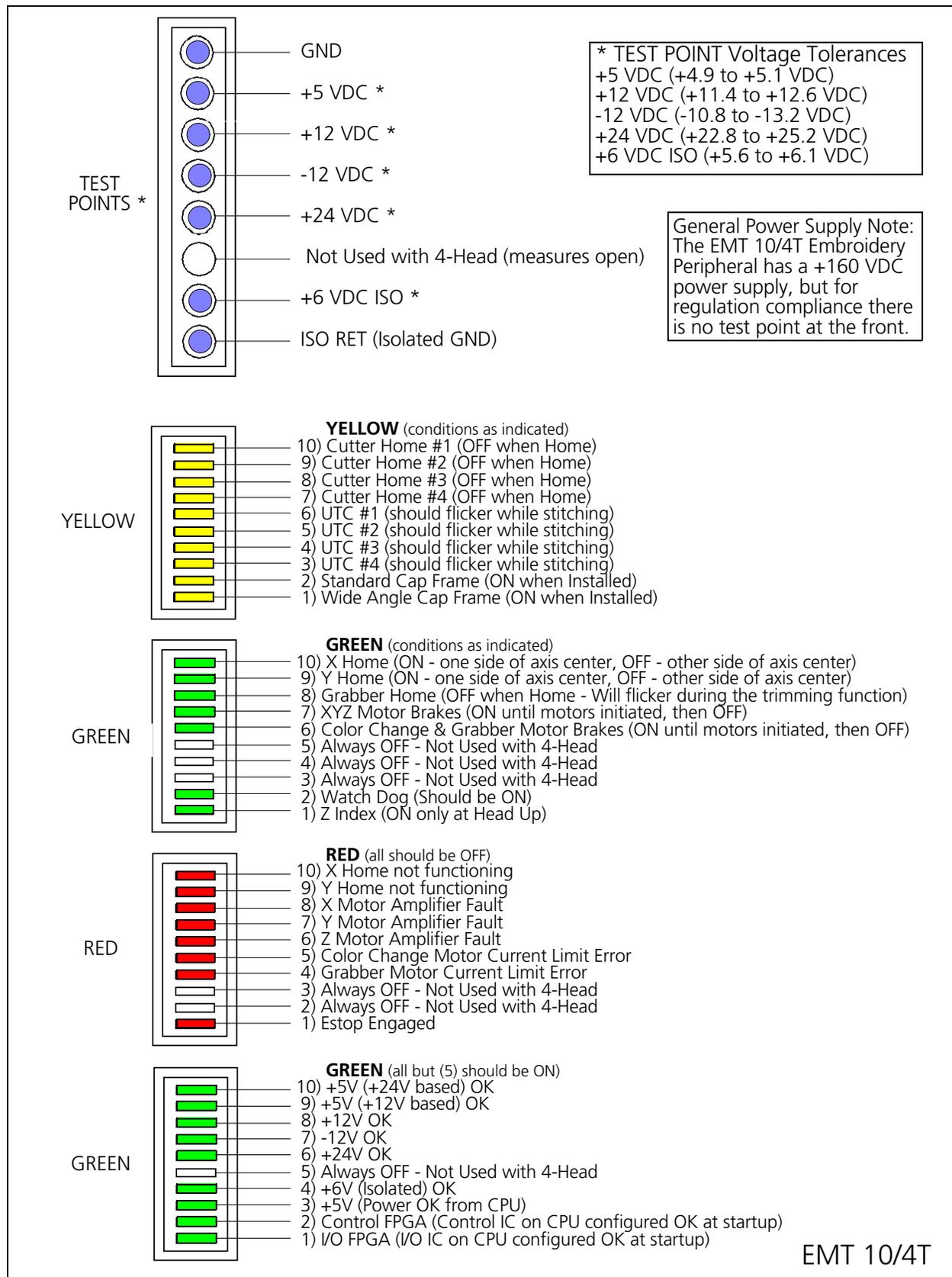


Figure 1 - 3

EMT 10/4T

Various Technical Specifications

The following is a list of various tension and force specifications for the EMT 10/4T (All specifications to be within plus or minus 10% unless otherwise indicated):

X Drive Belt Tension	50 pounds
X Motor Belt Tension	25 pounds
Y Drive Belt Tensions	50 pounds
Y Motor Belt Tension	22 pounds
Z Motor Belt Tension.	20 pounds
Color Change Motor Belt Tension	6 pounds
X Carriage Friction	15 +/- 2 pounds
Y Beam Friction	35 +/- 5 pounds

NOTE: A special force gauge has been designed for adjusting the belt tensions using specific procedures that are representative of these tension specifications. These procedures are found in the associated sections in this manual.

The following lists the X and Y home positions attained when the "Set Home" function is initiated on the EMT 10/4T Embroidery Peripheral.

- X Home centered within +/- 0.015 inches
- Y Home hoop bracket mounting hole center lines are 7.09 +/- 0.015 inches behind the center line of the needle plate hole

2. Service Maintenance (except head and trimmer)

General

This section of the manual provides parts replacement procedures and various adjustments required during parts replacement or other service repairs of all areas of the machine except the embroidery heads. Embroidery head service maintenance information other than trimmers is located in Section 3 of this manual. Trimmer service maintenance information is located in Section 4.

These procedures are guidelines for performing repairs and must be used by personnel practicing good maintenance and repair techniques. Refer to the Maintenance Philosophy topics in Section 1 of this manual for discussion of good maintenance and repair techniques, including concerns with static electricity.

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 Warranty is exclusive of, and may be VOID if, poor maintenance practices have caused damage to the equipment.

Drive Belt Tensions

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

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 and potential warranty issues voided.

Removing Front Covers, Panels, and Tensioner Covers

There are several covers and various panels attached around the keyboard, the embroidery head tensioner brackets, and the needle case assemblies. Refer to Figure 2-1 and the following procedures for removing any and all of these covers.

Lower Front Covers

1. To remove either of the lower front covers (between needle cases on heads #1 and #2 or heads #3 and #4), remove the 2 screws at the front of the cover.
2. Pull down slightly on the cover to remove the pin in the top of the cover from the grommet in the bottom of the upper front cover.
3. Disconnect any ground wire attached to the cover and remove the cover.

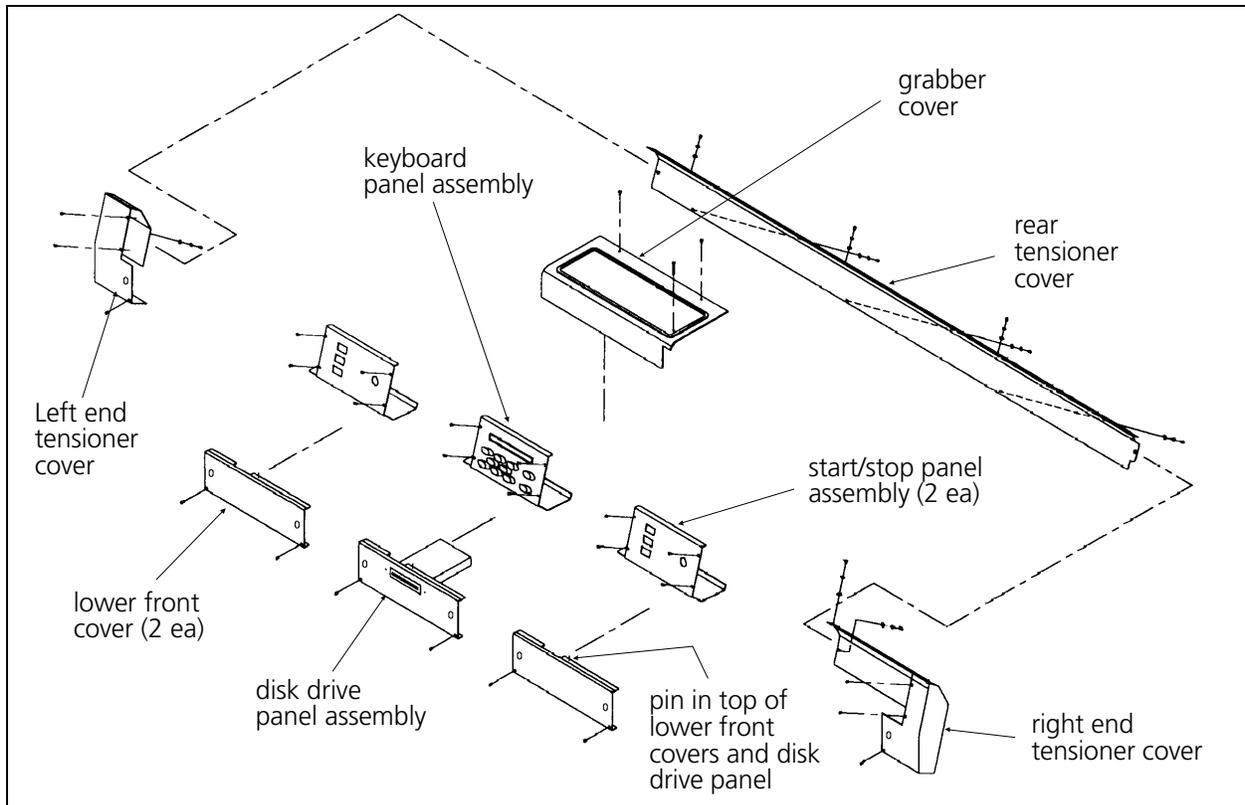


Figure 2 - 1

Disk Drive Panel Assembly

1. To remove the disk drive panel assembly from between the needle cases of the middle two heads, remove the 2 screws at the front of the panel.
2. Pull down slightly on the panel to remove the pin in the top of the panel from the grommet in the bottom of the keyboard panel.
3. Disconnect any ground wire attached to the panel.
4. To remove the disk drive panel assembly further the connectors cover of the disk drive must be removed (see Figure 2-5) and the two harnesses disconnected from the rear of the disk drive.

Start/Stop Panel Assemblies

1. The start/stop panel assemblies are located between the tensioners of heads #1 and #2 or heads #3 and #4. First remove the lower front cover below the panel assembly you wish to remove.
2. Remove the two screws holding the panel assembly at the rear tensioner cover.
3. Remove the four screws holding the start/stop panel assembly at the front.

4. To remove the panel assembly completely you must disconnect all harness connections associated with the switches in the panel assembly.
5. For reinstalling the start/stop panel assembly refer to the diagram in Figure 2-2 for reattaching the harness connections to the various switches in the panel.

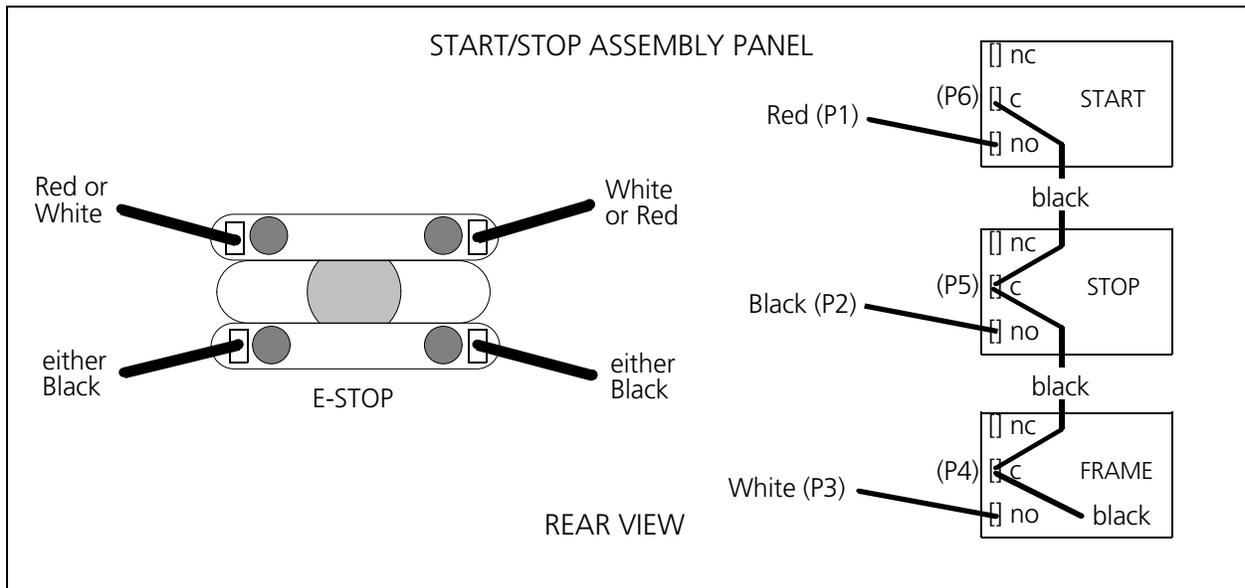


Figure 2 - 2

Keyboard Panel Assembly

1. To remove the keyboard panel assembly from between the tensioners of the middle two heads, you must first remove the disk drive panel assembly.
2. Remove the two screws holding the panel assembly at the rear tensioner cover.
3. Remove the four screws at the front and any ground wire connection associated with the keyboard panel assembly.
4. To remove the assembly completely out of its location you must disconnect the keyboard and display harness connections.

Tensioner Covers

Left Cover

To remove the left end tensioner cover, remove one screw at the rear (going into the rear tensioner cover) and remove three screws at the front. Slide the cover to the left to remove it.

Right Cover

To remove the right end tensioner cover, loosen two screws at the rear (going into the rear tensioner cover) and remove three screws at the front. Slide the cover to the right carefully to remove it.

Rear Cover

1. To remove the rear tensioner cover, first remove the 2 end covers.
2. Remove the remaining screws in the rear cover that hold it in place to the various panel assemblies.
3. Carefully slide the rear cover out to either side.

Keyboard Section

Keyboard/Display Replacement

To remove the keyboard/display assembly from the cover, refer to Figure 2-3 and the following procedure:

1. Turn OFF the power switch to the EMT 10/4T and remove the power cord from the power source electrical outlet and the rear of the machine.
2. Refer to the removal procedures earlier in this chapter and remove the disk drive and keyboard panel assemblies.
3. Install a static grounding strap as described in Chapter 1 of this manual.
4. Disconnect all the harnesses going to the keyboard panel assembly.
5. Remove the keyboard panel assembly to a surface which is free of static electricity.
6. Remove the keyboard/display assembly from the cover by removing the 4 nuts securing the PCB to the standoffs in the cover as shown in Figure 2-3.
7. Transfer the key caps from the old keyboard PCB to the new keyboard PCB by simply lifting them off 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 keyboard PCB.
8. When the key caps are transferred, reinstall the keyboard/display assembly by reversing the preceding steps. Leave the tensioner covers off for the display screen intensity adjustment.
9. Refer to the following Display Screen Intensity adjustment to set the intensity of the display.

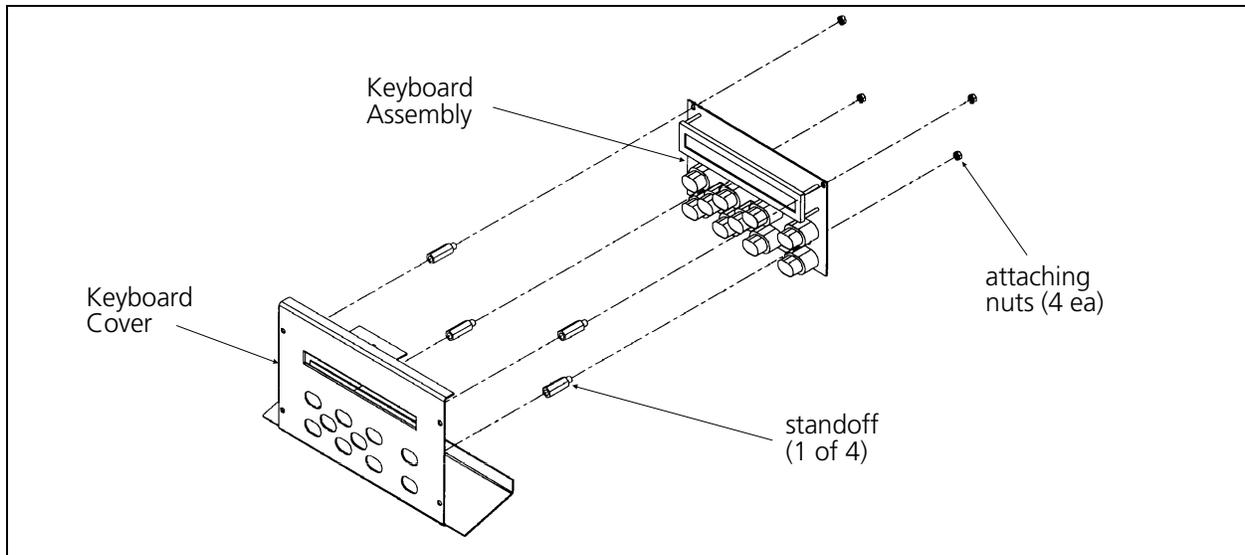


Figure 2 - 3

Display Screen Intensity

1. Turn OFF the power switch to the EMT 10/4T.

2. Refer to the removal procedures earlier in this chapter and remove the tensioner covers if not already removed.

3. Turn ON the power switch to the EMT 10/4T.

4. Locate the intensity adjustment knob on the top, rear of the keyboard/display printed circuit board as shown in Figure 2-4.

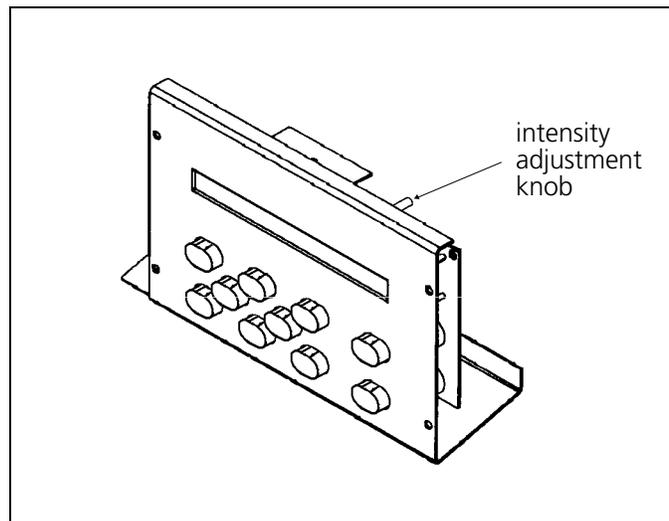


Figure 2 - 4

5. When facing the machine from the front, rotate the adjustment potentiometer clockwise to decrease intensity on the display, or counterclockwise to increase the intensity on the display.

6. Reinstall the tensioner covers.

Disk Drive

1. Remove the disk drive panel assembly as previously described.
2. Remove the four screws holding the connectors cover at the rear of the disk drive assembly (see Figure 2-5) and disconnect the two harnesses from the rear of the disk drive.

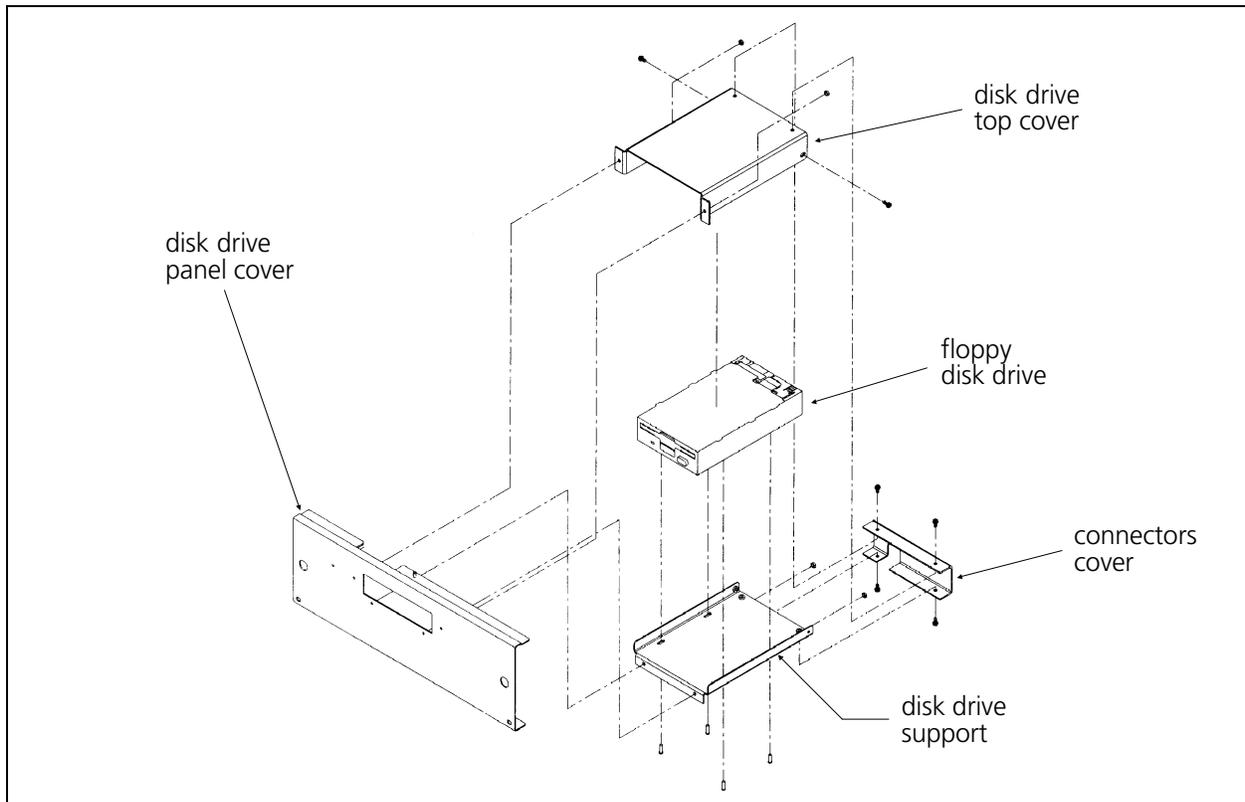


Figure 2 - 5

3. The assembly may now be moved to a work surface free of static electricity.
4. Remove the two screws and the two nuts shown in Figure 2-5 that hold the disk drive top cover and remove the top cover.
5. Remove the four screws that hold the floppy disk drive to the disk drive support (see Figure 2-5).
6. Replace the disk drive and reassembly the parts in reverse order of the previous steps.

NOTE: When installing the disk drive data ribbon orient the harness so the edge with the colored stripe (indicating pin #1) is lying adjacent to the power harness.

X Beam Assembly

The X beam assembly consists of the X carriage, X motor and belt, X drive belt, and various other mechanical components that make up the device that holds the hoop during the embroidery process. The X beam is attached to the Y drive system by connecting to the Y drive rails at the middle and either end of the beam.

This assembly and its installation to the peripheral requires specific factory tooling and training to maintain the assembly's parallelism with the rest of the peripheral. Portions of the carriage assembly, however, may be disassembled to replace various parts without sacrificing the overall orthogonal integrity. The following procedures are for replacing such parts.

X Drive Belt Replacement

NOTE: This procedure requires a specific Melco force gauge (p/n 995586-01), for proper adjustment.

Refer to the following procedure to replace the X drive belt:

1. Turn OFF the power switch to the EMT 10/4T and remove the power cord from the power source electrical outlet and the machine.
2. Remove the X beam cover by first removing the screws on the top, then lifting the cover off the entire length of the X beam.
3. Refer to Figure 2-6 and loosen the drive belt tensioning screw, then the two return pulley block mounting screws to loosen the drive belt.
4. The existing X drive belt is clamped and held to the X carriage plate by two flat head socket screws, a clamp, and a spacer. The screws go through holes in the belt as well. Remove the two socket screws and associated clamp and spacer to free the belt at this area (see Figure 2-6).
5. Slide the old belt out of the two pulleys at either end and position the new belt into place where the old one was.
6. Bring the ends of the new belt together above the two holes in the X carriage plate.
7. Position the X belt clamp above, and the spacer below the belt ends, sandwiching the belt between them.
8. Insert the two socket screws through the clamp, the holes in the belt ends, the spacer, and into the holes in the X carriage plate. Tighten the screws snug.
9. Refer to the following belt tensioning procedure for adjusting the X drive belt tension.

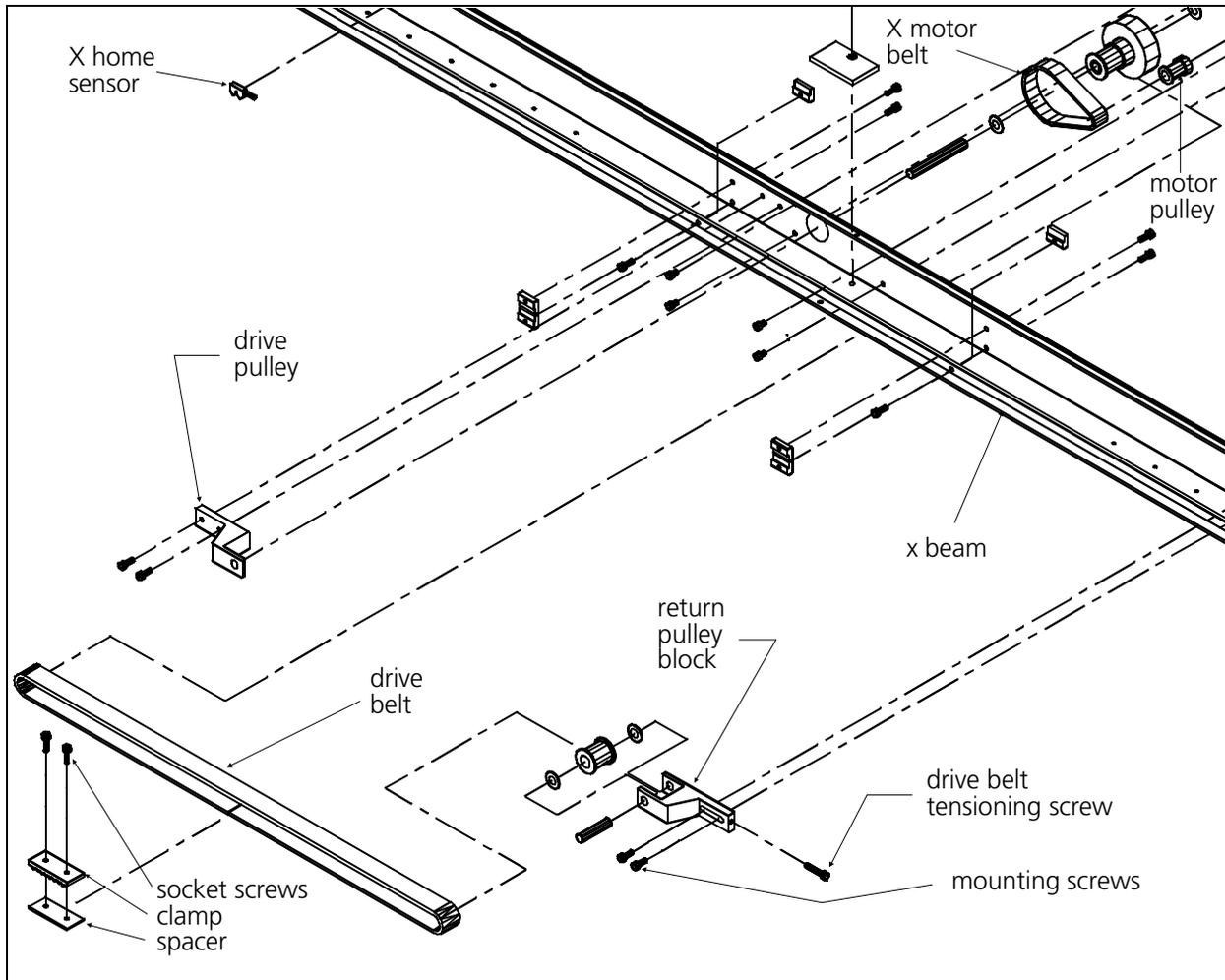


Figure 2 - 6

Belt Tension

NOTE: This procedure requires a specific Melco force gauge (p/n 995586-01) for proper adjustment.

1. Refer to Figure 2-6 and ensure the two return pulley block mounting screws are installed and holding the drive belt return pulley block loosely to the X beam frame.

Caution: Over tightening the screw in the next step may cause damage to the motor shaft or other drive components.

2. Refer to Figure 2-6 and rotate the drive belt tensioning screw clockwise to take up the slack in the belt. Do not over tighten the belt in this step.
3. Slightly tighten the two return pulley block mounting screws to snug the return pulley block to the X beam frame.

4. Move the X carriage all the way to the left of the beam until it mechanically stops.
5. Maneuver the pull-end the Melco force gauge (p/n 995586-01) under the upper loop of the belt and adjacent to the left side of the #2 head. This will position the force gauge approximately mid-way on the belt (see Figure 2-7).

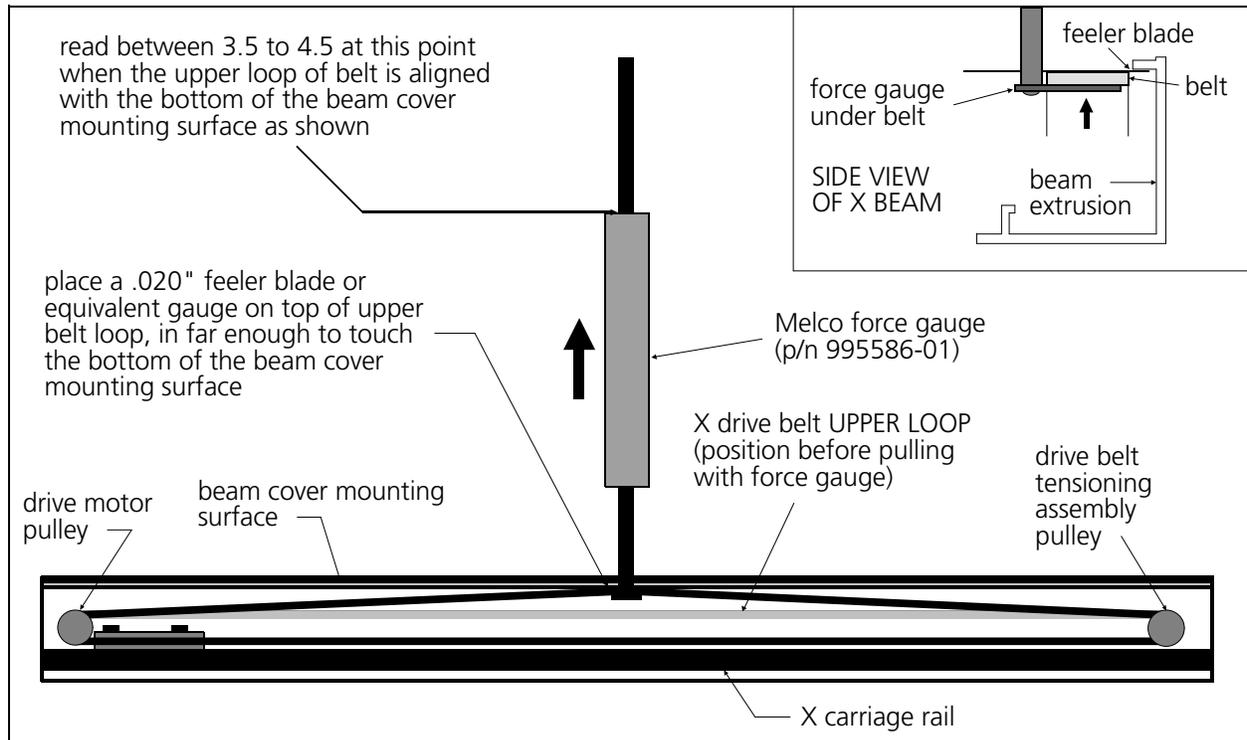


Figure 2 - 7

6. Place a .020 inch feeler blade or equivalent (such as a 6 inch metal pocket ruler) on top of the upper belt loop next to the force gauge.
7. Pull up on the force gauge until the feeler blade touches the under side of the beam cover mounting surface (see Figure 2-7).
8. Read the scale on the gauge while maintaining the situation in the previous step.

The reading should be between 3.5 and 4.5.

9. If the reading on the gauge is not within the specified range, repeat this belt tension procedure until the reading is within the specified range.

Tighten the drive belt tensioning screw clockwise to increase the belt tension.

Loosen the drive belt tensioning screw counter clockwise to decrease the belt tension.

10. Tighten the tensioner block mounting screws and replace the beam cover.

Lint Wiper

Located on the underneath side of the X drive belt tensioner block is a piece of Velcro attached with adhesive. This item is used to keep the top surface of the X carriage "brushed" clean and smooth for accurate reading by the X home sensor in that area of the carriage. In the unlikely event this needs to be replaced, it must be formed with a ripple in it to reach the X carriage surface but with some yielding of position. To form this ripple, simply form the middle section of the piece of Velcro around a 2mm (or equivalent) hex wrench as you attach it to the tensioner block. When the Velcro is securely attached, twist the wrench out from between it and the block. A rippled portion of the Velcro piece remains.

X Motor and Belt

The X motor is attached to the middle of the back side of the X beam. It has a pulley driven belt coupled to a second belt (the X drive belt) to drive the X carriage. Refer to the following procedure to replace the X motor and belt; and adjust the belt tension.

Motor Replacement

NOTE: This procedure requires a specific Melco force gauge (p/n 995586-01) for proper belt adjustment after replacing the motor.

1. Turn OFF the power switch to the EMT 10/4T and remove the power cord from the power source electrical outlet and the machine.
2. Remove the X beam cover by first removing the five screws on the top, then lifting the cover off the entire length of the X beam.
3. Loosen the two return pulley block mounting screws shown in Figure 2-6, then loosen the drive belt tensioning screw to loosen the drive belt.
4. Rotate the X drive belt off the X motor pulley.
5. Refer to Figure 2-8 and remove the screws holding the X beam PCB cover.
6. Move the cover away from the motor far enough to access the X home sensor harness and the X motor and encoder harnesses on the X beam PCB.
7. Press the tab in the middle of the connector to disconnect the X motor encoder harness from the X beam PCB PCB.
8. Press the tab in the middle of the connector and disconnect the X motor drive harness from the X beam PCB PCB.
9. Remove the 4 screws and associated hardware holding the X motor in place and remove the motor (see Figure 2-8).

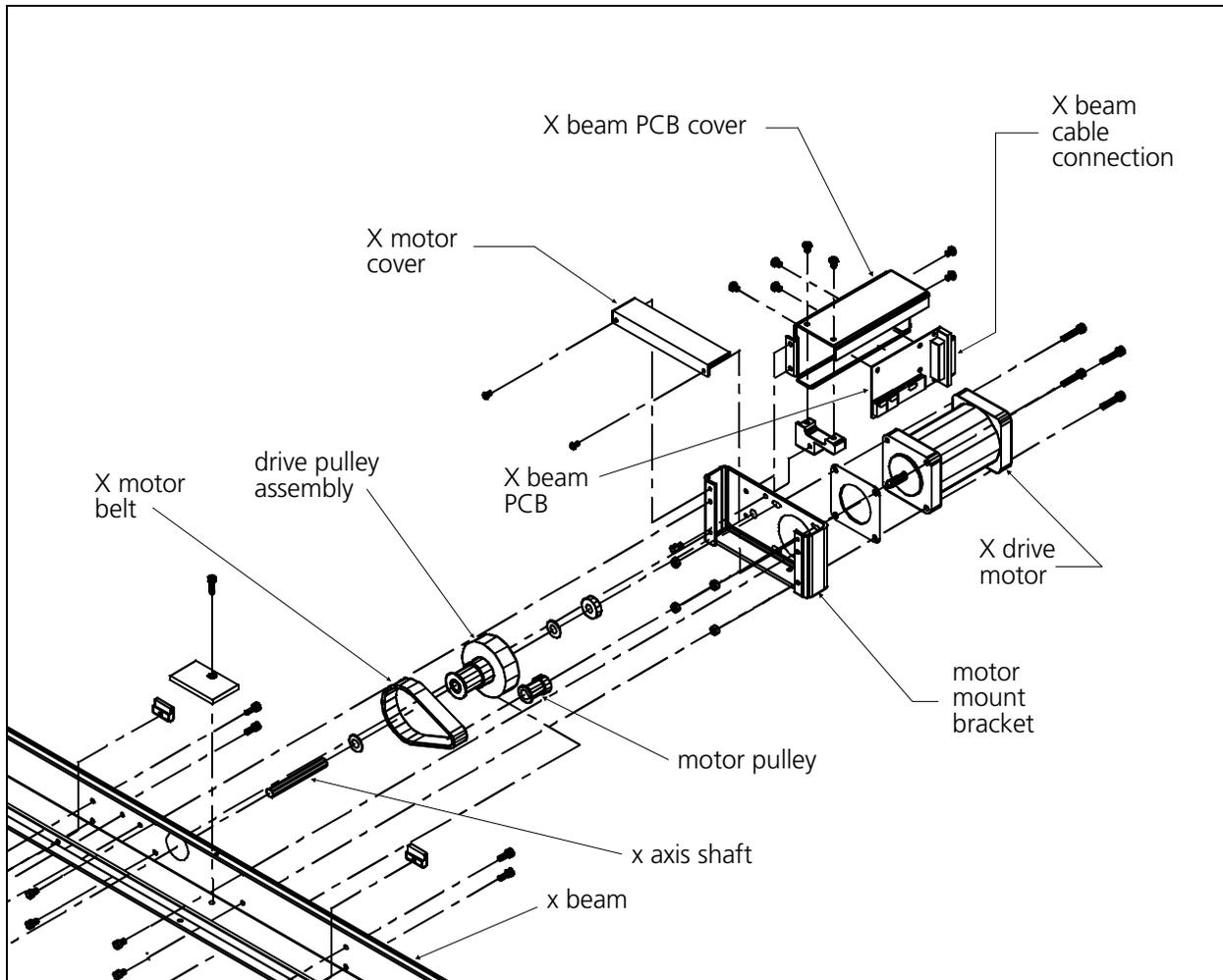


Figure 2 - 8

10. If replacing the motor belt, remove the screws securing the motor mount bracket to the X beam.
11. Carefully slide the motor mount bracket away from the X beam and allow the drive pulley assembly to separate from the X axis shaft.
12. Replace the motor belt and reassembly the drive pulley assembly to the X axis shaft and motor mount bracket.
13. Secure the motor mount bracket to the X beam with the original hardware.
14. Orient the new x drive motor into the motor mount bracket with the harnesses facing toward the X beam PCB.
15. Install the screws to hold the X drive motor to the motor mount bracket, but do not tighten the screws at this time.

16. Reconnect the X motor drive harness and encoder harness into their respective mating connectors on the X beam PCB.
17. Carefully tuck the two X motor harnesses between the motor and X beam PCB and reconnect the X beam PCB cover.
18. Refer to the following motor belt adjustment procedure to adjust the X motor belt to the proper tension.

Adjustment

. . . TBD.

TBD = To Be Determined (not available at this time)

Y Drive Belt

There are four Y drive belts used on the EMT 10/4T. One each is associated with the Y carriage assemblies in the channels at either end of the peripheral. Two are associated with the middle Y carriage assembly in the middle channel. Figure 2-9 shows an illustration of the middle channel parts.

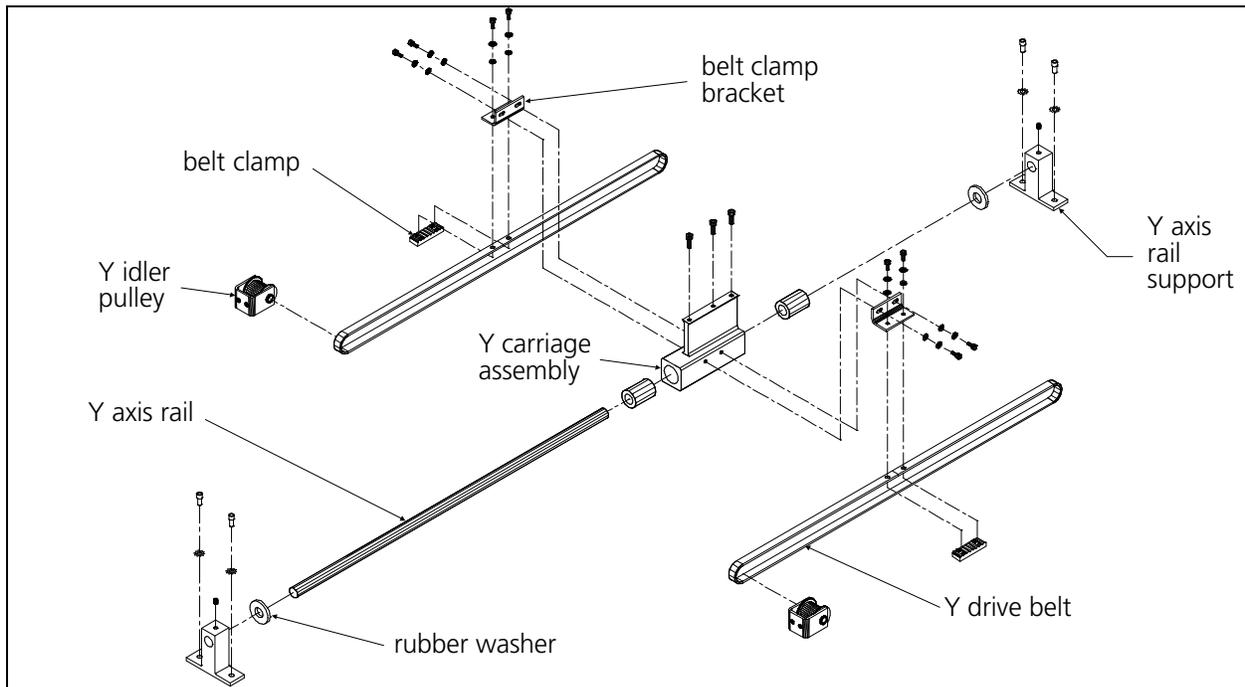


Figure 2 - 9

Replacement

NOTE: After performing this procedure, a specific Melco force gauge (p/n 995586-01) is required for proper belt adjustment.

To replace a Y drive belt, refer to the following procedure:

Caution! Never disassemble more than one Y carriage area at the same time. By doing so, the parallelism of the X beam with the Y carriages is threatened and may require service by a Melco trained technician.

1. Turn OFF the peripheral and unplug the power cord from the source.
2. Remove the channel cover associated with the Y drive belt being replaced.
3. Refer to the Caution statement at the beginning of this procedure and be certain the Y drive belts in the other Y carriages are secure and with some amount of tension.

- Position a hex wrench onto one of the two cap head screws in the front of the frame for adjusting the belt tension (see Figure 2-10).

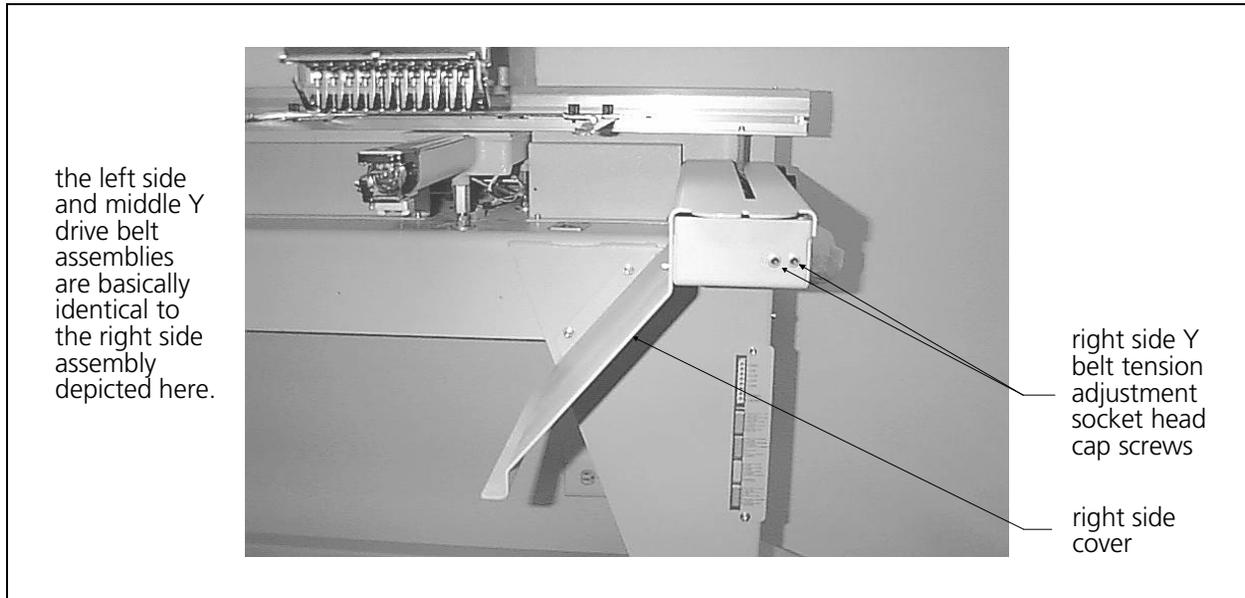


Figure 2 - 10

- Note the location of the wrench handle and rotate the socket head cap screw approximately 3 revolutions counter clockwise.
- Move to the other tensioning socket cap head screw associated with tensioning the belt and rotate that socket head cap screw the same amount as the first.
- Remove the two screws, lock, and flat washers at the top of the belt clamp bracket (see Figure 2-11). These screws go through the belt and into the belt clamp underneath the belt to secure the Y drive belt between the two pieces.

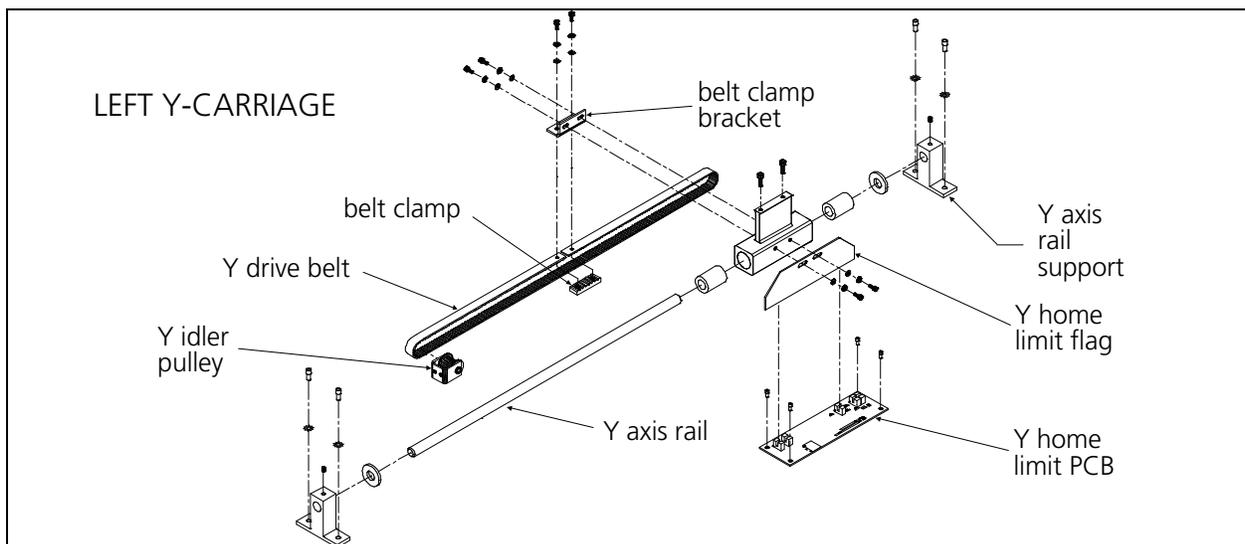


Figure 2 - 11

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

8. Place the new belt around the two pulleys. 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. Be certain the teeth on the new belt are positioned in the proper location in the rear pulley to maintain the parallelism between the X beam and Y carriages.
9. Move the X beam to the rear until it mechanically stops.
10. Rotate the adjusting socket head cap screws in the front approximately 3 revolutions clockwise to take up the slack in the belt and provide some amount of tension.
11. Refer to the Y drive belt tension adjustment procedure.

Belt Tension Adjustment

To adjust the Y drive belt tension, refer to the following procedure:

NOTE: This procedure requires a specific Melco force gauge (p/n 995586-01), for proper belt adjustment.

1. If not removed already, remove the channel cover associated with the Y drive belt being adjusted.
2. While observing the movement of the Y belt on the front pulley, move the beam forward and backward. The belt will vary somewhat on the surface of the pulley. This is commonly called belt tracking.
3. Adjust the two socket head cap screws independently at this time to obtain the least amount of belt tracking when the beam moves forward and backward.
4. When the adjustment in the previous step is complete, move the beam to the rear until it mechanically stops.
5. Refer to Figure 2-12 and check the Y drive belt tension with the Melco force gauge (p/n 995586-01) by the following steps.
6. . . . TBD.
7. . . . TBD.
8. . . . TBD.
9. If the tension is not correct, slightly tighten the two belt tensioning socket head cap screws equally to increase tension on the Y drive belt; or loosen the screws to reduce the tension.

TBD = To Be Determined (not available at this time)



Figure 2 - 12

10. Check the Y drive belt tension on the other three belts the same method as in the previous steps.

The tensions of the four belts should be within 0.25 pounds of each other.

11. If needed, adjust the other Y drive belts to the proper tension according to the above specifications.
12. Repeat this procedure until the proper tension adjustments are attained.
13. Replace all covers removed during this procedure. You may then plug the power cord back into the voltage source and turn ON the peripheral.

Under Carriage Section

This section of the peripheral consists primarily of the assemblies lying in and about the support frame of the machine (see Figure 2-13). It contains the power supply area located inside the left support leg and the electronics cage located inside the right support leg. Located inside the top support platform between heads #3 and #4 is the XYZ Amplifier assembly and between heads #2 and #3 is the Y drive motor.

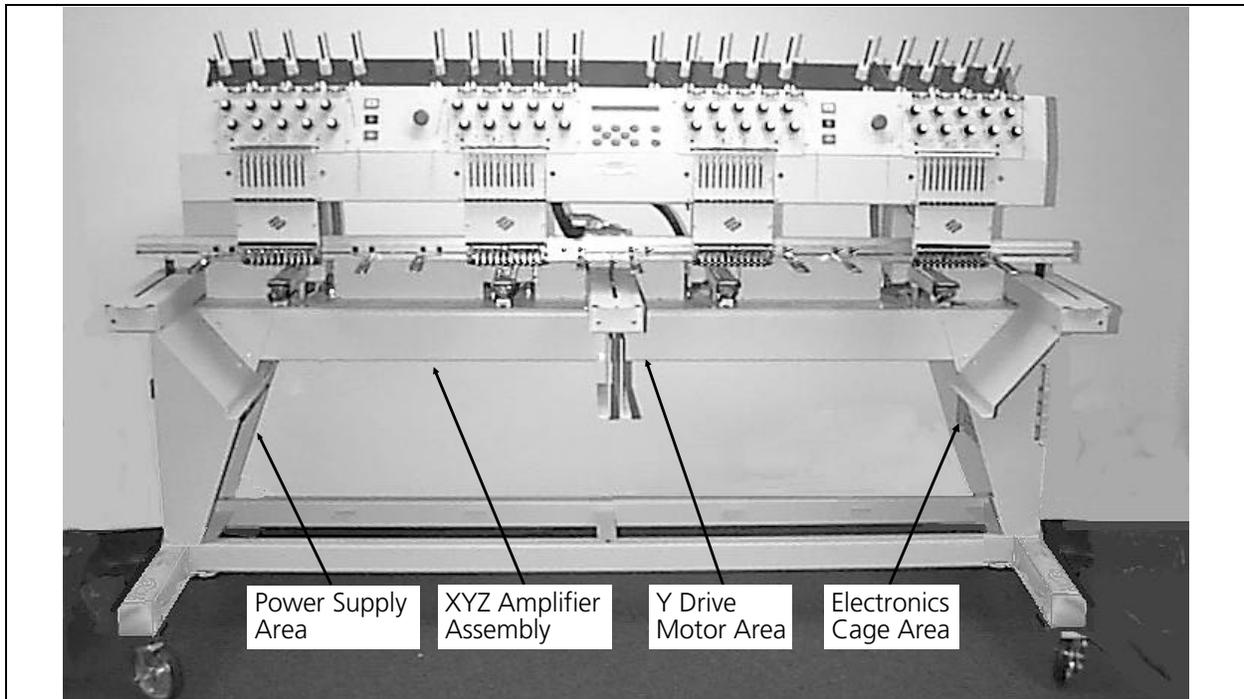


Figure 2 - 13

Y Drive Motor Replacement

The Y drive motor is located inside the top support platform between heads #2 and #3 as indicated in Figure 2-13. The Y motor is the initial driving force for "front to back" movement of the pantograph (Beam). Refer to the following procedure to replace the Y motor. If the Y motor belt must be replaced, refer to the next procedure for Y motor belt replacement.

Tools Required: A zero to 40 lbs. spring scale, 12 inch length of strong cord or cable, a set of socket head wrenches.

1. Turn the peripheral OFF and unplug the power cord from the source voltage.
2. Remove the two socket head cap screws and associated hardware holding the Y motor/belt cover around the motor pulley and belt area (see Figure 2-14). Remove the cover.

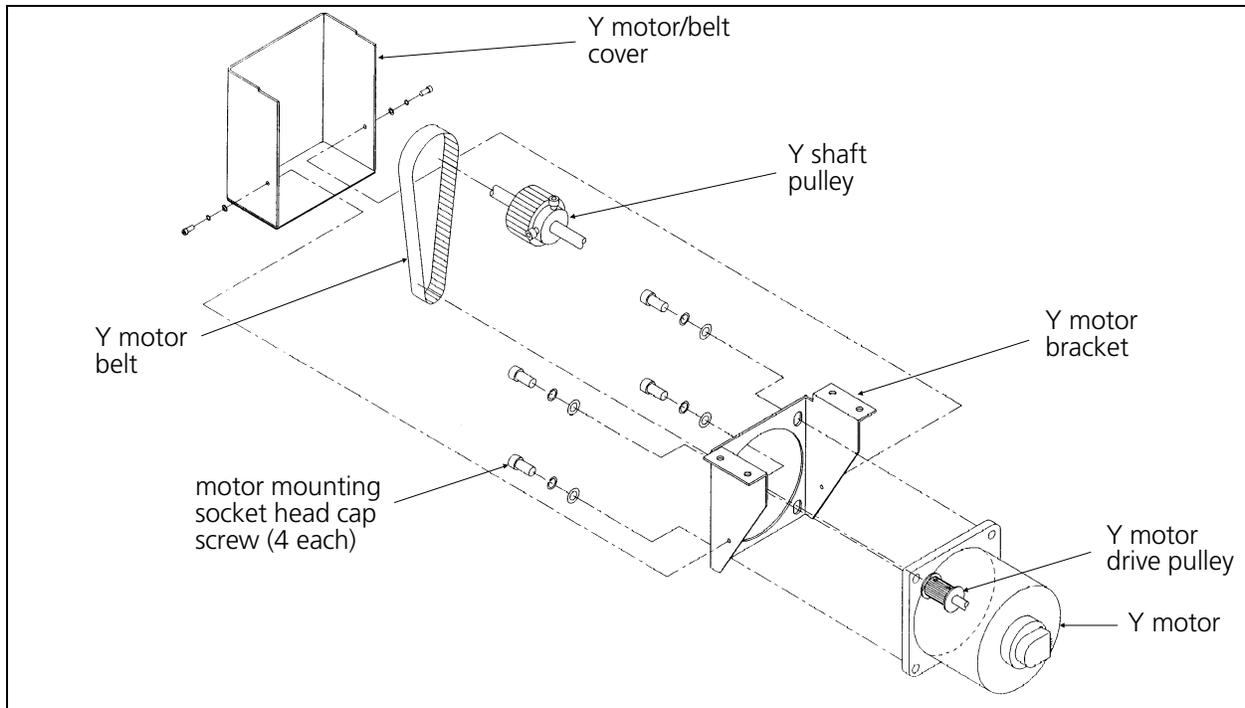


Figure 2 - 14

3. There are two harnesses leading from the motor and one harness connected to the motor encoder. Disconnect the motor encoder harness connection.
4. Remove the cover from the harness way located on the inside front wall of the frame top support platform to access the in-line connections for the two motor harnesses.
5. Disconnect the two motor in-line harness connection and remove them from the harness way.
6. Loosen the four socket head cap screws holding the Y motor to the motor bracket (see Figure 2-14).
7. Tilt the motor slightly to allow the motor belt to slip off the motor drive pulley.

NOTE: The motor shaft pulley is permanently attached to the motor shaft. Therefore, the new motor assembly must have a pulley already attached to the shaft.

8. Remove the four socket head cap screws (that are already loosened) and the associated hardware attaching the Y motor to the motor bracket. Remove the motor from the support bracket.
9. With the existing hardware, attach the new motor to the bracket and slip the motor belt over the motor pulley. Be certain the belt is properly fitted on the Y shaft pulley and directly above the motor pulley.

10. Rotate the four socket head cap screws until the slack is taken up between the screw head and the associated hardware. DO NOT, however, tighten the four socket head cap screws at this time.
11. Locate a length of strong cord or cable sufficient to loop over the motor pulley with four to six inches of cable hanging below the motor.
12. Loop this cable around the motor pulley between the belt and the pulley flange nearest the motor body. Tie the ends of the cable together.
13. Position a 0 to 40 lb. spring scale into the cable loop and pull down with the spring scale until the scale reads 30 to 35 lbs. With the pull tension still applied with the spring scale, tighten the attaching socket head cap screws securing the motor to the bracket.
14. Reattach the two motor harnesses and after positioning the excess harnessing into the harness way, reinstall the harness way cover.
15. Reattach the encoder harness to the motor (see diagram in Figure 2-14) and reinstall any and all covers removed during this procedure.

Y Motor Belt Replacement

It is recommended that a Melco-trained service technician perform this procedure. Replacing the Y motor belt requires a major disassembly of the Y drive system. After removing all the machine rear covers the Y shaft must be moved to the middle for the Y motor belt to be removed around the end of the shaft. To move the shaft all pulleys on the shaft must be loosened, and then an adequate reassembly of the Y drive system must be performed.

Tools Required: A zero to 40 lbs. spring scale, 12 inch length of strong cord or cable, and a set of socket head wrenches.

1. Turn the peripheral OFF and unplug the power cord from the source voltage.
2. To gain access to the Y shaft area, remove all the screws that secure the rear covers to the frame and to each other. Lift the cover pieces out of position and set them aside.
3. Remove the two socket head cap screws and associated hardware holding the Y motor/belt cover around the motor pulley and belt area (see Figure 2-14). Remove the cover.
4. Loosen the four socket head cap screws holding the Y motor to the motor bracket (see Figure 2-14).
5. Tilt the motor slightly to allow the motor belt to slip off the motor drive pulley.

6. At the front of the machine loosen each Y drive belt by loosening the two socket head cap screws at each of the four belt tensioning pulley idler assemblies.
7. At the rear of the machine loosen the locking collars on each of the two end pulleys (refer to Figure 2-15 for this and the several steps following).

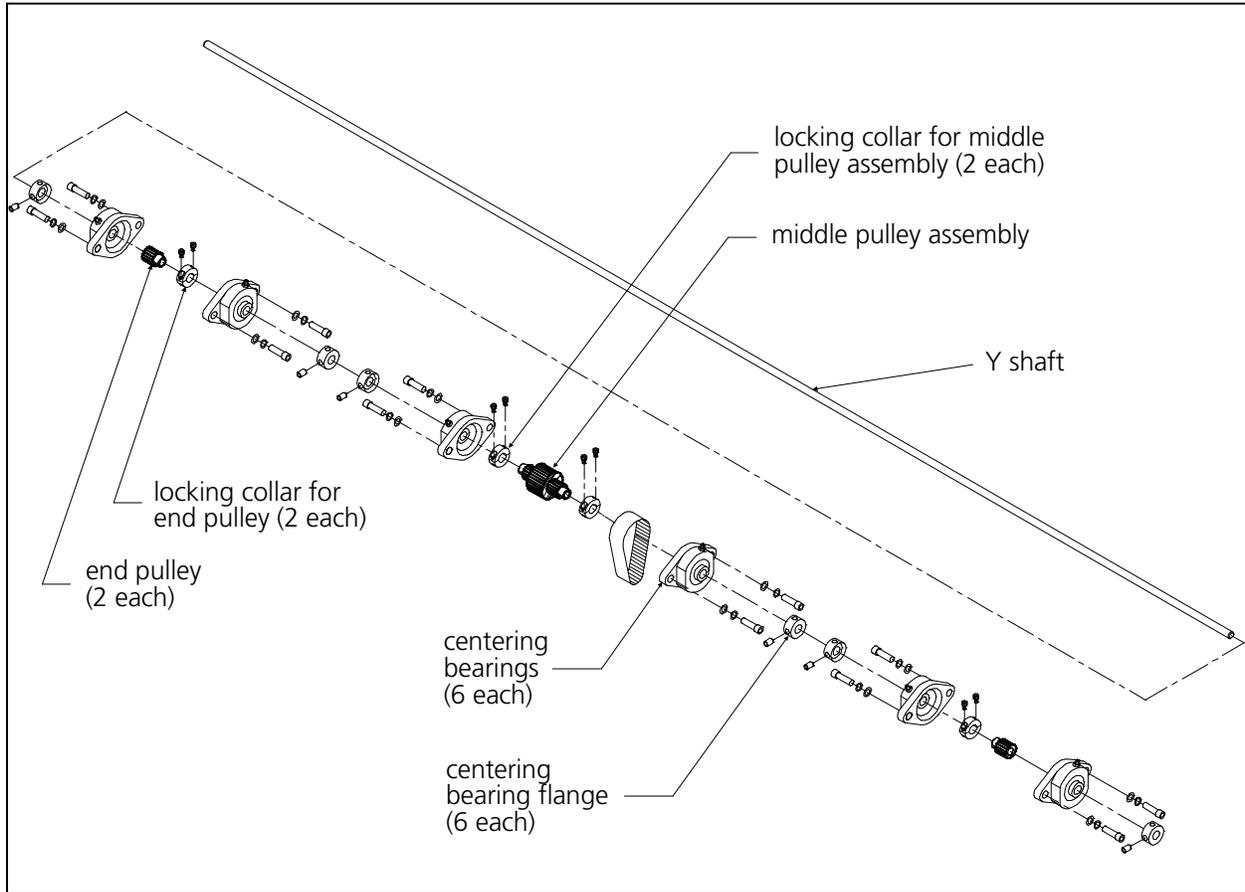


Figure 2 - 15

8. At the middle channel, loosen the two locking clamps holding the Y shaft drive pulley assembly at each side.

NOTE: In the next two steps DO NOT loosen or remove the centering bearing bodies; and use care not to adjust any recentering of the bearing.

9. At one end of the Y shaft, loosen and remove the centering bearing flange.
10. Except for the end opposite from the one loosened in the previous step, loosen the four remaining centering bearing flanges.
11. The Y shaft should now be loose and can be slid within the bearing structure.
12. Slide the Y shaft out of three of the six centering bearings and until the end is inside the Y shaft drive pulley assembly in the middle channel.

13. Slip the Y drive belt off the open end of the Y shaft drive pulley assembly and then slip the Y motor belt off the pulley assembly and out of the Y shaft area.
14. Install a new Y motor belt around the Y shaft drive pulley assembly and position it down to the Y motor pulley area.
15. Reinstall the rear end of the Y drive belt onto the outside pulley of the Y shaft drive pulley assembly.
16. Reverse the previous procedure to slide the Y shaft into original position and tighten the centering bearing flanges in place. Be certain to capture the rear ends of the Y drive belts as the shaft is slid through the various pulleys and bearings.

Adjustments

1. Push the X beam all the way to the rear until it mechanically seats itself.
2. Tighten the four locking collars on all the Y drive belt pulleys.
3. Refer to the Y Drive Motor Replacement procedure on Page 2-19 to adjust the Y drive belt tension.

XYZ Motor Drive Amplifiers

There are three identical XYZ Motor Drive Amplifiers located inside the motor amplifier assembly in the top support platform between heads #3 and #4 (see Figure 2-13). Refer to the following procedure for replacement.

WARNING! When the cover is removed, and the machine is ON, potential harmful voltage and current is exposed.

The capacitors in this section store high voltage for a few moments after power is removed, therefore extreme care is advised when working in this area immediately after removing power.

It is advised that you delay any work in this area for at least one (1) minute after removing power, to allow the voltage to "bleed" from the capacitors.

Current Limit Switch Settings

Before installing any new Motor Drive Amplifier, you must set the current limit DIP switches on the module. The current limit switch setting for the amplifier associated with the either the X or Y axis is the same, but is different for the Z axis. Refer to the following steps and set the switches accordingly.

1. Refer to Figure 2-16 and locate the current limit DIP switches on the motor drive amplifiers as indicated.

2. Using a small screw driver or similar device, position the DIP switch settings to the proper positions as shown in the enlarged sections of Figure 2-16.

For X and Y modules:
#1 ON, #2 OFF,
#3 OFF, #4 ON.

For the Z module:
#1 ON, #2 ON,
#3 OFF, #4 ON.

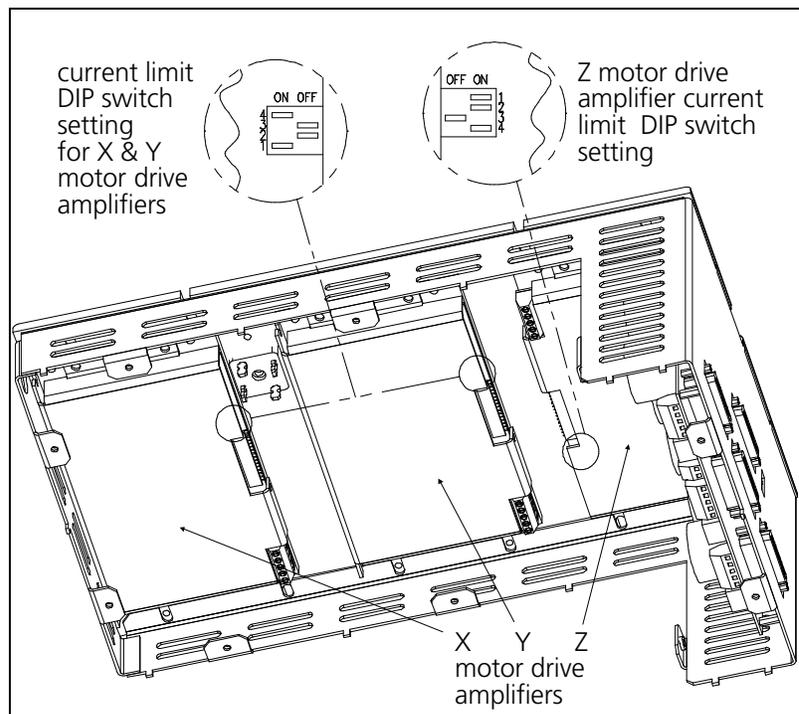


Figure 2 - 16

Module Replacement

To replace one or more of the XYZ Motor Drive Amplifiers refer to the following steps:

1. Turn the peripheral OFF.
2. WAIT ONE MINUTE, then remove the cover over the XYZ Motor Drive Amplifier section under the top support platform of the chassis (see Figure 2-13).
3. Disconnect the harnesses and remove hardware associated with the defective XYZ Motor Drive Amplifier (see Figure 2-17).

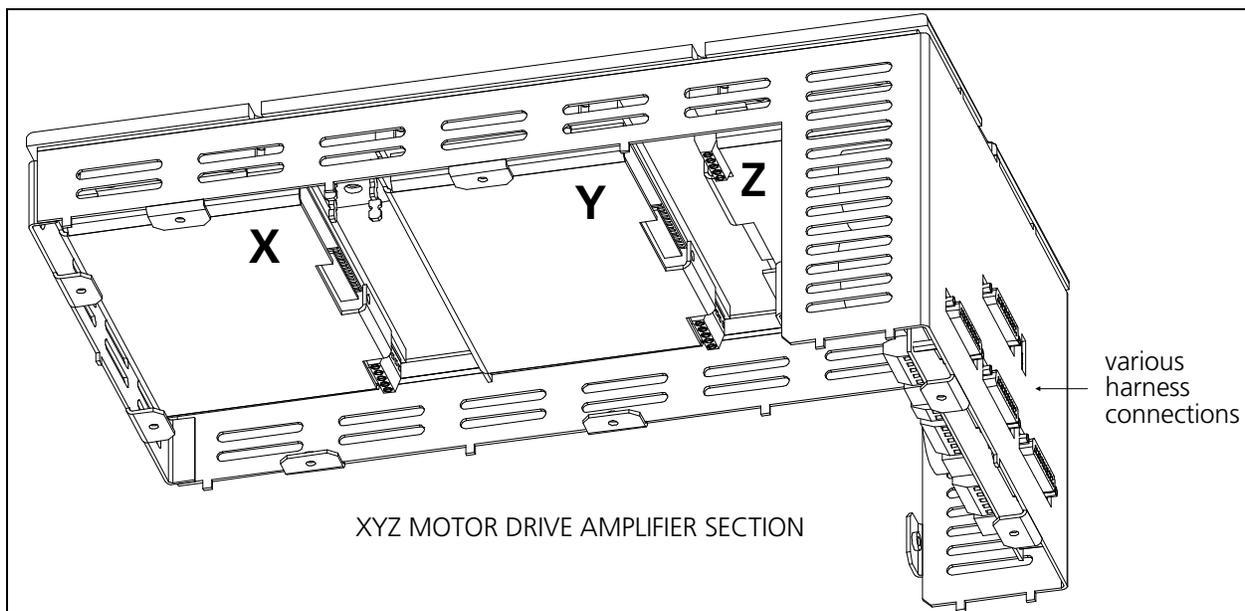


Figure 2 - 17

4. Remove the defective XYZ Motor Drive Amplifier.
5. Insure the current limit switches are set correctly as described previously, then install the new XYZ Motor Drive Amplifier using the same hardware.
6. Reconnect the harnesses that were disconnected during the removal of the defective module.
7. Reattach the XYZ Motor Drive Amplifier section cover removed earlier.
8. Reattach the XYZ Motor Drive Amplifier section cover removed earlier.

Electronics Section

The electronic section consists of the major electronic printed circuit boards located within an RFI controlling box called the card cage. The card cage is located inside the right chassis leg (see Figure 2-13).

Remove Card Cage Cover

1. Turn OFF the power switch to the EMT 10/4T.
2. To remove the card cage cover, remove the screws and associated hardware from around the cover as shown in Figure 2-18 and lift the cover off.

Caution: When the electronics cover is removed the various printed circuit boards are exposed. DO NOT TOUCH THESE BOARDS Without Using Antistatic Precautions as instructed in this manual.

IMPORTANT: Do Not operate the embroidery peripheral with the electronics 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.

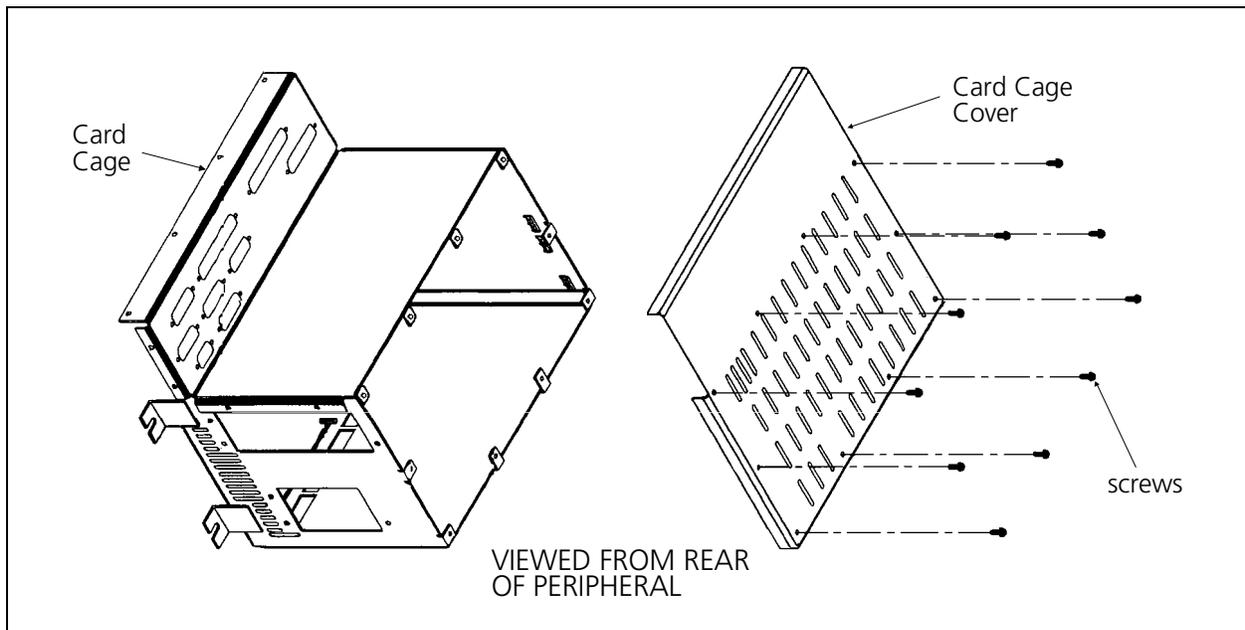


Figure 2 - 18

Card Cage Components

Inside the card cage is found the Backplane PCB lying against the end of the chassis leg with its respective PCBs inserted into its connectors. The PCBs installed are:

- The CPU PCB
- The Ethernet network PCB
- The Interface PCB
- Blank space
- The LV Driver PCB

Refer to Figure 2-19 for identifying where each PCB is specifically located.

CAUTION! In removing any PCBs from the EMT 10/4T, 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.

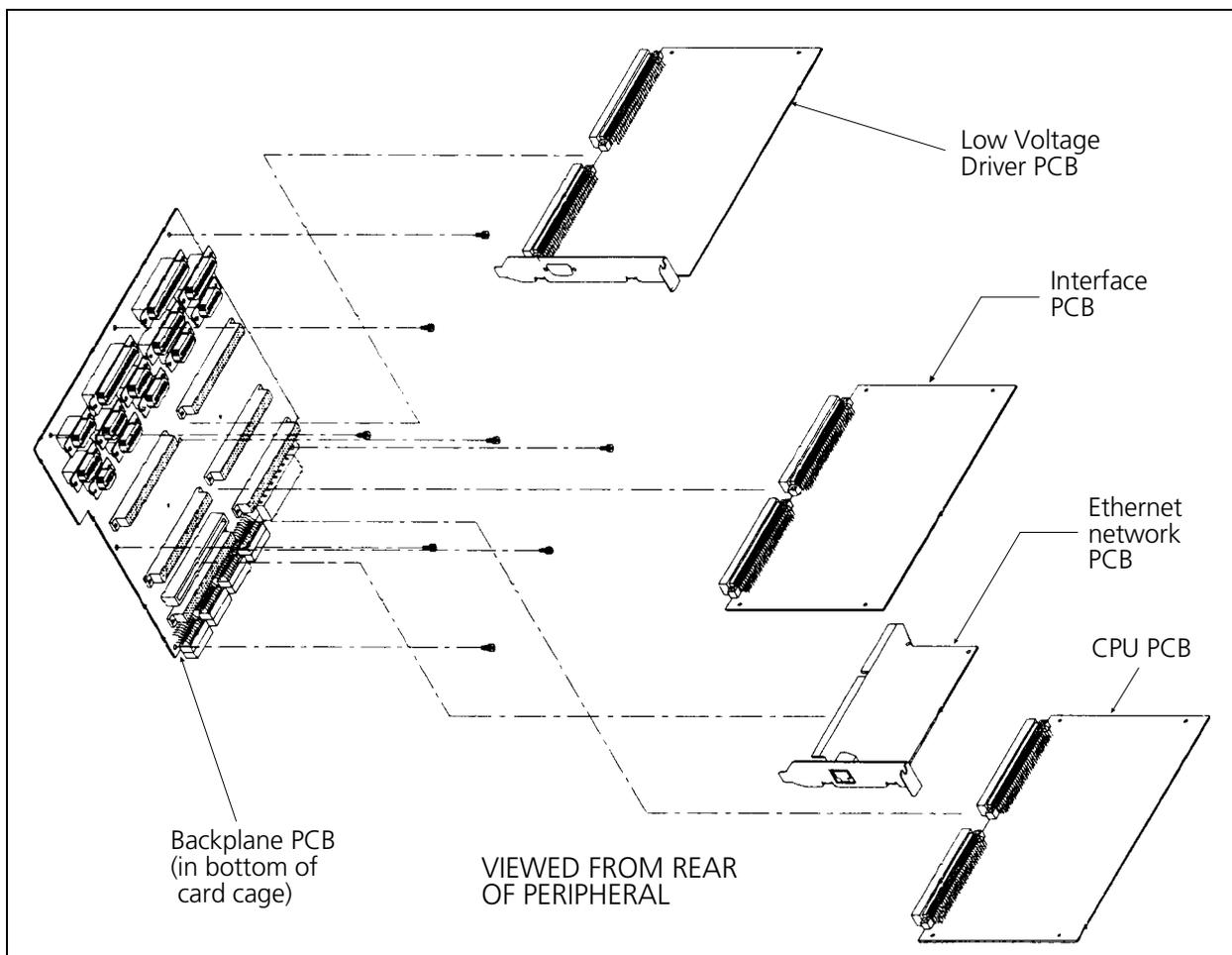


Figure 2 - 19

CPU PCB Replacement

The CPU PCB is the first PCB located toward the front of the card cage as shown in Figure 2-19. Refer to the following procedure for replacing the CPU PCB.

1. Turn OFF the power switch to the EMT 10/4T.
2. Remove the card cage cover and install a static grounding strap between the working surface and the personnel performing this procedure.
3. Grasp the CPU at the corners and gently rock it out of its connectors in the backplane PCB. Remove the CPU.

CAUTION! It is advised to place the removed PCB into an anti-static bag before handling it any further. Portions of this board are very sensitive to static charges.

4. To replace the CPU PCB, perform the previous steps in reverse order.
5. Remove the static grounding strap and replace the card cage cover.

NOTE: If during this procedure, the CPU has been replaced with a different one, you must "configure" the embroidery peripheral. Refer to the peripheral operation manual and Section 1 of this manual for information regarding the configuration process.

Ethernet Network PCB

The Ethernet PCB is positioned inside the card cage of the peripheral between the CPU PCB and the Interface PCB as Figure 2-19 shows. Refer to the following procedure for replacement.

1. Turn OFF the power switch to the EMT 10/4T.
2. Remove the card cage cover and install a static grounding strap between the working surface and the personnel performing this procedure.
3. Disconnect the Ethernet cable from the bottom end of the PCB at the Ethernet card edge mounting bracket.
4. Remove the screw and washer at the card edge mounting bracket for the PCB.
5. Grasp the Ethernet PCB at the corners and gently rock it out of its connectors in the backplane PCB. Remove the Ethernet PCB.

CAUTION! It is advised to place the removed PCB into an anti-static bag before handling it any further. Portions of this board are very sensitive to static charges.

6. Replace the Ethernet PCB by reversing the previous steps.
7. Install the screw and washer at the card edge mounting bracket to secure the printed circuit board.
8. Reinstall the Ethernet cable at the bottom end of the Ethernet PCB.
9. Remove the static grounding strap and replace the card cage cover.

Interface PCB Replacement

The Interface PCB is positioned inside the card cage with the Ethernet PCB on one side and the blank space before the Low Voltage Driver PCB on the other side (see Figure 2-19). Refer to the following procedure for replacement.

1. Turn OFF the power switch to the EMT 10/4T.
2. Remove the card cage cover and install a static grounding strap between the working surface and the personnel performing this procedure.
3. Grasp the Interface PCB at the corners of the board and gently rock it out of its connectors in the backplane PCB. Remove the PCB.

CAUTION! It is advised to place the removed PCB into an anti-static bag before handling it any further. Portions of this board are very sensitive to static charges.

4. To replace the Interface PCB, perform the previous steps in reverse order.
5. Remove the static grounding strap and replace the card cage cover.

Low Voltage Driver PCB

The Low Voltage Driver PCB is positioned inside the peripheral card cage in the last position to the rear as Figure 2-19 shows. Refer to the following procedure for replacement.

1. Turn OFF the power switch to the EMT 10/4T.
2. Remove the card cage cover and install a static grounding strap between the working surface and the personnel performing this procedure.
3. Loosen the screws in the connector and remove the cable from the bottom end of the Low Voltage Driver PCB.
4. Remove the screw and washer at the card edge mounting bracket for the Low Voltage Driver PCB.

5. Grasp the PCB at the corners and gently rock it out of its connectors in the backplane board. Remove the PCB.

CAUTION! It is advised to place the removed PCB into an anti-static bag before handling it any further. Portions of this board are very sensitive to static charges.

6. Replace the PCB by reversing the previous steps.
7. Install the screw and washer at the card edge mounting bracket to secure the printed circuit board.
8. Reconnect the cable at the bottom end of the Low Voltage Driver PCB and tighten the screws in the cable connector.
9. Remove the static grounding strap and replace the card cage cover.

Backplane PCB

The Backplane PCB sits inside the card cage, all the way toward the side of the chassis leg. It contains the connectors where the other PCBs and all the associated cables are inserted. Refer to the following procedure for replacing the Backplane PCB.

1. Turn OFF the power switch to the EMT 10/4T.
2. Disconnect all the harnesses going to the backplane PCB connectors, the Ethernet PCB cable, and the low voltage driver PCB harness.
3. Remove the entire card cage by removing the four screws holding it to the side of the right chassis support leg (see Figures 2-20).
4. Remove the card cage cover and install a static grounding strap between the working surface and the personnel performing this procedure.
5. Remove all the other printed circuit boards as earlier described.
6. Remove the screws holding the cover over the backplane PCB connectors (see Figure 2-21).

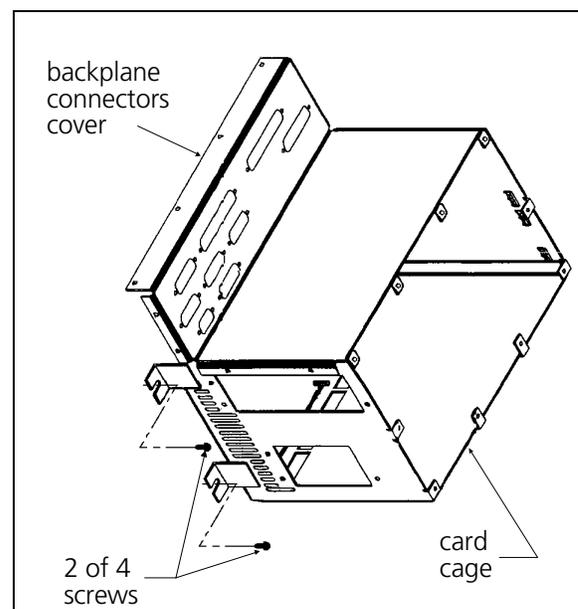
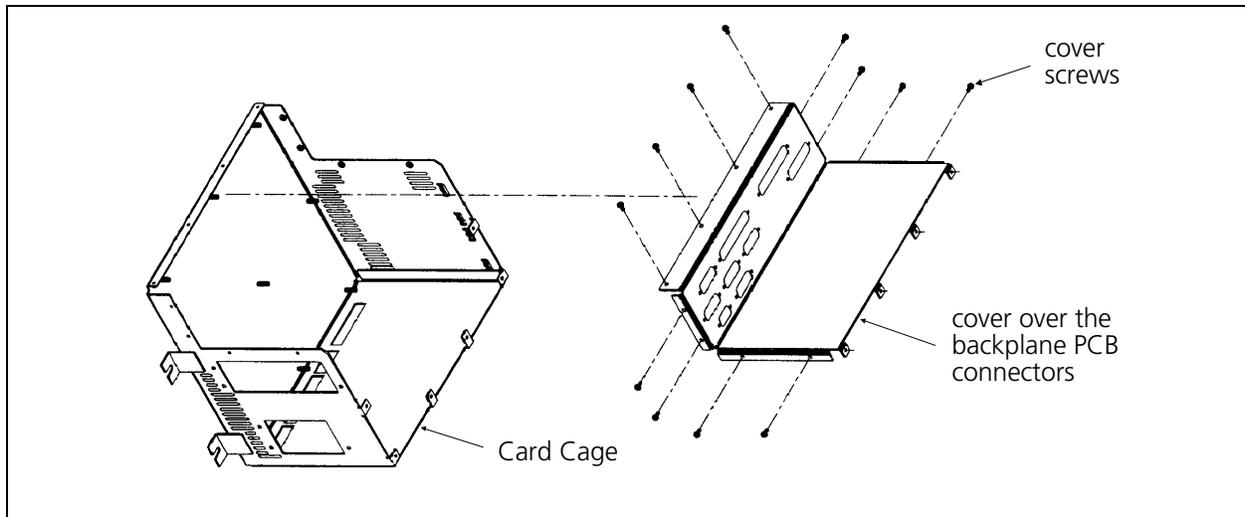


Figure 2 - 20

**Figure 2 - 21**

7. Remove the screws holding the backplane PCB to the base of the card cage.
8. Lift the backplane PCB out of the card cage.
9. Install a new backplane PCB using the same hardware that secured the previous one in the base of the card cage.
10. Replace the cover over the backplane PCB connectors using the same screws that previously secured it.
11. Replace all the previously removed printed circuit boards that fit into the backplane PCB.
12. Remove the static grounding strap and replace the card cage cover.
13. Reinstall the card cage into the right chassis support leg, securing it with the four screws.
14. Reconnect the harnesses to the backplane PCB connectors, the Ethernet PCB cable, and the low voltage driver PCB harness.

Power Distribution Section

The AC voltage distribution panel, power supplies, and associated circuitry for the EMT 10/4T are located inside the left chassis leg. In addition to the AC voltage distribution panel, there are two power supplies, one for logic voltages and another for motors, and the e-stop control PCB located in this section.

AC Input Voltage Selection

1. Refer to Figure 2-22 and unplug the main power cord at the entry module on the AC voltage distribution panel inside the left frame leg.

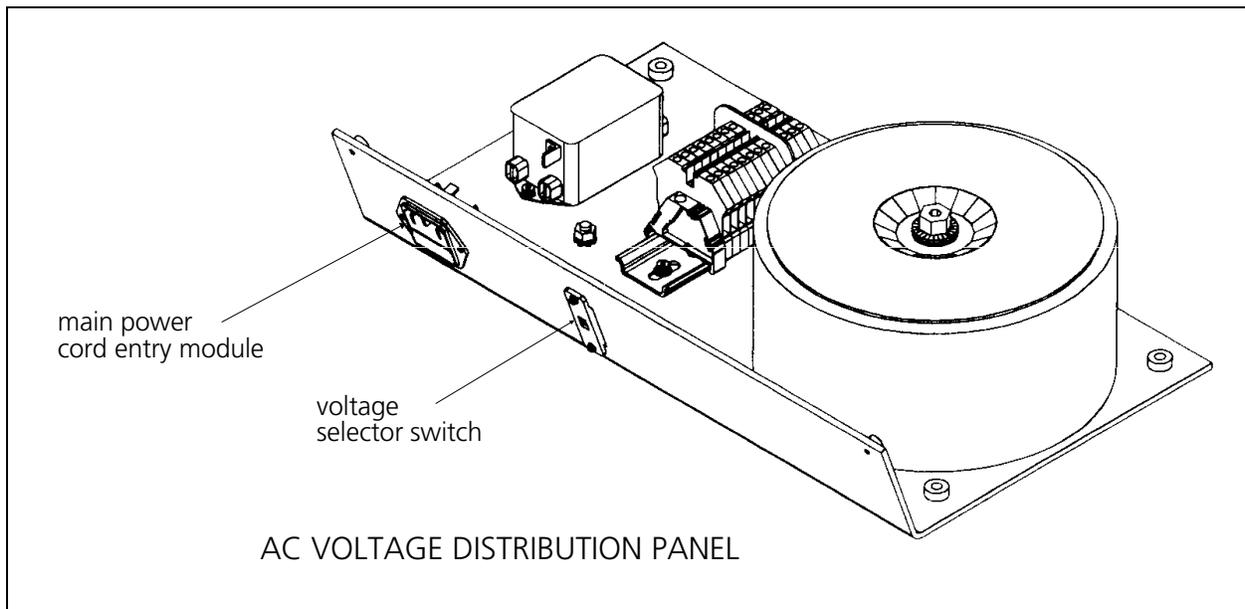


Figure 2 - 22

2. Locate the voltage selector switch on the AC voltage distribution panel.

CAUTION! Be Certain Power Is NOT Applied To The Peripheral When Performing The Next Step.

3. Slide the voltage selector switch to the appropriate position: 115 Volts or 230 Volts, depending on your input voltage.
4. Squeeze the tabs on either side of the fuse holder built into the entry module and remove the fuse holder and fuses.
5. Place the correct fuses in the fuse holder, depending on the selected voltage and the following fuse value:

115 Volt Source selected - 10 Amp Fuses

230 Volt Source selected - 5 Amp Fuses

Voltage Adjustments

All voltage values are regulated within the operating ranges of the machine design. Therefore, NO adjustments are required for voltage values for either supply.

Power Supply Assembly Removal/Replacement

1. Refer to Figure 2-22 and unplug the main power cord at the entry module on the AC voltage distribution panel inside the left frame leg.
2. Remove 4 screws fastening the power tray cover and remove the cover.
3. Disconnect the following cables: estop cable, motor power cable, logic power cable, 24V power cable.
4. Refer to Figure 2-24 and remove the 4 screws fastening the power supply assembly from the outside of the peripheral frame leg.
5. Refer to Figure 2-24 and remove the 4 screws securing the power supply assembly to the under side of the frame from the inside the leg, and lower the assembly from the frame leg.

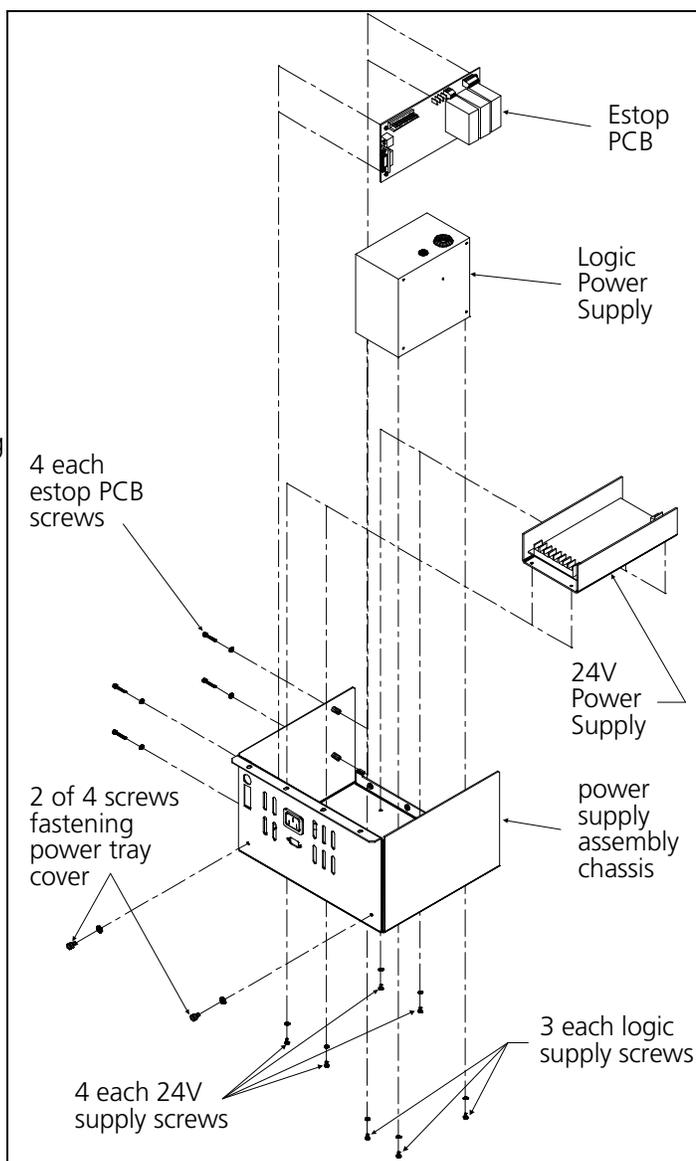


Figure 2 - 23

6. Disconnect the power supply cable at the circuit breaker and the ground wire from the frame ground terminal.
7. Replacement is the reverse of the removal. When replacing the assembly into the frame leg, be certain the tabs on the power supply assembly fit into the slots in the frame before the upper screws are replaced and tightened.

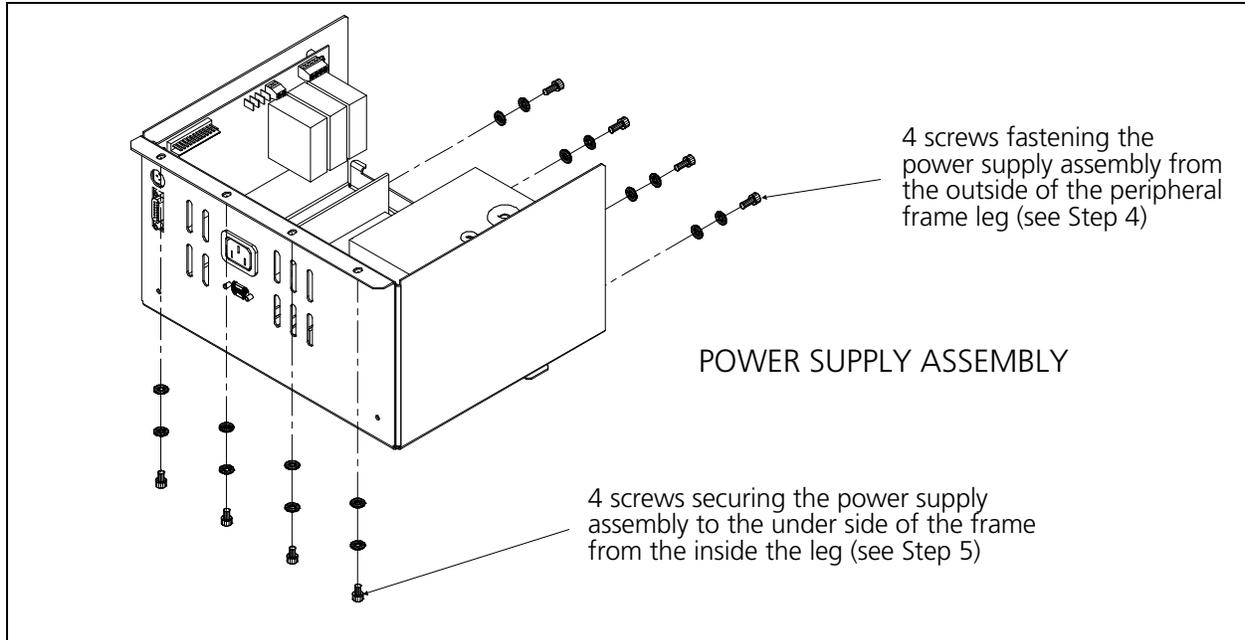


Figure 2 - 24

Logic Power Supply Removal/Replacement

1. Remove the power supply assembly from the left frame leg as described earlier.
2. Refer to Figure 2-23 to identify the location of the logic power supply and estop PCB. Unplug the 2 power connectors (labeled P8 & P9) from the estop PCB.
3. Unplug the 4 spade terminals (wires colored blue, brown, black & white) from the estop PCB.
4. Remove the 3 mounting screws from around the fan on the outside of the power supply assembly, and remove the Logic supply.
5. Replacement is the reverse of removal.

24V Power Supply Removal/Replacement

1. Remove the power supply assembly from the left frame leg as described earlier.
2. Refer to Figure 2-23 to identify the location of the 24V supply and remove the 3 ring terminals from the connector labeled J1 and the 4 fork terminals from the connector labeled J2.
3. Remove the 4 mounting screws from the outside of the power supply assembly and remove the 24V supply.
4. Replacement is the reverse of removal.

Emergency Stop PCB Assembly Removal/Replacement

1. Remove the power supply assembly from the left frame leg as described earlier.
2. Refer to Figure 2-23 to identify the location of the e-stop PCB and unplug the 2 power connectors (labeled P8 & P9) from the estop PCB.
3. Unplug the 4 spade terminals (wires colored blue, brown, black & white) from the Estop PCB.
4. Unscrew the 2 wires from connector ES5 (AC power in) and the 4 wires from connector ES6 (AC power out).
5. Remove the 4 mounting screws from the outside of the power supply assembly and remove the estop PCB assembly.
6. Replacement is the reverse of removal.

Estop PCB Fuses

Refer to Figure 2-25 to identify the location of the various fuses used in the estop PCB. When required, replace any and all fuses with the same type and value as indicated.

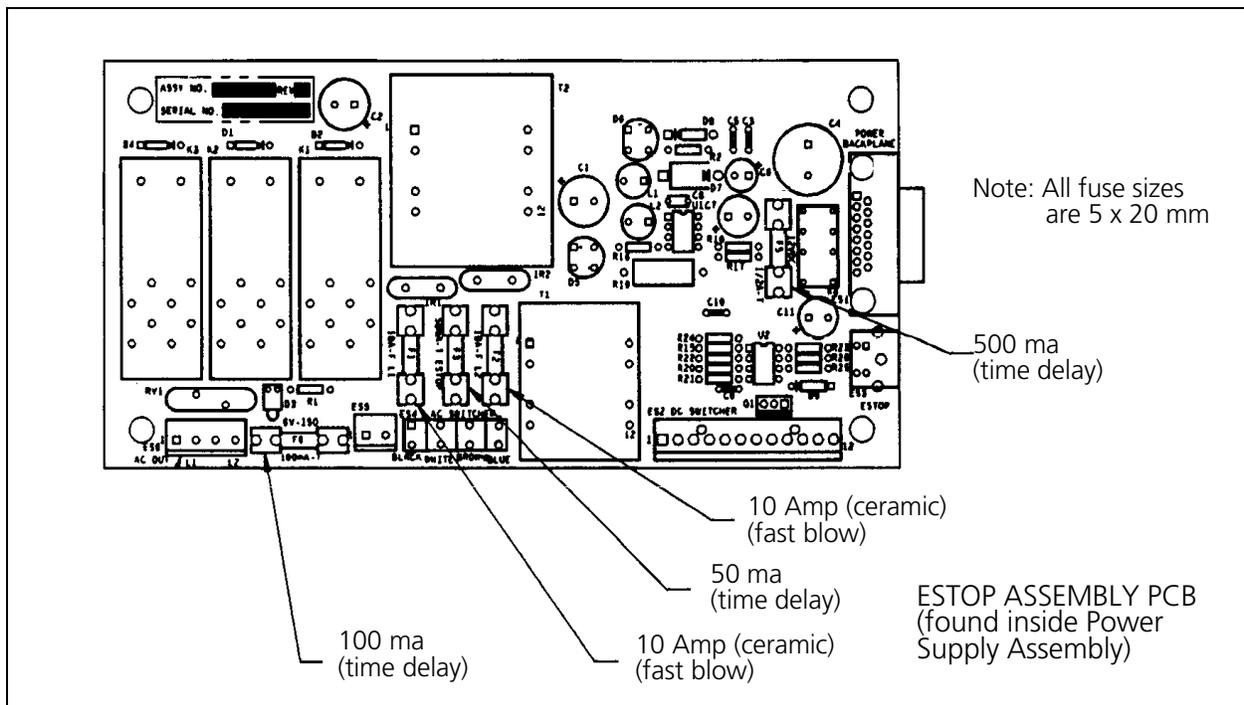


Figure 2 - 25

Power and Light Switch Removal/Replacement

1. Refer to Figure 2-24 and unplug the main power cord at the entry module on the AC voltage distribution panel inside the left frame leg.
2. Remove 4 screws fastening the power tray cover and remove the cover.
3. Remove 4 screws fastening the AC voltage distribution panel (see Figure 2-26), and lower the module to the bottom of the frame leg.

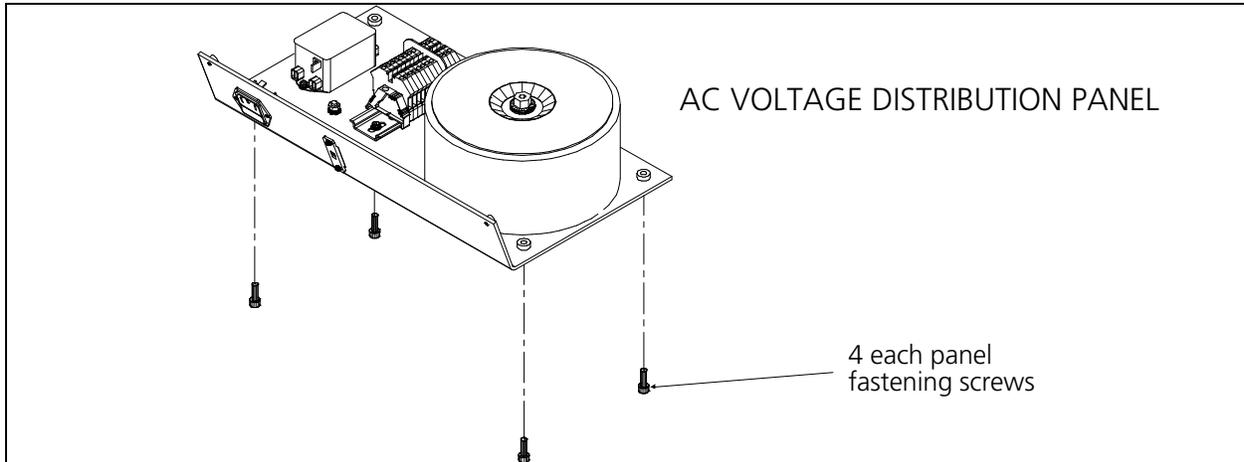


Figure 2 - 26

4. Pull off 4 spade terminals from the switch being replaced.
5. Squeeze the tabs on top and bottom of switch and push the switch out from the inside of the frame leg.
6. Replacement is the reverse of removal.

3. Embroidery Head Maintenance

General

This section of the manual provides parts replacement procedures and various adjustments required during repair maintenance of the embroidery head only. Information for service maintenance on trimmers is located in Section 4 and the rest of the machine is located in Section 2 of this manual.

These procedures are guidelines for performing repairs and must be used by personnel practicing good maintenance and repair techniques. Refer to the Maintenance Philosophy topics in Section 1 of this manual for discussion of good maintenance and repair techniques, including concerns with static electricity.

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 Warranty is exclusive of, and may be VOID if, poor maintenance practices have caused damage to the equipment.

Arm and Bed Assembly

The arm and bed assembly provides a stable embroidery head platform. All other components of the head are attached to this assembly.

Inside the arm and bed assembly are the shafts, belts, and pulleys that drive the needle and rotary hook. Attached to the outside of the arm and bed assembly are the Z drive motor, needle case and color change mechanism, thread tree, and trimmer grabber blade control.

Z Drive Mechanical System

The embroidery heads are driven by the Z drive system. This is a mechanical system of shafts, gears, and belts driven by a single motor. Each head has two main shafts running through it. The upper shaft moves the needle, take up lever, and other associated parts as the lower shaft rotates the hook assembly and provides for optional trimmer blade movements. These shafts are connected by a belt at the rear of the head.

A bevel gear is attached to the rear of the upper embroidery head shaft of each head. Mating with each of these four embroidery head bevel gears are bevel gears attached to the Z drive shaft running horizontally along the back of the peripheral and aligning perpendicular to the rear of the heads (see Figure 3-1).

At the left end of the Z drive shaft is a pulley, driven by a belt, which in turn is driven by the Z drive motor. Also at this end of the Z drive shaft is an in-line shaft encoder which detects rotational position of the shaft.

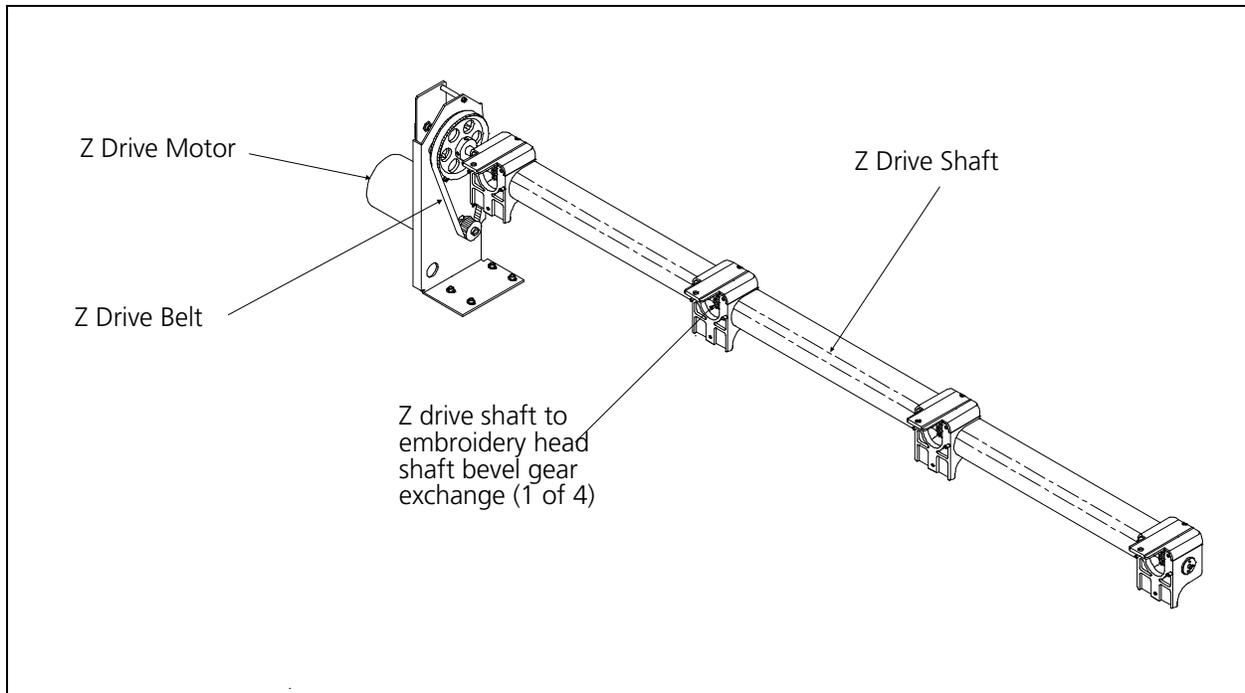


Figure 3 - 1

The alignment and calibration of this mechanical system is critical for proper operation of the EMT 10/4T Embroidery Peripheral.

Z Motor Replacement

Note: This procedure requires a Gates 5M Tensiometer (Melco p/n 992165-01) for proper belt adjustment.

1. Turn the main power OFF, and remove the power source cable from the power supply assembly.
2. Remove the left rear cover over the Z motor drive area by the following procedure and referring to Figure 3-2:
 - a) Remove the 2 screws on the inside surface of the cover near the head, just above the Z drive shaft.
 - b) Of the 3 screws located near the head and directly below the 2 screws removed in step a, remove the 2 outer screws. Leave the middle screw secure.
 - c) Remove the only screw at the front surface of the cover and the 2 screws located at the base of the outer (left) surface of the cover.
 - d) Lift the cover and tilt it enough to get the mounting tabs past the Z drive collar located on the left side of the head. Lift the cover the rest of the way off.

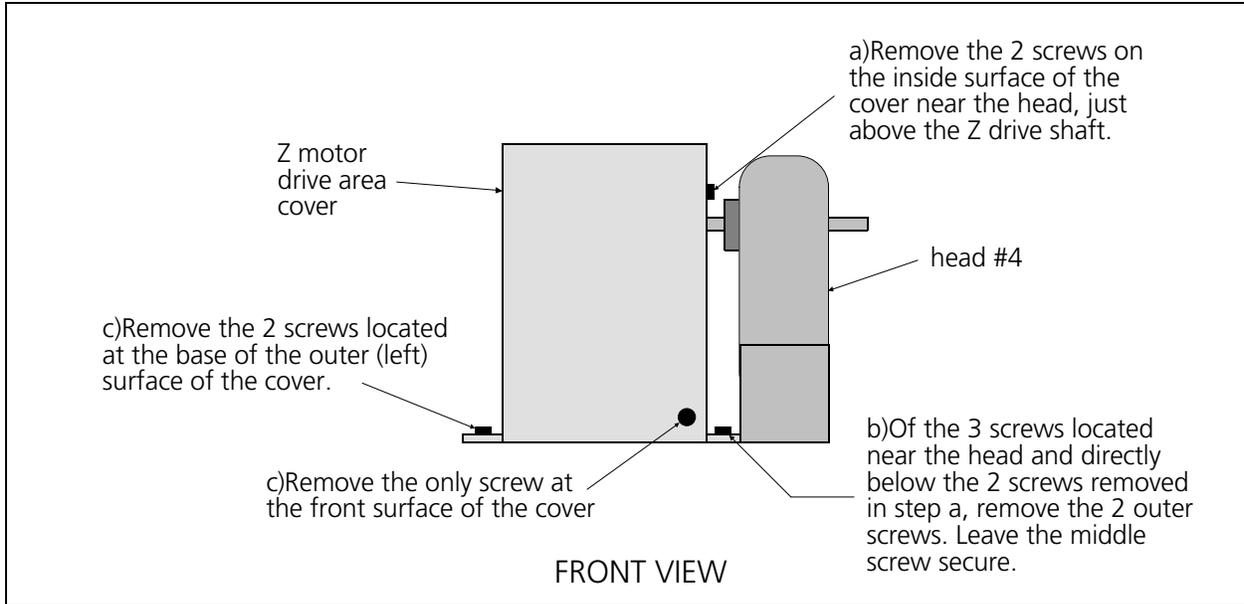


Figure 3 - 2

3. Disconnect the Z motor harnesses from the associated in-line XYZ driver harness connections.
4. Remove the four socket head cap screws attaching the motor to the motor support bracket (see Figure 3-3).

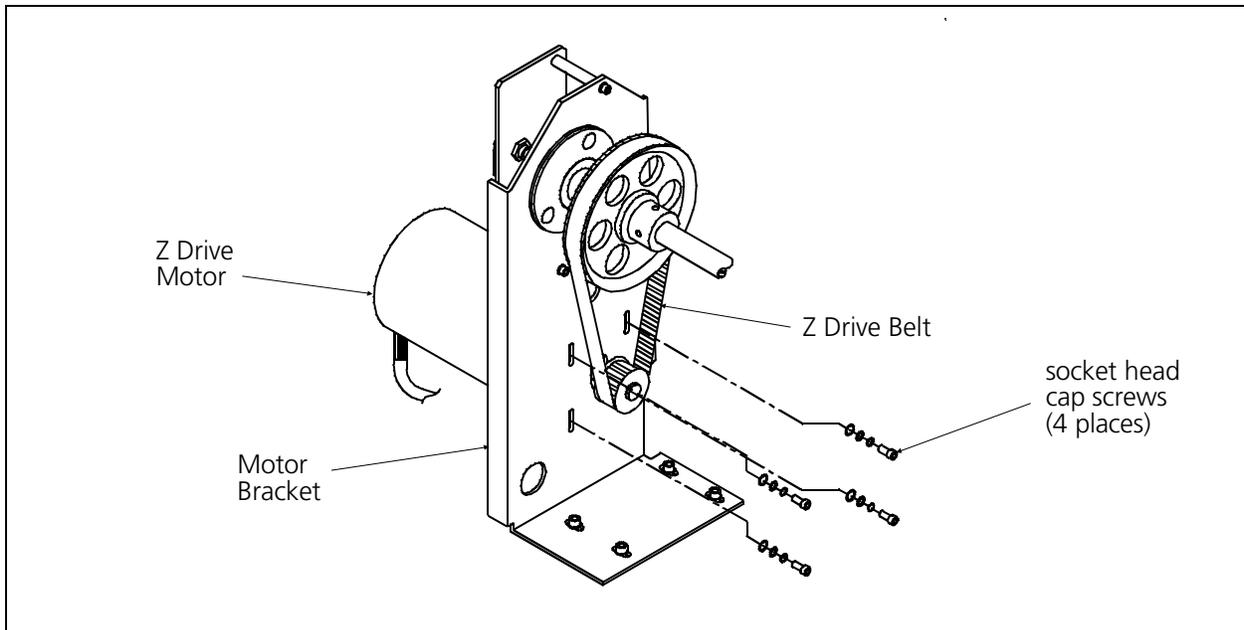


Figure 3 - 3

5. Tilt the motor slightly to allow the drive belt to slip off the motor drive pulley and remove the motor from the support bracket.
6. Loosen the pulley set screws and remove the pulley from the motor shaft.

7. Place the pulley on the new motor shaft and, before tightening the pulley set screws, perform the next steps to insure the motor shaft pulley is positioned so the belt will ride in the middle of the two pulleys.
8. Put the new motor in place in the support bracket and slip the drive belt over the pulley. Insure the other end of the drive belt remains on the pulley associated with the z drive mechanism.
9. With the existing hardware, attach the motor to the bracket, but DO NOT tighten the four socket head cap screws at this time.
10. Remove the motor pulley set screws and apply Loctite 222 or equivalent screw adhesive, then reinstall the set screws.
11. Position the motor pulley on the motor shaft so the belt will ride squarely on both pulleys and that the belt will not ride up on the flanges of either pulley.
12. Insure the set screws are in line with the flats of the motor shaft and tighten the motor pulley set screws.

Z Motor Belt Tensioning

Refer to the following procedure to adjust the belt tension as you secure the motor to the support bracket.

Note: This procedure requires a Gates 5M Tensiometer (Melco p/n 992165-01) for proper belt adjustment.

1. Loosen the 4 socket head cap screws securing the Z motor to the motor support bracket.
2. Place the Gates 5M Tensiometer midway on one side of the belt (see Figure 3-4).

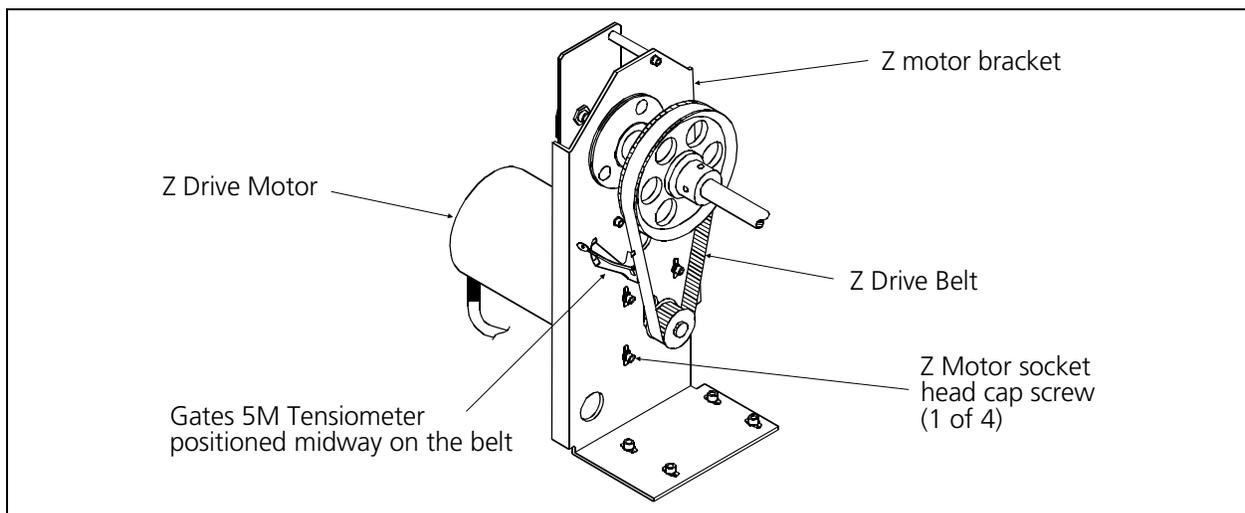


Figure 3 - 4

3. Push down on the motor and, when the reading on the tensiometer is at 25, tighten the socket head cap screws.
4. After the screws are tightened, check the tension again to verify the proper measurement was maintained.

Synchronizing The Embroidery Heads

Head synchronization is very critical in maintaining proper stitch timing for all four heads. Without head synchronization, the embroidery quality for those heads that are not in sync with the rest will become very marginal, if they make stitches at all. To sync the heads, refer to the following procedure:

1. With the 5 mm hex wrench, rotate the Z drive shaft to the HU position on the disk at the right end of the Z drive shaft (see Figure 3-5).

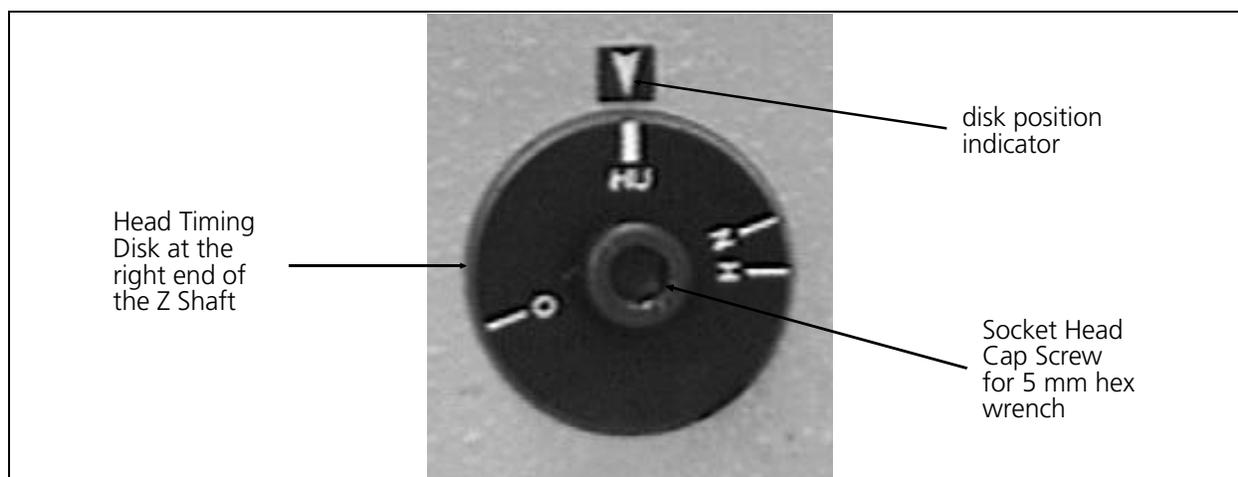


Figure 3 - 5

2. Turn ON the peripheral and ensure the Z encoder is at the headup position with the Z drive shaft at HU. (The green LED marked ZINDEX on the front of the right frame leg of the peripheral [see Figure 3-7] should come ON within +/- 3 degrees of rotation around the HU mechanical position of the Z drive shaft.)
3. Perform the Z Shaft Encoder Calibration procedure in this section of the manual if the previous step is not met.
4. When the Z drive shaft and Z shaft encoder are set at the HU position, check that head #1 is set to the mechanical headup position by installing the headup fixture as described in the Z Shaft Encoder Calibration procedure.
5. Head #1 must be at its mechanical headup position when the Z drive shaft is at HU and the Z shaft encoder is indicating the headup signal (ZINDEX LED ON). To adjust any head other than #4 to the mechanical headup position, you must remove the shroud over the Z drive shaft section just to the right of the head as view from the rear.

NOTE: It remains IMPORTANT to insure that the Z drive shaft stays at the HU position during this procedure.

6. Loosen the socket head cap screw in the locking collar of the bevel gear on the Z drive shaft associated with the embroidery head (see Figure 3-6). This will loosen the grasp of the Z drive shaft on the head.

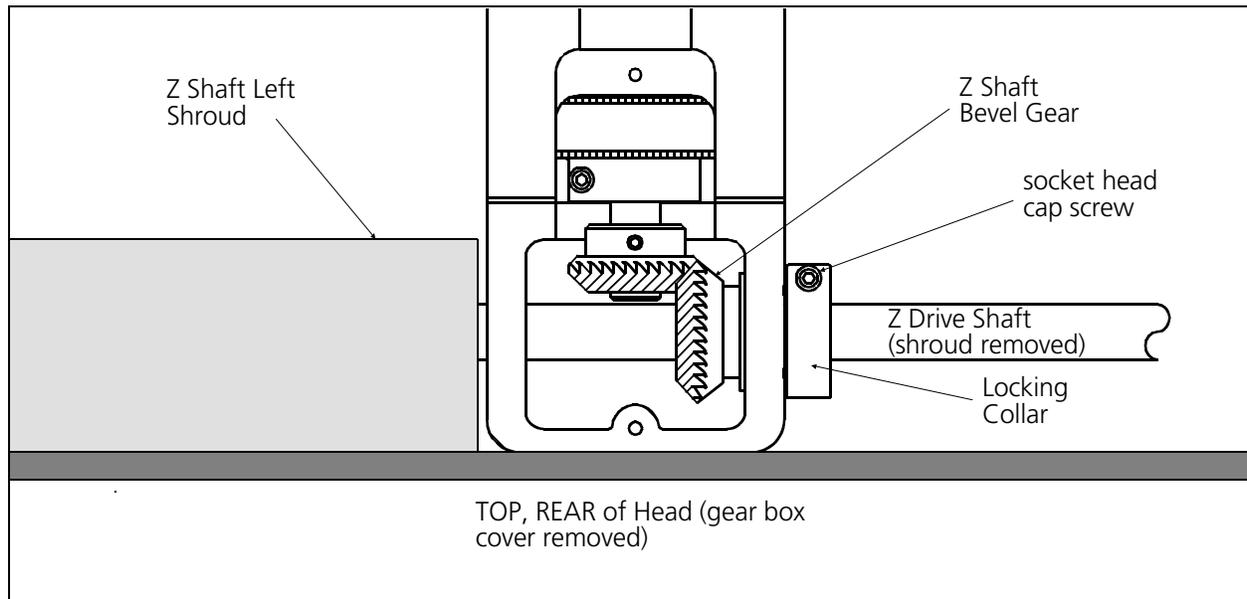


Figure 3 - 6

7. Rotate the embroidery head upper shaft (not the Z drive shaft) until the headup alignment tool is installed at the head's mechanical headup position.
8. Refer to the section on gear mesh on the following page and retighten the locking collar of the bevel gear on the Z drive shaft loosened in Step 6. This will secure the head position.

IMPORTANT! Anytime an embroidery head is re-synchronized, you must check and adjust the hook timing (if needed) on that head. Refer to the hook timing procedure in the EMT 10/4T Operation Manual.

Shaft Drive Gear Mesh

Engaging the bevel gears on the Z drive shaft and the mating bevel gear on each of the 4 embroidery heads must be 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 (approximately .003 to .005 inch gear spacing).

When adjusted properly, you should be able to "feel" the free movement between the mating gears, while you may not be able to "see" the movement.

Z Shaft Encoder

Introduction

The ability to place stitches precisely at high speed is dependent on the accurate operation of the electronics and electromechanical assemblies. The "key" to this is the Z encoder. The information provided to the CPU and other electronics by the Z encoder is the basis for all the embroidery 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 head for a color change, when setting home position is allowed, how fast the head is running, how many stitches have been embroidered, etc.

It is important 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 marked ZINDEX on the front of the right frame leg of the peripheral (see Figure 3-7) can be used to see if the CPU is in fact receiving a head up (or mark) pulse from the encoder. (This indicates that the encoder and associated cables are functional.) It should be noted however, that the ZINDEX (or "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 procedures in the following pages will result in the most proper and accurate alignment and repair of the Z encoder system that is possible and/or feasible in the field by a technician.

It can be seen that the proper alignment of the Z encoder can result in maintaining embroidery quality and proper machine operation. Slight Z encoder misalignment can cause many kinds of erratic operation and/or intermittent thread breaks. 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.

Inspection

This procedure is a guide for determining the condition of the encoder.

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

1. Switch the peripheral OFF, lower the table top, and remove the rear head cover.
2. When switched back on it is important that the computer not download a design to the peripheral. To insure this condition remove the network cable (or boot disk if used).
3. With the network cable removed (or boot disk not inserted into the disk drive), turn ON the embroidery peripheral.
4. Locate the green LED marked "ZINDEX" on the front of the right frame leg of the peripheral (see Figure 3-7).
5. Rotate the embroidery head manually in a clockwise direction (when viewing from the rear of the machine). This rotation can be performed by rotating the Z drive shaft clockwise with the 5 mm hex wrench at the right end of the shaft (see Figure 3-5).
6. While slowly rotating the heads, check that the green LED on the front or the innermost LED on the CPU blinks once each revolution (this is the "index" or "headup" mark).
7. If there is no evidence of the LED blinking, inspect the electrical connectors (encoder cable plug and encoder body) for loose wires, loose fits, and any visual damage to the encoder cabling or coupler. Clean connections and/or replace components as necessary.
8. Rotate the head again to check for the blinking LED. If the "test" repeatedly fails refer to the following installation procedure for a new Z shaft encoder.

Installation

The Melco EMT 10/4T Embroidery Peripheral uses a shaft encoder on the end of the Z drive shaft to the left of embroidery head #4. It's function is to provide the information required by the CPU.

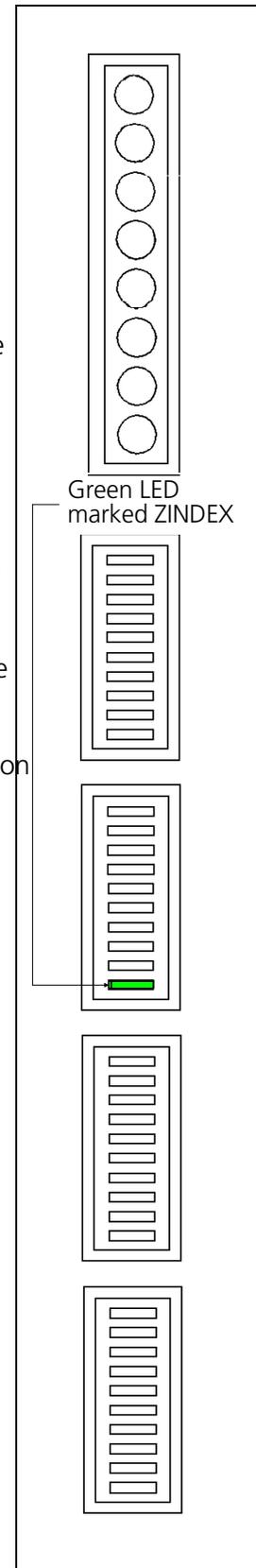


Figure 3 - 7

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

To replace the encoder follow these steps:

1. Turn the machine OFF, then disconnect the power from the power source.
2. Remove the rear cover.
3. Disconnect the Z encoder harness from the z encoder.
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 (see Figure 3-8).

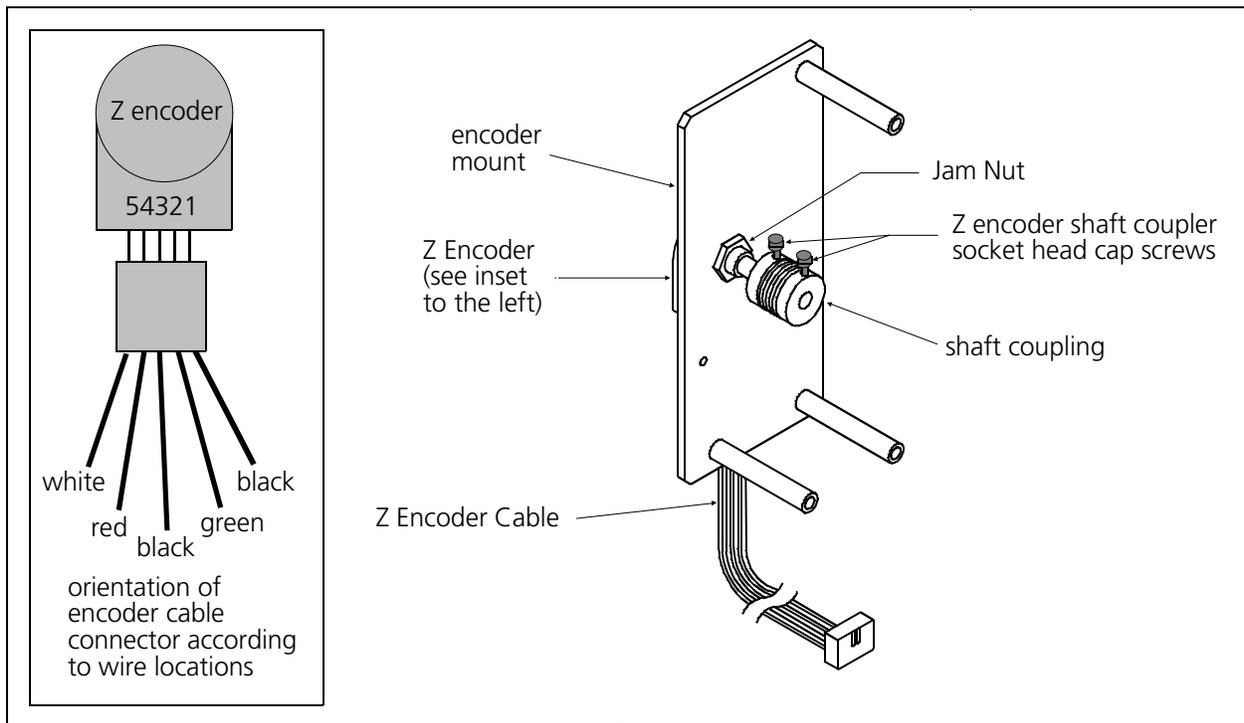


Figure 3 - 8

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. Orient the connector on the encoder cable so the outside black wire is to the right and will plug into pin 1 of the new encoder (see Figure 3-8). Push the encoder cable connector onto the new encoder.

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

12. Calibrate the Z encoder per the following procedure.

Calibration

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 10 needle headup fixture (p/n 995673-01).

1. Install the Z shaft encoder as previously described.

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).

2. With the network cable removed (or boot disk not inserted into a disk drive option), turn ON the embroidery peripheral.
3. Locate the green LED marked "ZINDEX" on the front of the right frame leg of the peripheral. Or with the card cage cover removed, locate the innermost LED on the top 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.
4. Position the Melco 10 needle headup fixture (p/n 995673-01) into the headup alignment hole in the top of head #1, just in front of the thread tree (see Figure 3-9).

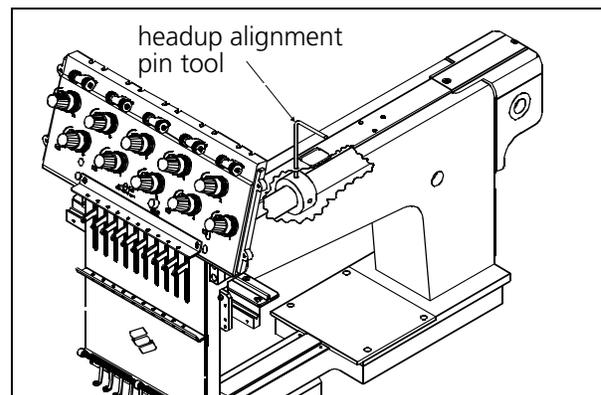


Figure 3 - 9

5. Slowly rotate the heads at the 5mm socket head cap screw in the right end of the Z drive shaft until the headup alignment pin tool inserts into the hole in the headup alignment collar on the Z shaft. This is the "mechanical" headup position for head # 4.
6. Now loosen the encoder coupler socket head cap screw at the left end of the Z shaft (see Figure 3-10) and slowly rotate the coupling and encoder (encoder shaft socket head cap screw is still tight) in either direction. Rotate until the LED on the CPU (or the ZINDEX LED on the front of the peripheral) glows.
7. When the LED is glowing, tighten the Z shaft socket head cap screw on the encoder coupler.
8. Remove the headup alignment pin tool.
9. Remove the second socket head cap screw and apply a small amount of Loctite 222 (or equivalent) hardware adhesive. Reinstall and tighten the screw.
10. Return to the first encoder coupler socket head cap screw, remove the screw and apply a small amount of Loctite 222 (or equivalent) hardware adhesive, then reinstall and tighten the screw.

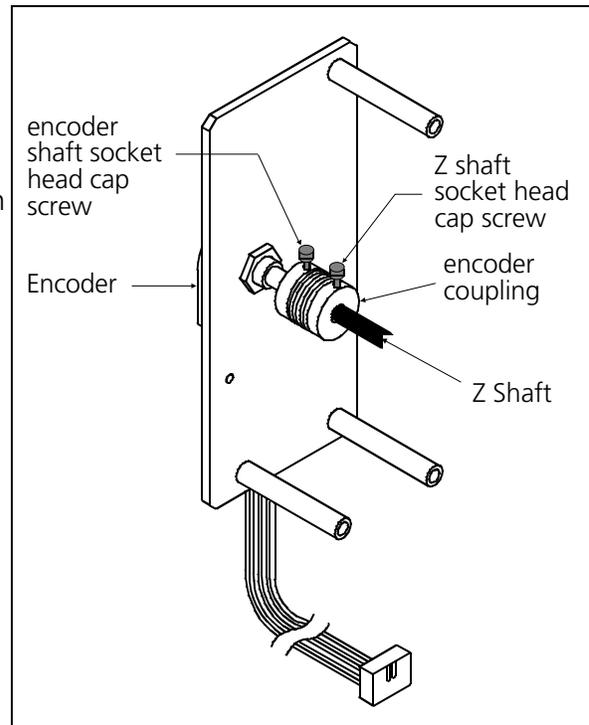


Figure 3 - 10

11. Turn the embroidery peripheral OFF and attach the network cable (or install the boot disk if the disk drive option is installed).
12. Turn the embroidery peripheral ON again and allow its program to download.
13. Go to the head timing menu and check that when the heads are brought to headup, that the ZINDEX LED on the front of the right frame leg of the peripheral (or the innermost LED on the CPU) glows within plus or minus 1.5 degrees of rotation.
14. Reinstall all covers removed during this procedure.

Thread Tensioner Assembly

Assembly Removal

The thread tensioner assembly is attached to the top of the needle case. To remove the tensioner assembly refer to the procedure that follows.

1. Turn OFF the EMT 10/4T and disconnect the power cord from its power source.
- 2a. Remove the side, rear, end, and front covers from around the head that is having the tensioner assembly removed (refer to cover removal on page 2-1).
- 2b. For head #1, also remove the color change covers as described on page 3-21.
- 3a. For head #1, disconnect the ribbon cable connection at the front connector of the color change PCB.
- 3b. For heads #2 and #3, disconnect the two ribbon cable connections at the rear of the tensioner PCB.
- 3c. For head #4, disconnect the single ribbon cable connection at the rear of the tensioner PCB.
4. Remove the 4 socket head cap screws at the front as shown in Figure 3-11.

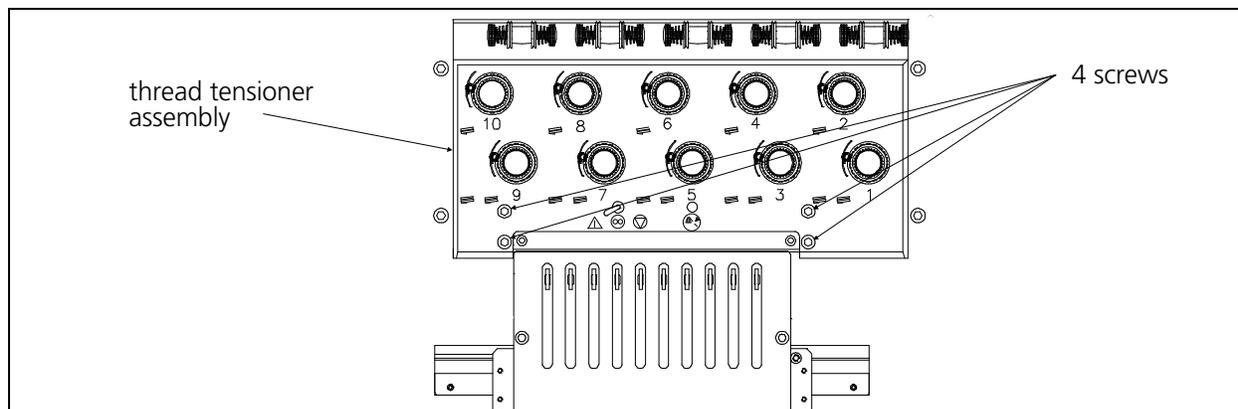


Figure 3 - 11

5. Carefully lay the tensioner assembly (with the thread tubes still attached) over the top of the thread tree.

Thread Guide Tubes

The thread guide tubes from the thread tree extend into the tensioner bracket. If you wish to remove the tensioner bracket assembly further from the head, you will need to remove the thread guide tubes.

1. Remove the thread from the thread guide tubes.

2. Carefully grasp the thread guide tubes individually and remove them from the thread tensioner bracket assembly by pulling on each thread guide tube near where it enters the hole in the thread tensioner bracket.

NOTE: The thread guide tubes may be held in place with a bracket attached to the tensioner assembly. This bracket must be removed to remove the tubes.

Individual Thread Tensioner Replacement

Each thread tensioner is secured by a set screw against the thread tensioner shaft inside the thread tensioner bracket. The set screw is accessible through a slot at the top of the tensioner bracket.

1. Using a 2.5 mm hex wrench, loosen the set screw associated with the thread tensioner to be removed (see Figure 3-12).

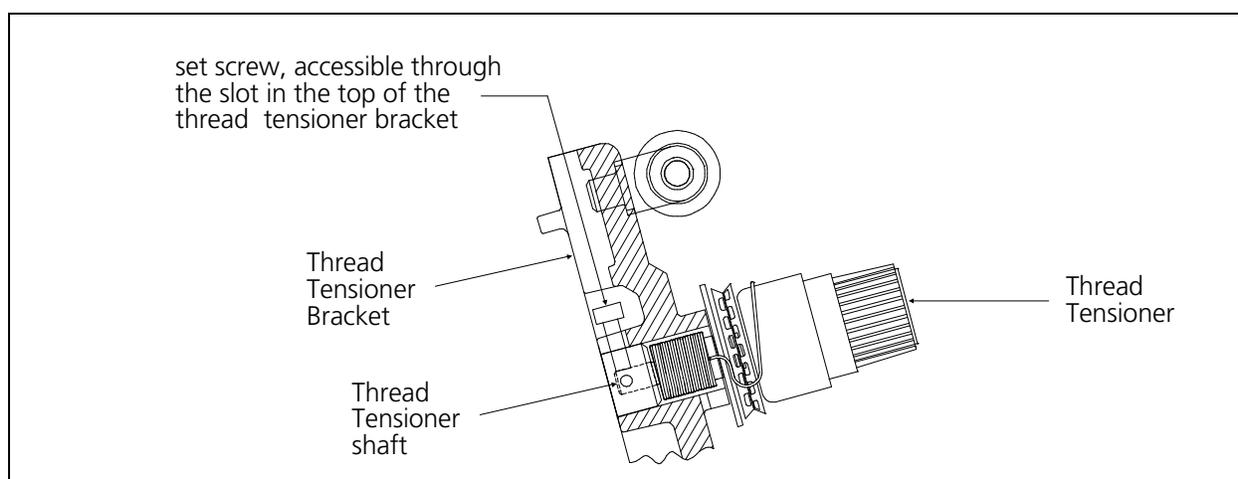


Figure 3 - 12

2. Pull the thread tensioner out of the tensioner bracket.
3. To reinstall the thread tensioner, refer to the next procedure for changing a check spring.
4. After inserting the thread tensioner into the tensioner bracket, the tensioner disk may wobble while it is rotating. This is caused by the plastic disk not being fully seated on the post. Grasp the plastic disk between your thumb and forefinger; and while twisting back and forth, push to seat the disk fully on the post.
5. Perform the thread tensioner check spring adjustment that follows the check spring replacement procedure. The adjustment procedure, not only adjusts the check spring tension, but secures the thread tensioner in the tensioner bracket by tightening the set screw previously loosened in this procedure.

Changing A Check Spring

1. As described in the previous procedure, remove the thread tensioner associated with the check spring that is being changed.
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 Figure 3-13.
 - 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.

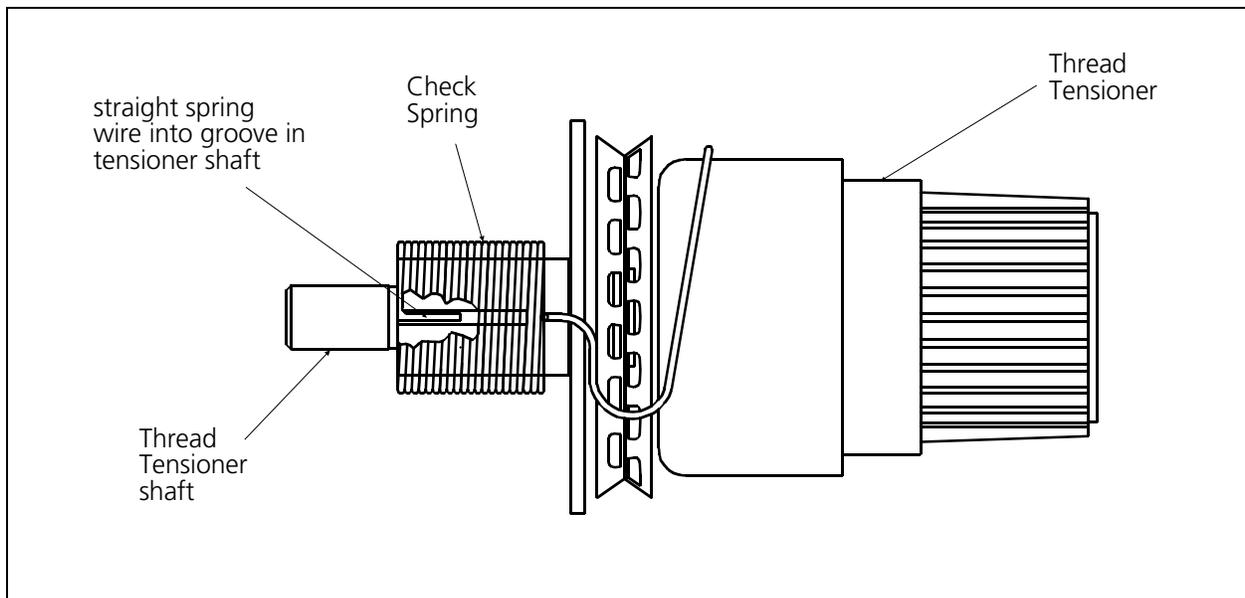


Figure 3 - 13

4. While holding the check spring in position, place the thread tensioner into the tensioner bracket. Insure the tensioner shaft seats into the smaller diameter hole in the bracket with the check spring still positioned on the tensioner shaft properly.
5. After inserting the thread tensioner into the tensioner bracket, perform the thread tensioner check spring adjustment. This adjustment procedure, not only adjusts the check spring tension, but secures the thread tensioner in the tensioner bracket by tightening the set screw loosened to remove the thread tensioner.

Check Spring Adjustment

After replacing a thread check spring, install the thread tensioner into the thread tensioner mounting bracket. You must then adjust the tension of the check spring against the thread break contact. To set this tension:

1. Slightly loosen the set screw in the top of the thread tensioner mounting bracket that secures the thread tensioner (see Figure 3-12).
2. Rotate the thread tensioner to the position where the check spring is just touching the left side of the thread break contact (brass post). See Figure 3-14.

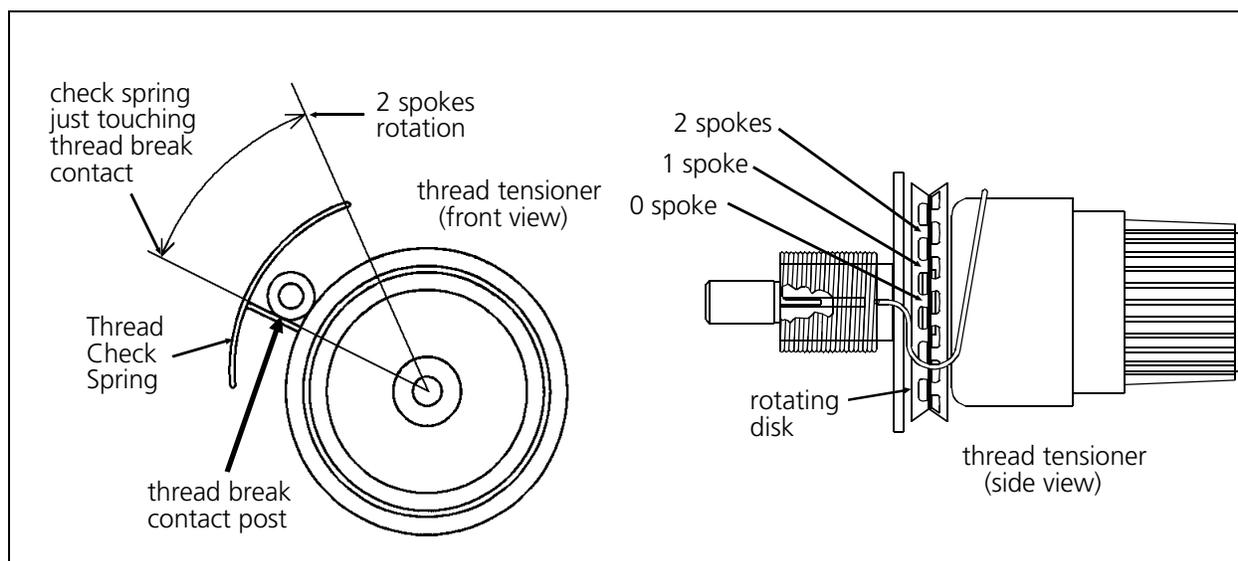


Figure 3 - 14

3. Observe the position of the thread tensioner check spring, then continue to rotate the thread tensioner clockwise the distance of 2 spokes of the rotating disk (see Figure 3-14). This represents 40 degrees rotation.
4. Tighten the set screw in the top of the thread tensioner bracket.

Adjustment Hints

The following is a discussion of embroidery quality issues with respect to the check spring adjustment:

As you exceed 2 spokes you may start to see deterioration of the tightening of the stitch due to a reduced rotational stroke of the check spring. A certain amount of stroke distance is required to take up the thread slack and cinch the stitch properly. If the check spring is too tight against the thread break post it will not retract far enough to make that stroke needed for a good tight stitch. False thread break messages may also occur with a setting too tight.

If you rotate less than 2 spokes you will begin to lose the force needed to make a tight stitch. You may have enough stroke but not enough force to cinch up the stitch tightly. You may also begin to have failure of thread break detection. You must have enough rotation to cause the check spring to make a good contact with the thread break contact post. A poor contact will often not provide the signal to stop embroidering when there is a thread break.

Replacing A Thread Break Contact Post

1. As described previously in this manual, remove the thread tensioner associated with the thread break contact post to be replaced.
2. Remove the thread break contact post (see Figure 3-15) by rotating it counter-clockwise out of its location in the thread tensioner bracket.

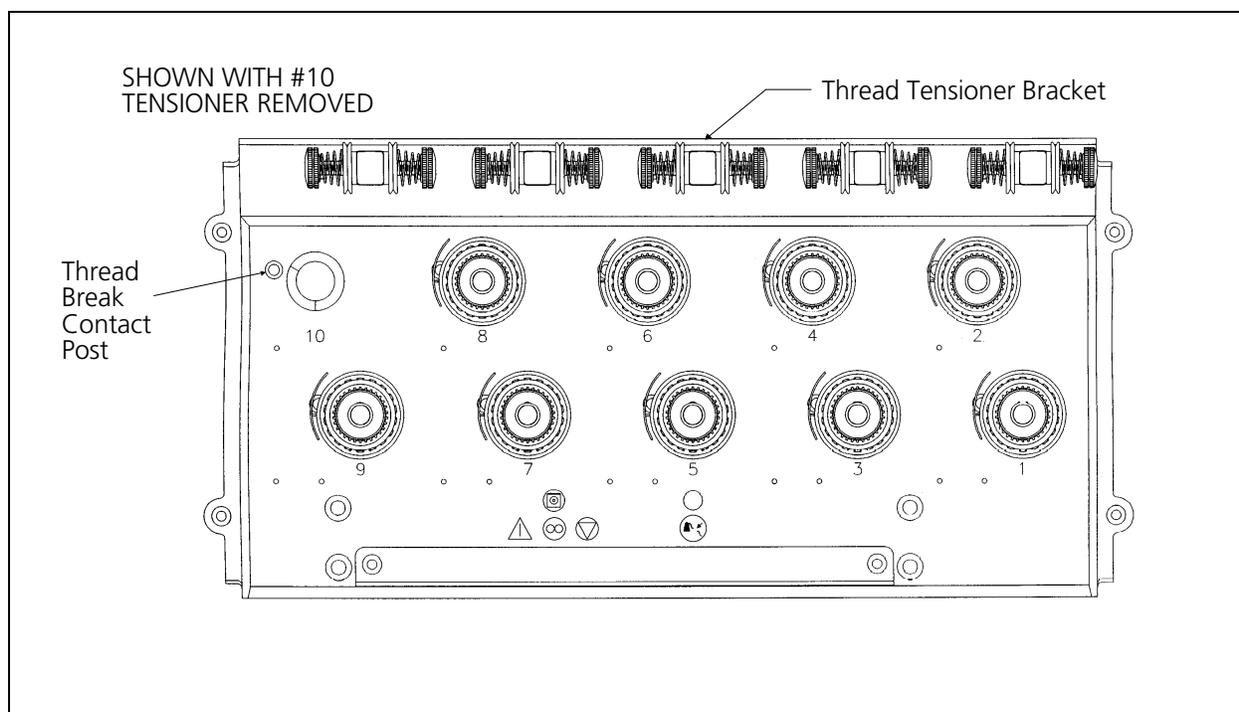


Figure 3 - 15

3. Install the new thread break contact post by rotating it clockwise into the tensioner bracket. Secure the post "finger-tight" only.

CAUTION! Use care not to cross thread the post when installing it.

4. Reinstall the thread tensioner and check spring as described in a previous procedure in this section, then perform check spring adjustment.

Jump Stitch Solenoid

Replacement

If a jump stitch solenoid must be replaced, follow these steps:

1. Color change the needle case to needle #10 for best access to the solenoid area.
2. Remove the left arm front cover to expose the jump stitch solenoid mounting bracket area (see Figure 3-16).
3. Use a pencil or other suitable marking device and mark the bracket location in reference to the front surface of the arm casting at the locations shown in Figure 3-16).
4. Remove the jump stitch harness from any and all cable clamps, then disconnect the jump stitch harness in-line connector from the harness coming from the side of the head.

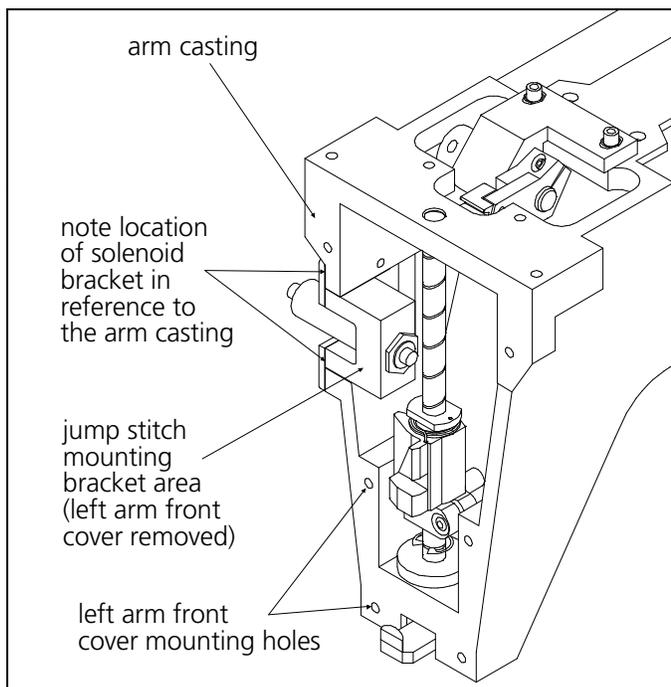


Figure 3 - 16

5. Remove the 2 screws holding the mechanical jump stitch mechanism and cover to the jump stitch bracket as shown in Figure 3-17. Remove the mechanism and cover.
6. Remove the 2 jump stitch solenoid bracket screws shown in Figure 3-17, then remove the solenoid and the solenoid bracket as one piece.

NOTICE: TO HELP AVOID THE NEED TO REMOVE THE NEEDLE CASE . . . Before you remove the solenoid from the bracket, record the number of threads of the solenoid that are showing beyond the solenoid bracket (or measure the distance that the end of the solenoid protrudes from the solenoid bracket). When the new solenoid is installed into the bracket, position the solenoid with the same number of threads (or distance) that you recorded in this step.

7. Loosen the solenoid locking nut then rotate the bracket off of the solenoid.

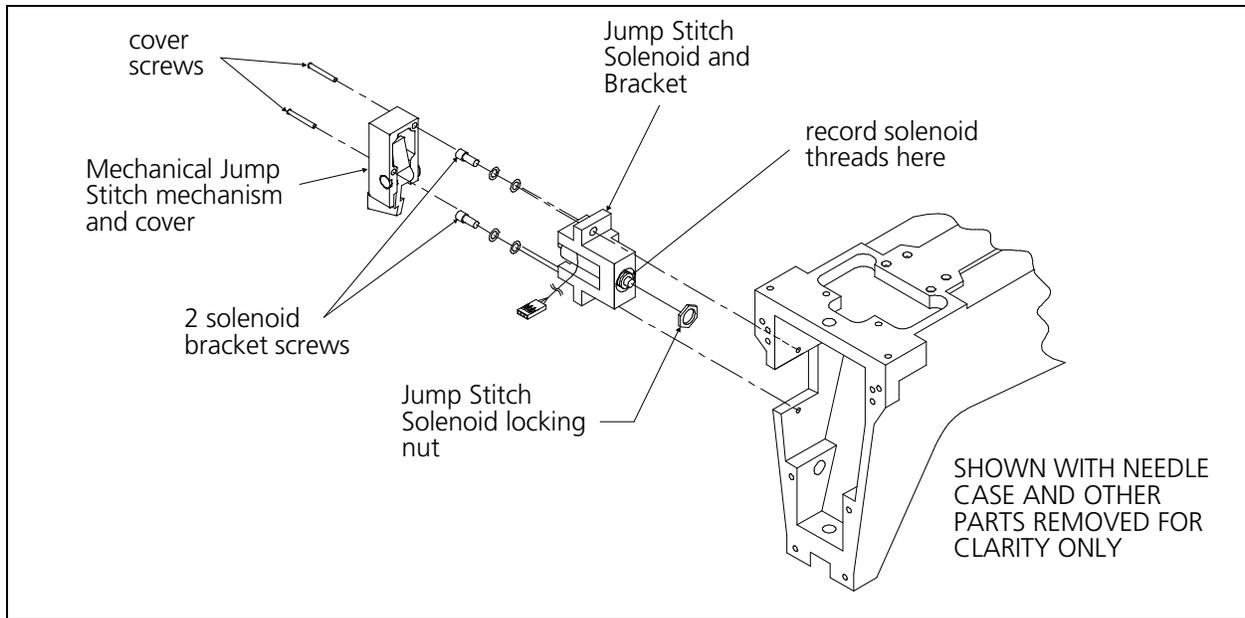


Figure 3 - 17

8. Replace with new solenoid by reversing the procedure above. Adjust the position of the solenoid into the solenoid bracket using the "thread counts" or measurement you obtained above (see previous NOTICE).
9. Position the jump stitch bracket back in the embroidery head against the mechanical stop.
10. Insert a 5 mm hex wrench in the cap head set screw at the right end of the Z shaft and rotate clockwise to move the heads through at least one revolution to check that no mechanical interference occurs.

NOTE: During installation the solenoid must be adjusted properly. If you did not adhere to the previous NOTICE, or if for some other reason, the adjustment for the solenoid is not correct, Refer to the following jump stitch solenoid adjustment procedure for the proper adjustments.

Adjustment

If a jump stitch solenoid has been replaced, you may have to perform one or more of the following adjustment procedures. The needle case must be removed to perform these adjustments. See the procedure for needle case removal in this section.

Plunger Positioning

During the jump stitch solenoid replacement procedure you were to count the number of threads that are showing beyond the solenoid bracket. If this was not done, the following procedure will help position the solenoid plunger properly. There are two plunger positions of concern:

Plunger Position 1

The jump stitch solenoid must be positioned so that the plunger is close enough to actuate the needle bar driver reciprocator when the solenoid is engaged (energized).

Plunger Position 2

The plunger also must not be contacting the reciprocator during normal embroidery, when the solenoid is relaxed or not energized.

A typical dimension for the gap between the relaxed solenoid plunger and needle bar driver reciprocator is approximately 0.015 to 0.045 inches (0.4 to 1.1 mm). Refer to Figure 3-18 for an illustration of the gap location.

To obtain this gap, loosen the locking nut on the solenoid and rotate the solenoid inside the bracket until the gap is proper. Tighten the locking nut.

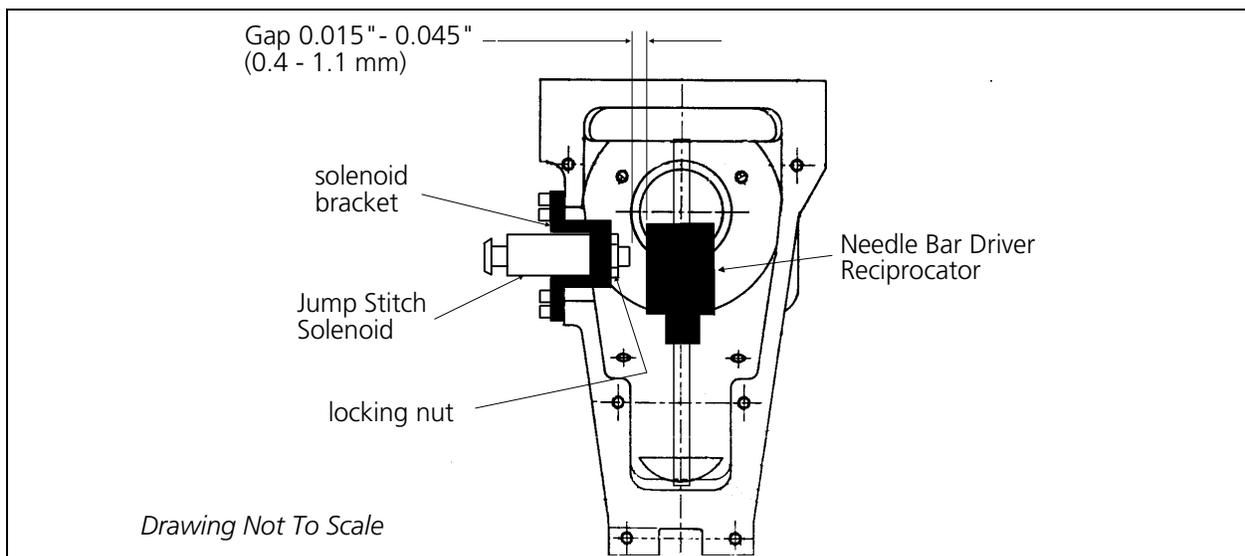


Figure 3 - 18

Bracket Positioning

When attaching the jump stitch solenoid and bracket, it is not only necessary to place the plunger correctly, but you must also position the assembly in the proper forward to backward relationship. There are three concerns in positioning the solenoid and bracket assembly:

Bracket Position 1

The solenoid and bracket assembly should be far enough forward so the plunger will cause the reciprocator to rotate enough to release the needle bar during the jump stitch cycle.

Bracket Position 2

The solenoid and bracket assembly must not be so far forward that it causes the reciprocator to rotate to its mechanical rotational limit. This may cause premature failure of the reciprocator mechanism.

Bracket Position 3

The solenoid and bracket assembly must not be so far backward that it contacts the embroidery head connecting rod during its mechanical motion.

To position the solenoid and bracket:

1. Put the new solenoid and bracket assembly in place and push it to the back of the cutout in the side of the head.
2. Attach it to the head with the 2 screws removed earlier, then check the alignment to be within the above 3 positions. Be sure that the plunger contacts the reciprocator mechanism, that the mechanism works properly, and that the jump stitch assembly does not contact the embroidery head connecting rod during its mechanical motion.
3. Using one or two nylon cable ties, attach the solenoid wires to the metal around the front left color change PCB connecting pin.
4. Reinstall the needle case and all the covers removed to change the jump stitch solenoid and test embroider a large letter (6 inch block I, for example) to check the machine for proper jump stitch operation.

Color Change

The color change PCB, the color change motor, the cam, and harnesses are located under the color change covers behind the embroidery head tensioner area.

PCB Replacement

The color change PCB is an interface from the CPU for color change commands from the design and keyboard. It also has interfacing for thread break and needle position information from the tensioner PCB back to the CPU. To remove the color change PCB refer to the following procedure:

1. Remove the right tensioner cover as described on page 2-3.
2. Refer to Figure 3-19 and remove the left color change cover behind the tensioner assembly by first loosening the top two screws then removing the side two screws.
3. Next remove the two screws in the side of the right color change area cover and remove the cover.
4. Install a static grounding strap between the working surface and the personnel performing this procedure.
5. Disconnect the harness from the head and the ribbon cable from the tensioner PCB (see Figure 3-19).

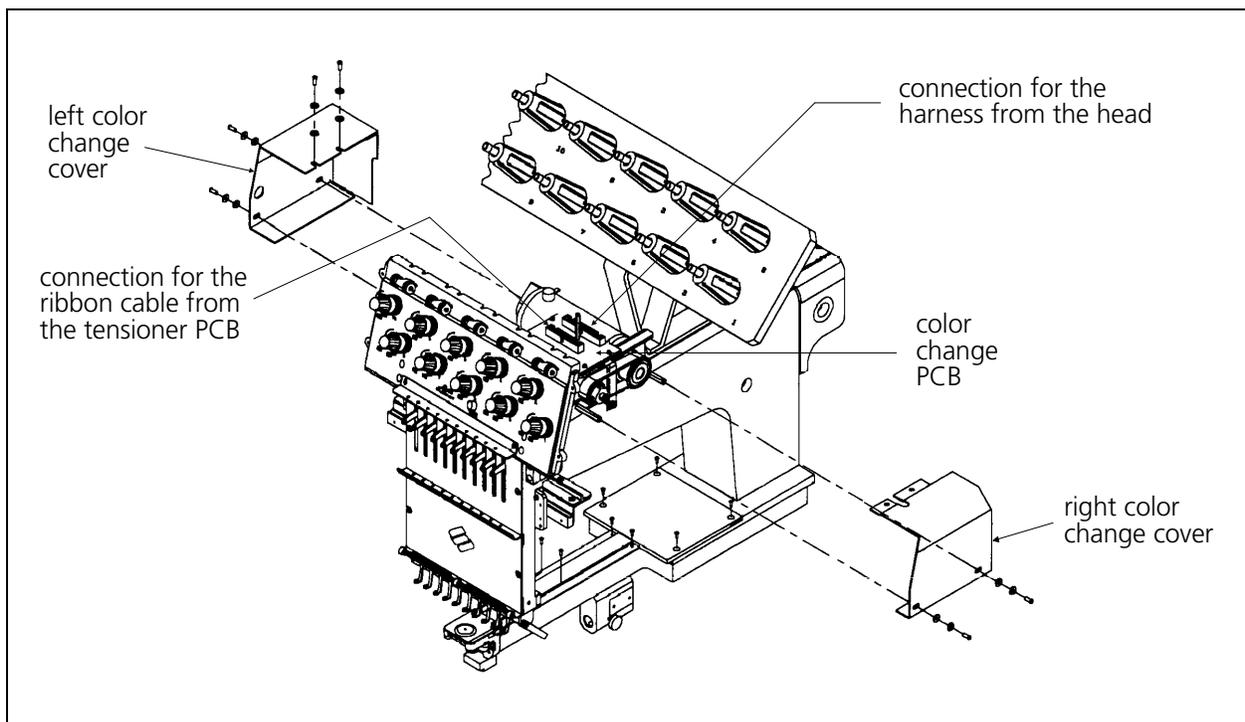


Figure 3 - 19

CAUTION! The Color Change PCB is snapped into place on top of the color change bracket. Be careful not to damage the photo sensors or any other components when removing the PCB.

6. Remove the color change PCB by lightly prying up on the board near the 4 catch pins that hold the PCB in place (see Figure 3-20). The color change PCB should simply lift off of the color change housing.

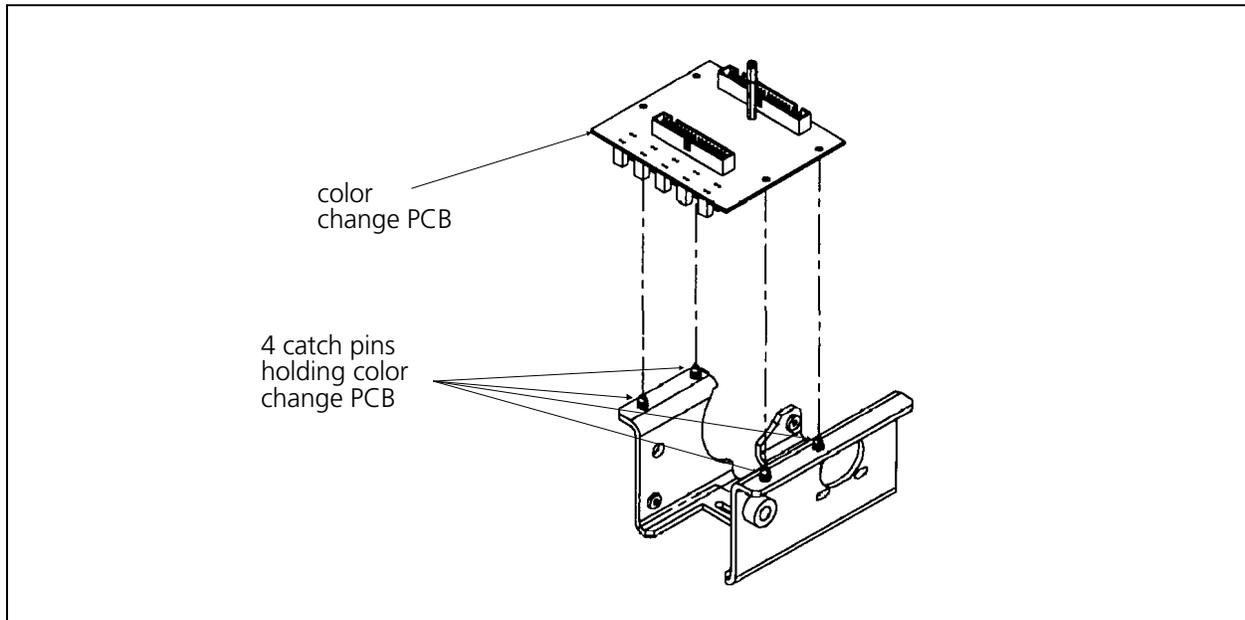


Figure 3 - 20

CAUTION! In the next step, press only on the board, DO NOT press on board components. Use care not to damage the photo sensors on the new PCB on the color change bracket on the needle case.

7. To reinstall the color change PCB, align the holes in the board over the catch pins in the color change bracket and lightly press on the board to seat it in place. DO NOT press on board components.
8. Reinstall the harness from the head and the ribbon cable from the tensioner PCB. Also, reinstall all the covers removed to replace the color change PCB.

Color Change Motor Replacement

To remove the color change motor refer to the following steps:

1. Remove the color change area covers and tensioner covers as previously described (see Figure 3-19).
2. Remove the color change PCB as described in the procedure just previous to this procedure.
3. Remove the harness connection from the color change motor encoder (see Figure 3-21).
4. Loosen and remove the 4 color change motor mounting screws (see Figure 3-21).
5. When the motor is loose, pull off the drive belt.
6. Loosen the pulley set screws and remove the motor drive pulley (see Figure 3-21).

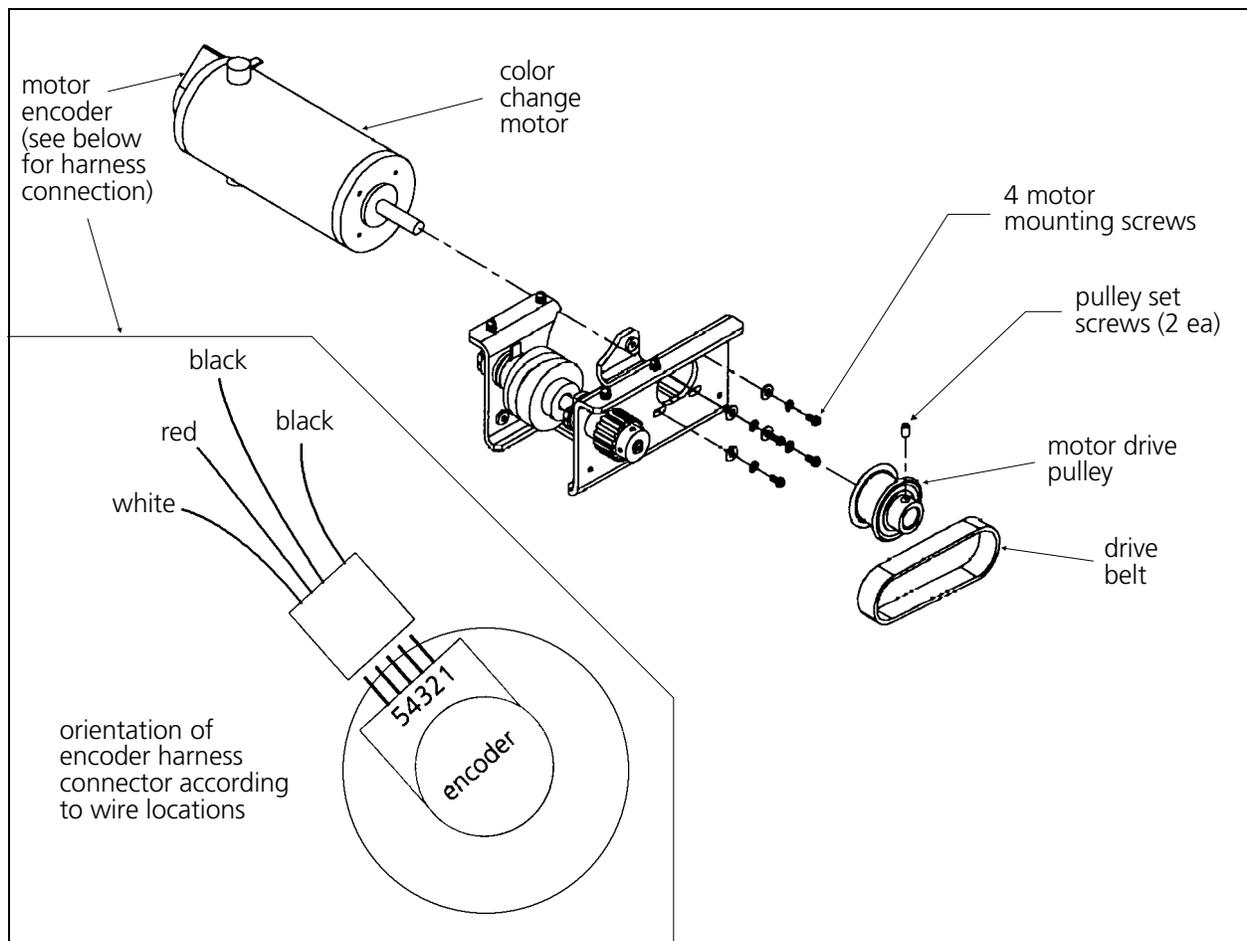


Figure 3 - 21

9. The motor is now loose and can be removed.
10. Replace the motor and reverse the preceding steps.
11. Refer to (see Figure 3-21) for attaching the color change motor encoder harness connector to the motor encoder.
12. Refer to the color change motor belt tension adjustment procedure to adjust the belt.

Color Change Motor Belt Tension

The color change belt tension should cause the color change cam to rotate with minimum backlash. The belt should be tensioned with some amount of slack so it is not so tight that it wears the color change shaft and bushings needlessly.

Adjust the color change belt tension by loosening the color change motor mounting screws (see Figure 3-22) and moving the motor to make the belt more or less taut. A belt tension of 6-7 pounds is snug enough to take out any belt slack, but is not so tight it binds the mechanics. When tightening the belt tension, use hand pressure only on the motor. No additional force is needed.

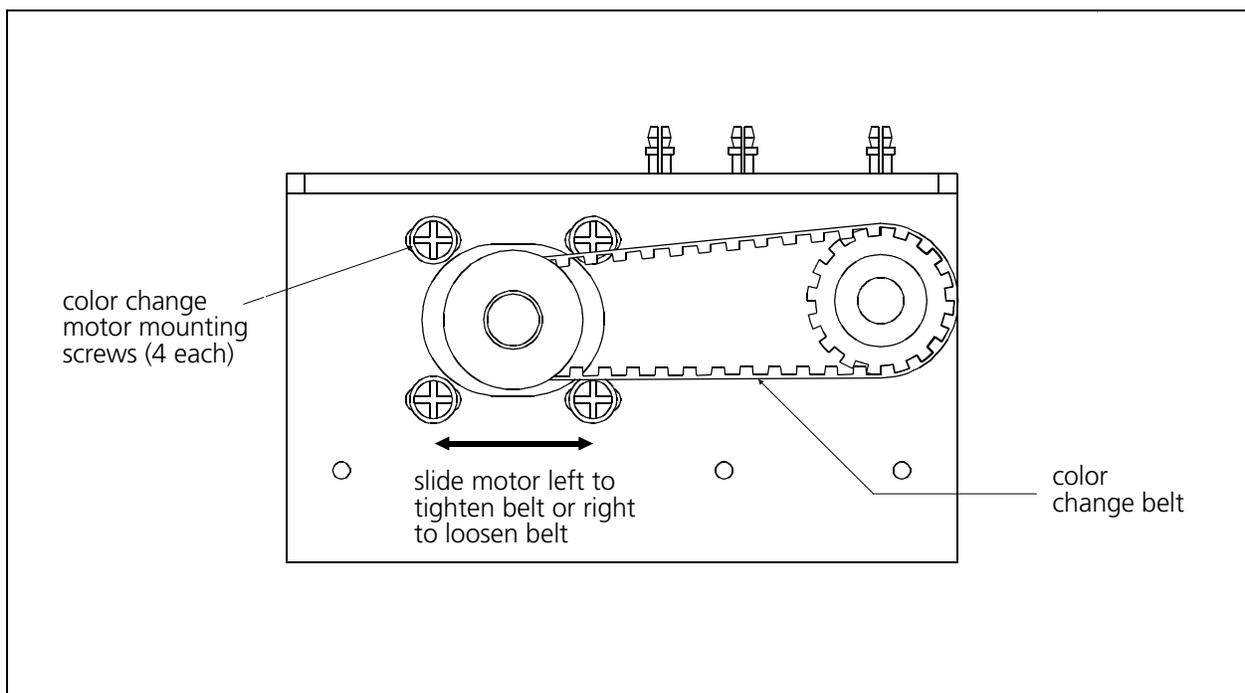


Figure 3 - 22

Replace all the covers removed to perform this service.

Color Change Cam Assembly Replacement

If replacing the color change cam and associated hardware, refer to the following procedure to allow the new assembly to rotate freely within the bracket.

1. Remove the tensioner bracket covers and the color change covers as described earlier.
2. Remove the color change PCB as described earlier.
3. Remove the color change motor as described earlier.
4. Refer to Figure 3-23 to remove the 2 screws, then the color change bracket (with cam and hardware).

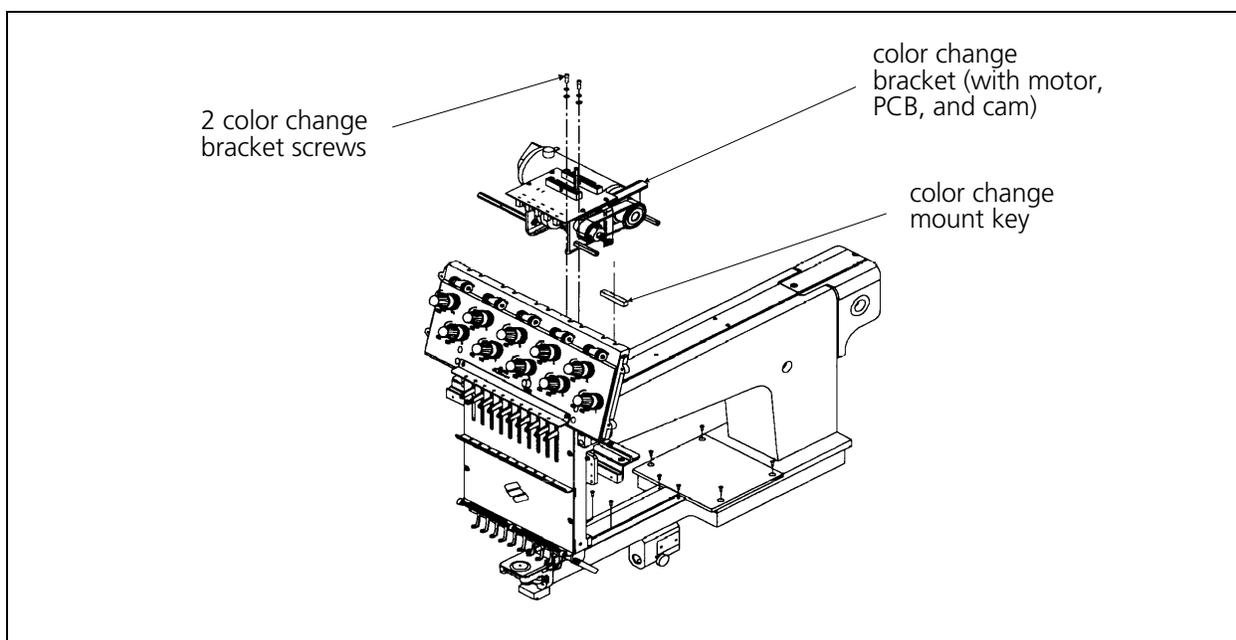


Figure 3 - 23

5. Refer to Figure 3-24 and disassemble the various parts of the color change cam assembly to replace the part in question. Leave the pulley and spacer attached to the left side of the shaft if possible.
6. Refer to Figure 3-24 to reassemble the color change cam assembly parts loosely.
7. Install the color change PCB to put the color change bracket to the form it will take when completely assembled.
8. Tighten the color change cam onto the shaft flats.

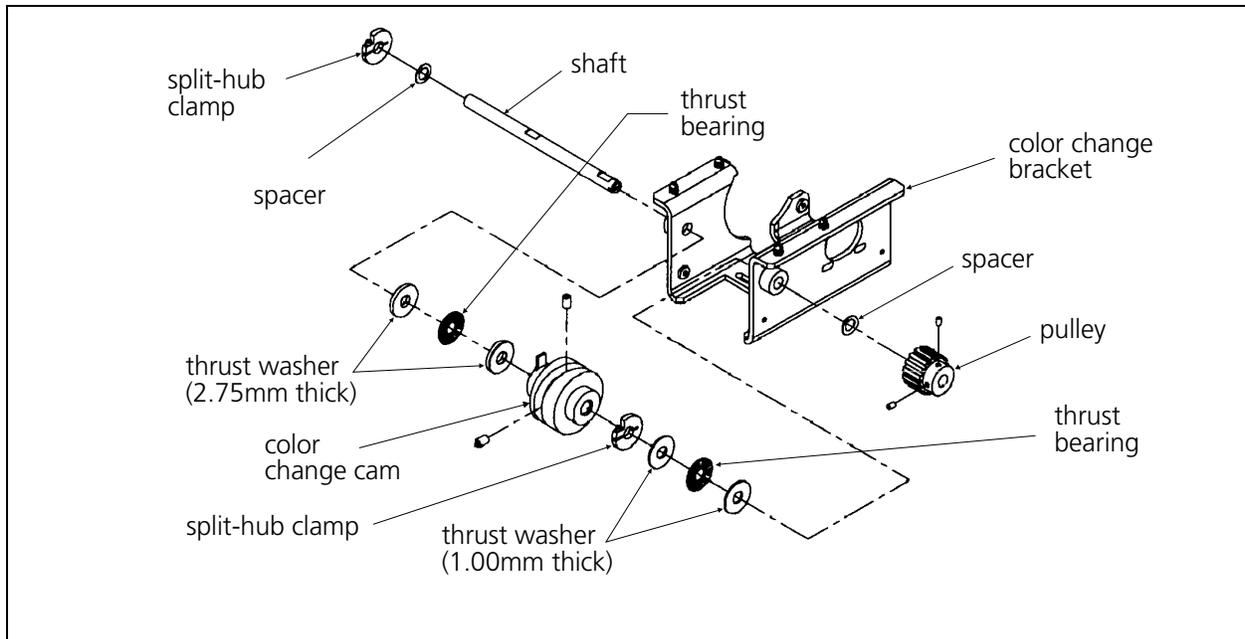


Figure 3 - 24

9. Position the outer split-hub clamp and spacer against the left outside of the bracket and the color change cam against the two 2.75mm thrust washers and thrust bearing combination to take up the slack. Tighten the split-hub clamp.
10. Position the inner split-hub clamp against the two 1.00mm thrust washers and thrust bearing combination and the pulley and spacer against the right outside of the bracket to take up the slack. Tighten the clamp and pulley.
11. Check that the rotation of the cam assembly provides a smooth operation and is free of any binding. If this is not true, rework the previous two steps until the operation is acceptable.
12. Remove the color change PCB.
13. Lay the color change mount key into the embroidery head keyway (see Figure 3-23), then put the color change bracket (with the cam and hardware) into position.
14. Ensure the needle case is positioned with the needle centered in the needle plate hole by moving the color change bracket to obtain the needle centering, then tighten the color change bracket screws (see Figure 3-23).
15. Reinstall the color change motor and adjust the motor belt tension as previously described.
16. Reinstall the color change PCB as previously described.
17. Reattach the color change area covers and the tensioner covers.

Needle Case

Replacing a Needle Bar / Presser Foot / Associated Parts

To replace a needle bar, presser foot, or other parts associated with this area refer to the following steps:

1. Turn ON the EMT 10/4T and bring the head to the HEAD UP position.
2. Turn OFF the EMT 10/4T and disconnect the power cord from its power source.
3. Remove the thread tensioner bracket assembly as described in a previous procedure.
4. Remove the 2 screws holding the upper needle case cover plate and set the cover plate aside (see Figure 3-25).

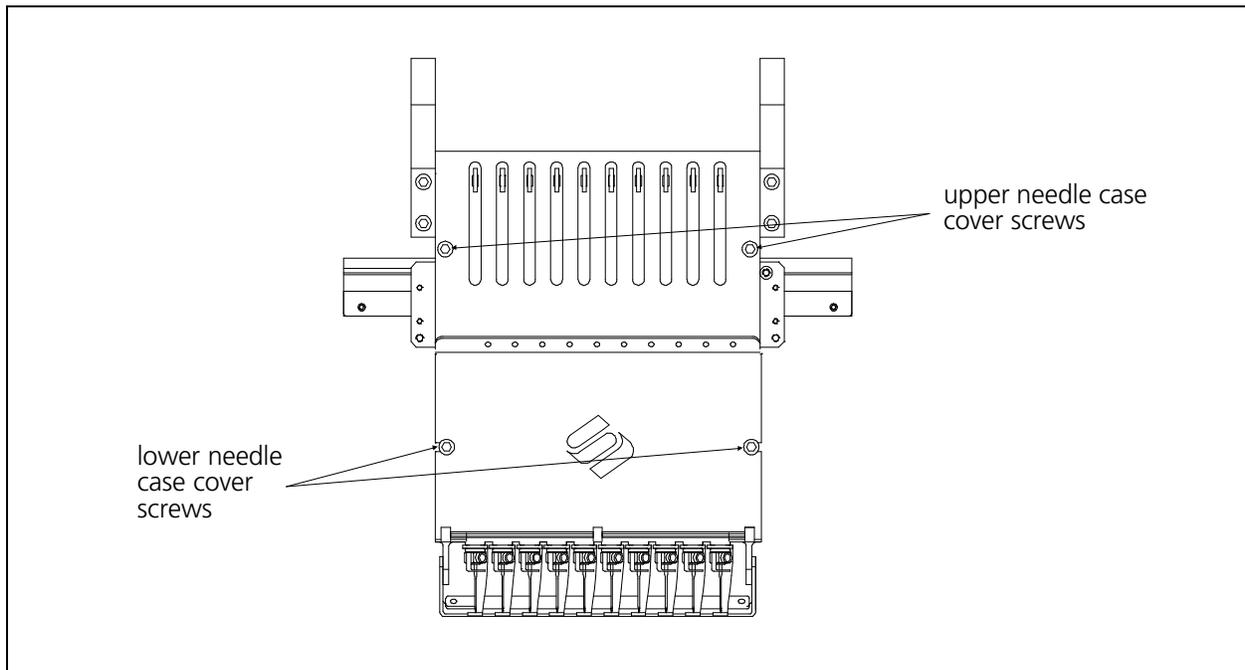


Figure 3 - 25

5. Loosen one and then remove the other of the 2 screws holding the lower needle case cover plate and set the cover plate aside. You can now access the needle bar area to remove any of the 10 needle bars out through the top of the needle case.
6. Refer to Figure 3-26, then loosen the needle clamp set screw and remove the needle, needle clamp, and needle clamp damper from the bottom of the needle bar.

7. Next, loosen the needle bar stop clamp (black clamp).
8. Loosen the top screw (see Figure 3-26) on the needle bar. (You will remove and transfer the screw in step 11.)

CAUTION! After the next step, the needle bar is free to be moved out the top of the needle case. Use care so the springs and other parts do not suddenly fly out of position.

9. Loosen the needle bar clamp.
10. Carefully capture and retain the various parts that become released by the needle bar as you remove the needle bar upward and out the top of the needle case.
11. Transfer the screw from the top of the old needle bar to the top of the new needle bar. Apply Loctite screw adhesive number 222 or equivalent to the screw if possible.
12. Install a new needle bar by inserting it from the top of the needle case and through the various pieces in the order shown in Figure 3-26.
13. Install a new needle into the needle clamp and tighten the needle clamp screw to secure the needle and capture the needle bar.

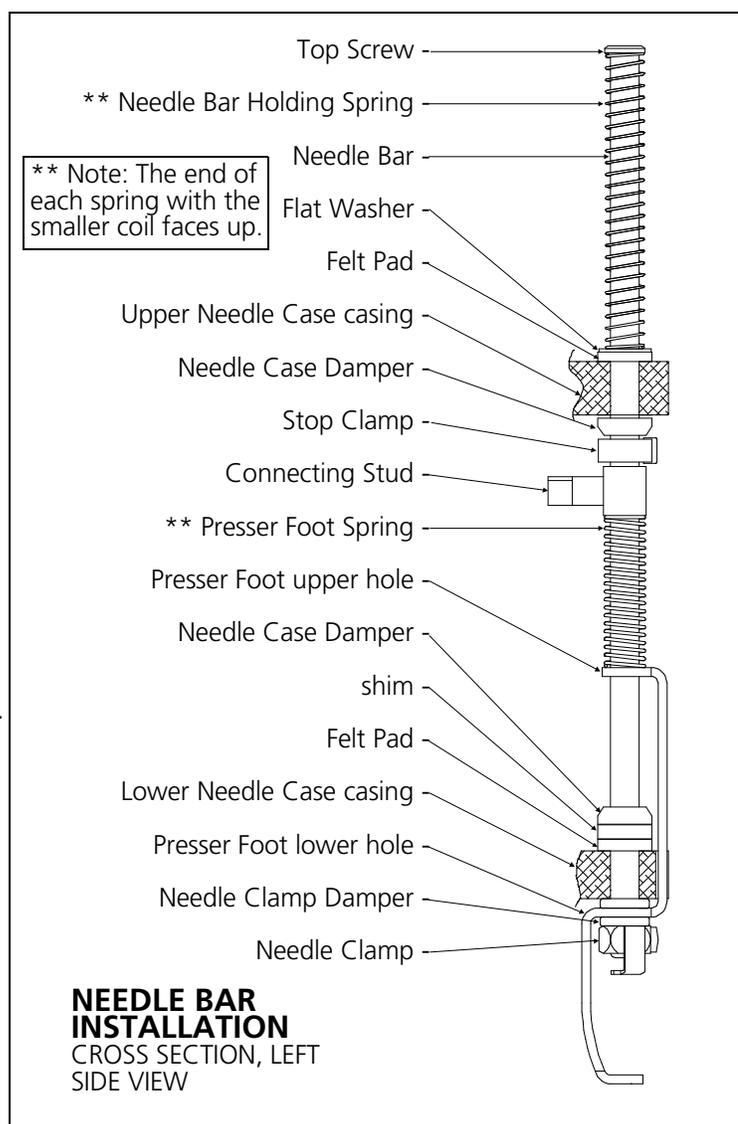


Figure 3 - 26

14. You may reinstall the upper needle case cover at this time. The lower needle case cover must, however, remain off to perform the needle bar height adjustment.
15. After installing a new needle bar, you must adjust the needle bar height. Refer to the peripheral operation manual for the adjustment procedure for needle bar height.
16. When the needle bar height has been properly adjusted, reinstall the lower needle case cover.

Needle Case Removal

It may become necessary to remove the needle case from the front of the head to replace the needle bar driver, take up lever gear, needle bar reciprocator, or other associated parts. Refer to the following steps to remove the needle case from embroidery head.

Head #1

1. Turn ON the EMT 10/4T and bring the head to the HEAD UP position.
2. Turn OFF the EMT 10/4T and disconnect the power cord from its power source.
3. Remove the thread tensioner bracket assembly as described in a previous procedure.
4. Position the needle case to mid-point (needle 5 or 6), then secure the bearing retainer plate assembly from sliding left or right by placing any workable clamping device onto each end of the V-rail.
5. Remove the 2 screws holding the upper needle case cover plate (see Figure 3-27) and set the cover plate aside.

Caution! You must remove the needle position photo sensor interrupter blade to avoid damage to the LEDs on the color change PCB.

6. Remove one and loosen the other of the 2 screws that hold the photo sensor interrupter blade to the top of the needle case. Carefully slide the blade out from between the LEDs under the color change PCB.

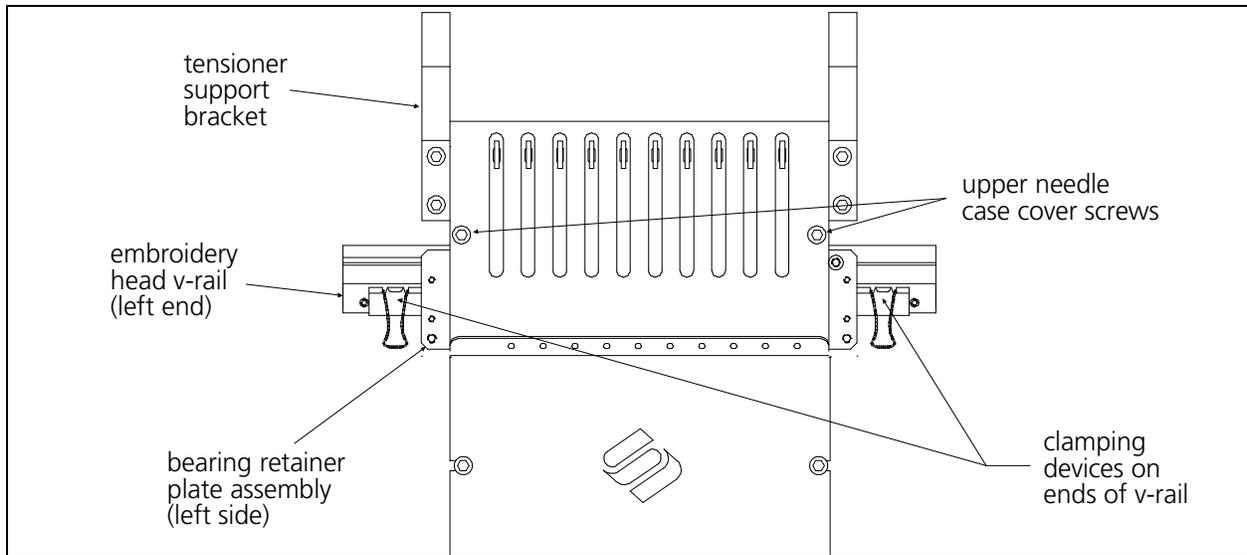


Figure 3 - 27

7. Hold the needle case securely with one hand while you remove the 4 socket head cap screws that secure the needle case to the bearing retainer plate assembly near the top of the needle case (see Figure 3-28).

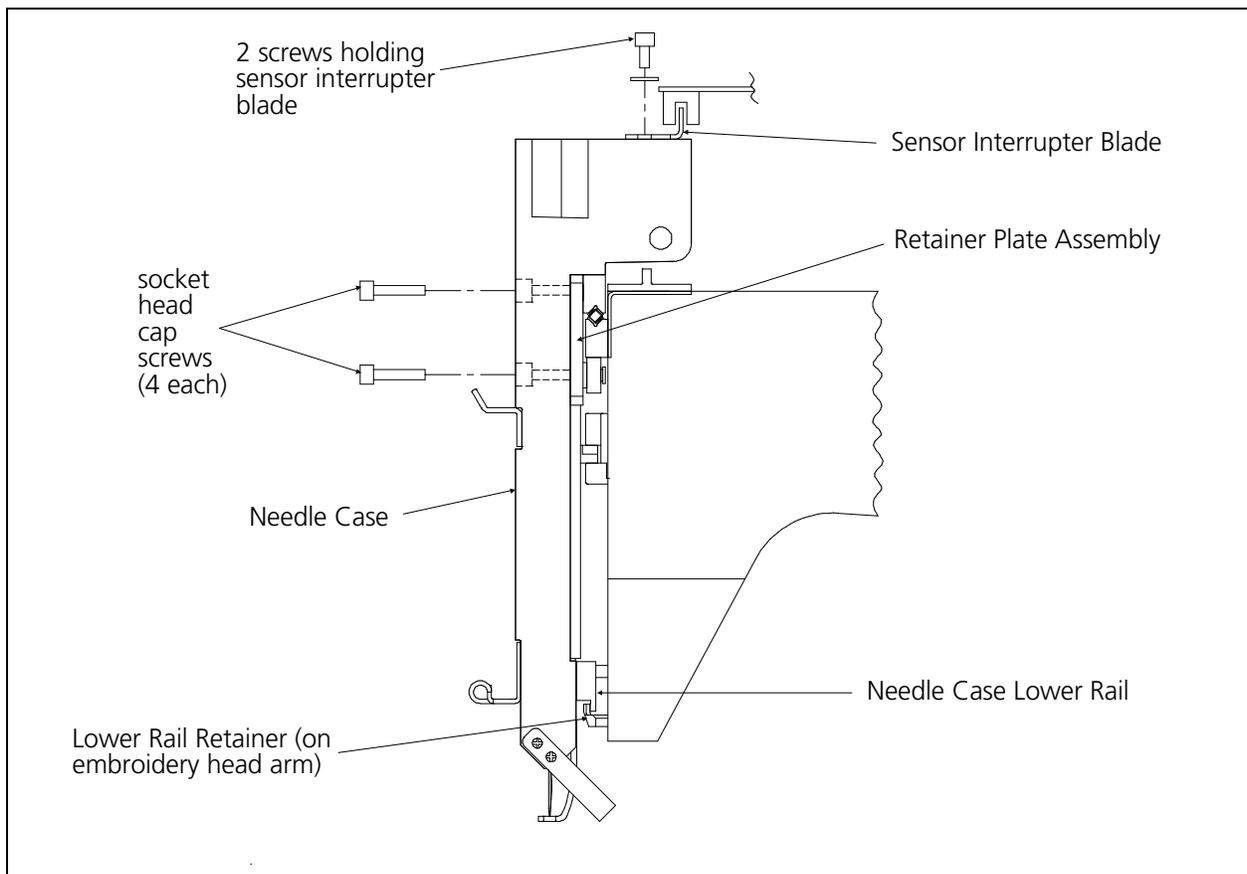


Figure 3 - 28

8. Lift the needle case slightly to disengage the lower rail from the lower rail retainer coming from the bottom of the embroidery head arm.
9. The needle case will now be free to remove from the head.

Using care not to damage any components, set the needle case aside.

Head #s 2, 3, and 4

1. Turn ON the EMT 10/4T and bring the head to the HEAD UP position.
2. Turn OFF the EMT 10/4T and disconnect the power cord from its power source.
3. Remove the thread tensioner bracket assembly as described in a previous procedure.
4. Position the needle case to mid-point (needle 5 or 6), then secure the bearing retainer plate assembly from sliding left or right by placing any workable clamping device onto each end of the V-rail.
5. Remove the 2 screws holding the upper needle case cover plate (see Figure 3-27) and set the cover plate aside.
6. Hold the needle case securely with one hand while you remove the 4 socket head cap screws that secure the needle case to the bearing retainer plate assembly near the top of the needle case (see Figure 3-28).
7. Lift the needle case slightly to disengage the lower rail from the lower rail retainer coming from the bottom of the embroidery head arm.
8. The needle case will now be free to remove from the head.

Using care not to damage any components, set the needle case aside.

Replacing Needle Case Cross Roller Bearing

Refer to the figures within the needle case removal and installation procedures for this procedure.

1. Remove the needle case as described previously in this manual.
2. Remove the clamping devices that were installed at each end of the V-rail during the removal of the needle case.
3. Carefully slide the bearing retainer plate assembly with cross roller bearing off either end of the V-rail.
4. Position the new cross roller bearing onto the V-rail and install the bearing retainer plate assembly. Refer to the cross roller bearing centering adjustment.

5. Check for proper adjustment of the retainer plate assembly bearings by referring to the retainer plate bearing adjustment procedure.
6. Reinstall the clamping devices at each end of the V-rail.

Cross Roller Bearing Centering

The cross roller bearing must be installed between the embroidery head v-rail and the needle case v-rail attached to the retainer plate. When these two are slid together and the retainer plate is centered on the head, the cross roller bearing must be centered (equal distance from each end of the rails).

1. With the needle case and retainer plate assembly removed, lay the cross roller bearing onto the embroidery head v-rail. Orient the bearing with the welded edge down and position it to the right edge of the v-rail.
2. Place the retainer plate assembly onto the cross roller bearing at the right end of the embroidery head v-rail. (The needle case may or may not be attached to the retainer plate assembly at this time.)
3. Slide the retainer plate assembly left to the point where the left edge of the retainer plate is aligned with the center of the needle bar guide shaft felt pad (see Figure 3-29).

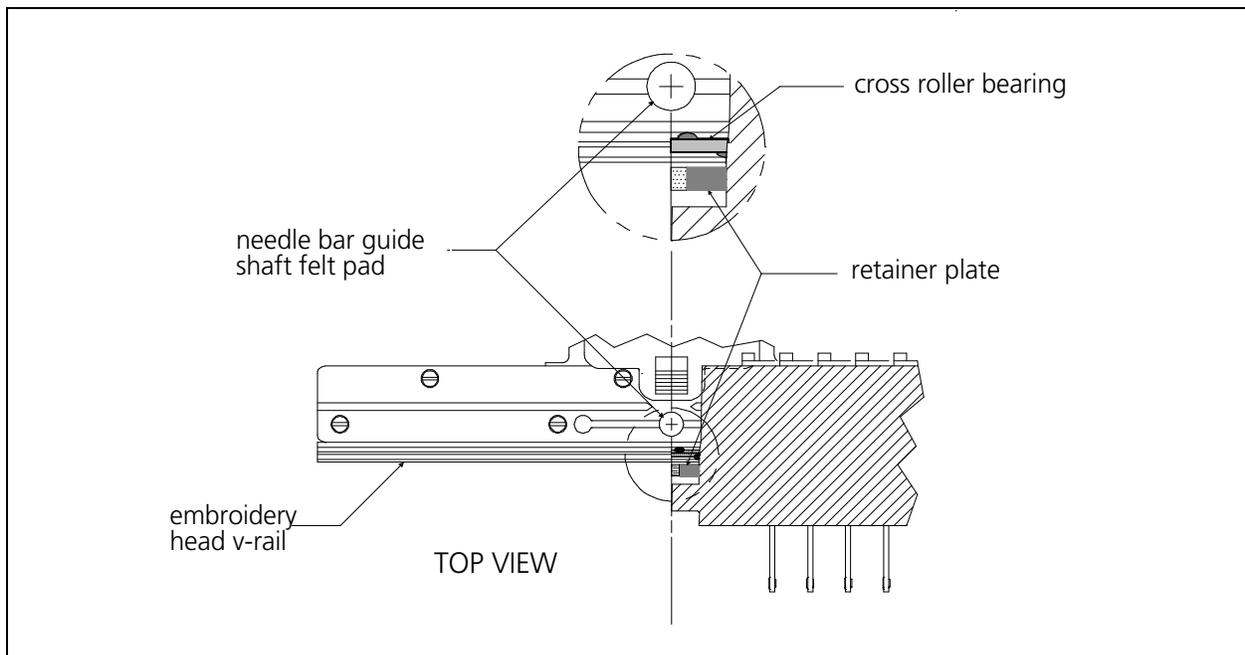


Figure 3 - 29

4. Position the left edge of the cross roller bearing in line with the left edge of the retainer plate and the center of the needle bar guide shaft felt pad. (The second roller of the cross roller bearing should just be engaging between the embroidery head v-rail and the needle case v-rail.)
5. Slide the retainer plate assembly onto the embroidery head v-rail and cross roller bearing.
6. Check that the cross roller bearing is centered in the 2 v-rails by the following method:
 - a) Center the retainer plate assembly on the embroidery head v-rail.
 - b) Carefully insert a solid instrument, such as a straight allen wrench, into the opening at one end where the two v-rails join. Insert the instrument until it contacts the cross roller bearing. Do not force it any further.
 - c) Mark the position of the instrument at the end of the embroidery head v-rail, when the instrument is inserted to where it contacts the cross roller bearing.
 - d) Repeat this on the other side of the v-rails and compare the two marks. They should be very close to the same - within about 3/32 of an inch.
 - e) Repeat the above procedure for centering the cross roller bearing until the checking verifies it is within the proper tolerance.

Retainer Plate Bearing Adjustment

Note: This procedure requires the use of a special service tool: the V-Rail Adjustment fixture (p/n 995675-01).

1. Loosen the two socket head cap screws holding the needle case v-rail to the retainer plate assembly as indicated in Figure 3-30.
2. Install the retainer plate assembly with the cross roller bearing centered between the 2 v-rails.
3. Install the v-rail adjustment fixture (p/n 995675-01) into the middle front hole of the retainer plate assembly as shown in Figure 3-30.
4. Snug the needle case v-rail to the retainer plate assembly very lightly with the socket head cap screws. Do not overtighten the screws or the fixture will be unable to perform its adjustment properly.
5. Carefully and slowly rotate the v-rail adjustment fixture clockwise until you feel a slight resistance. The left and right retainer plate bearings should now be snug against the bottom of the embroidery head v-rail.

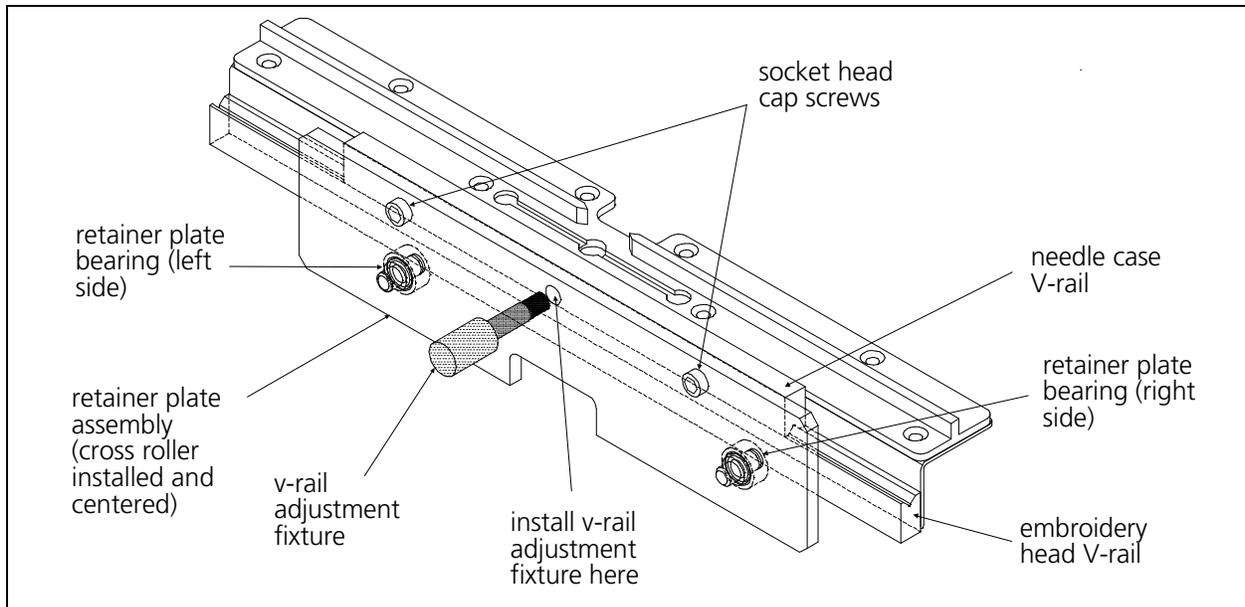


Figure 3 - 30

6. Tighten the socket head cap screws securely and remove the fixture.
7. Push the retainer plate assembly left and right as far as possible without the bearings coming off the end of the embroidery head v-rail. While moving the retainer plate assembly try to hold the bearings from rotating (one at a time) with your fingers. With a medium amount of pressure, you should be able to stop the bearing rotation.
8. If required, loosen the socket head cap screws and repeat this process until the bearings are adjusted as described in step 7.

Replacing Reciprocator / Needle Bar Guide Shaft

1. Remove the needle case as described previously.
2. Loosen the set screw from the left side of the head that secures the needle bar guide shaft (see Figure 3-31).
3. Remove the retaining clip from the needle bar guide shaft (see Figure 3-27).
4. Remove the felt from the hole in the top of the arm casting, then remove the needle bar guide shaft by sliding it up through the hole (see Figure 3-32).

Note: If you are only replacing the needle bar guide shaft, proceed to step 8.

5. Remove the reciprocator from the connecting rod by pulling it straight out of the head (see Figure 3-31). Discard the reciprocator.
6. On the new reciprocator place a drop of machine oil on the reciprocator connecting stud (located on the lower back side of the reciprocator).

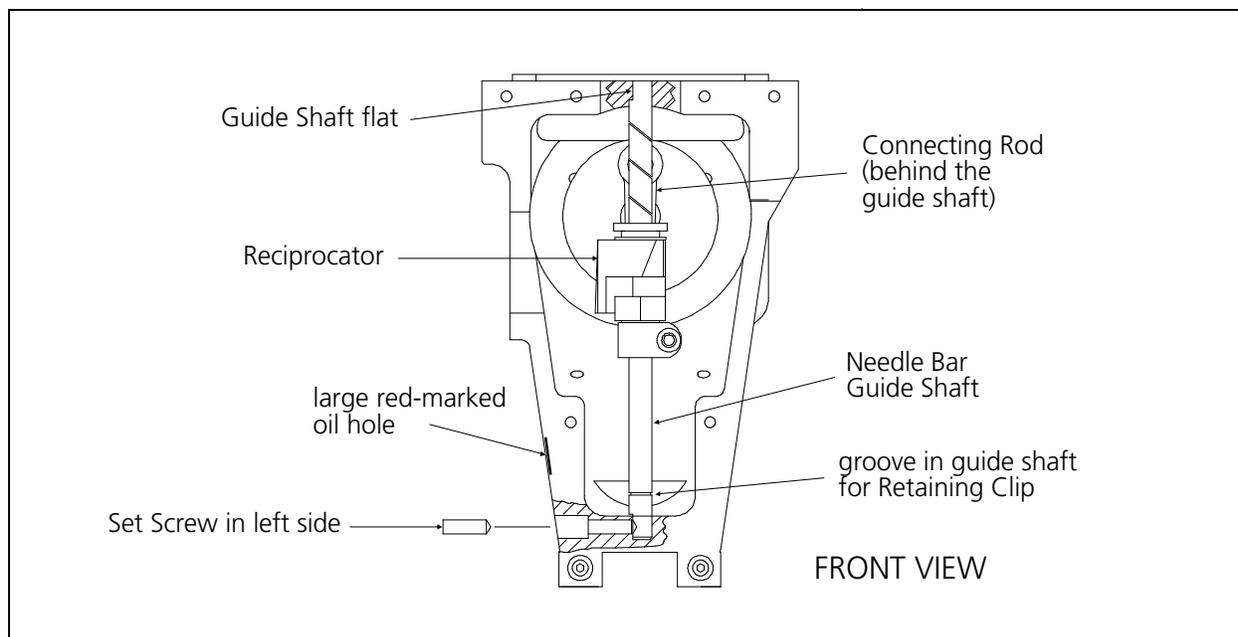


Figure 3 - 31

7. Install the new reciprocator into the head (see Figures 3-31 and 3-32). Make sure it is oriented properly and insert the connecting stud onto the connecting rod.
8. Add two drops of machine oil onto the needle bar guide shaft (or new guide shaft if replacing).
9. Install the needle bar guide shaft as follows (see Figures 3-31 and 3-32):
 - a) Insert the guide shaft down through the hole in the top of the head.
 - b) Insert the guide shaft through the reciprocator.
 - c) Insert the guide shaft down through the roller bearing.
10. Reinstall the retaining clip onto the needle bar guide shaft (see Figure 3-32).
11. Turn the needle bar guide shaft until the flat near the top faces the left side of the head (see Figure 3-31).
12. Pull the needle bar guide shaft down until it seats into the lower hole. Be certain the retaining clip is located low enough so the reciprocator will not hit it during its down stroke and the roller bearing is loose enough to rotate freely.
13. Tighten the set screw on the left side of the head to secure the needle bar guide shaft (see Figure 3-31). Reinstall the felt in the hole in the arm casting.

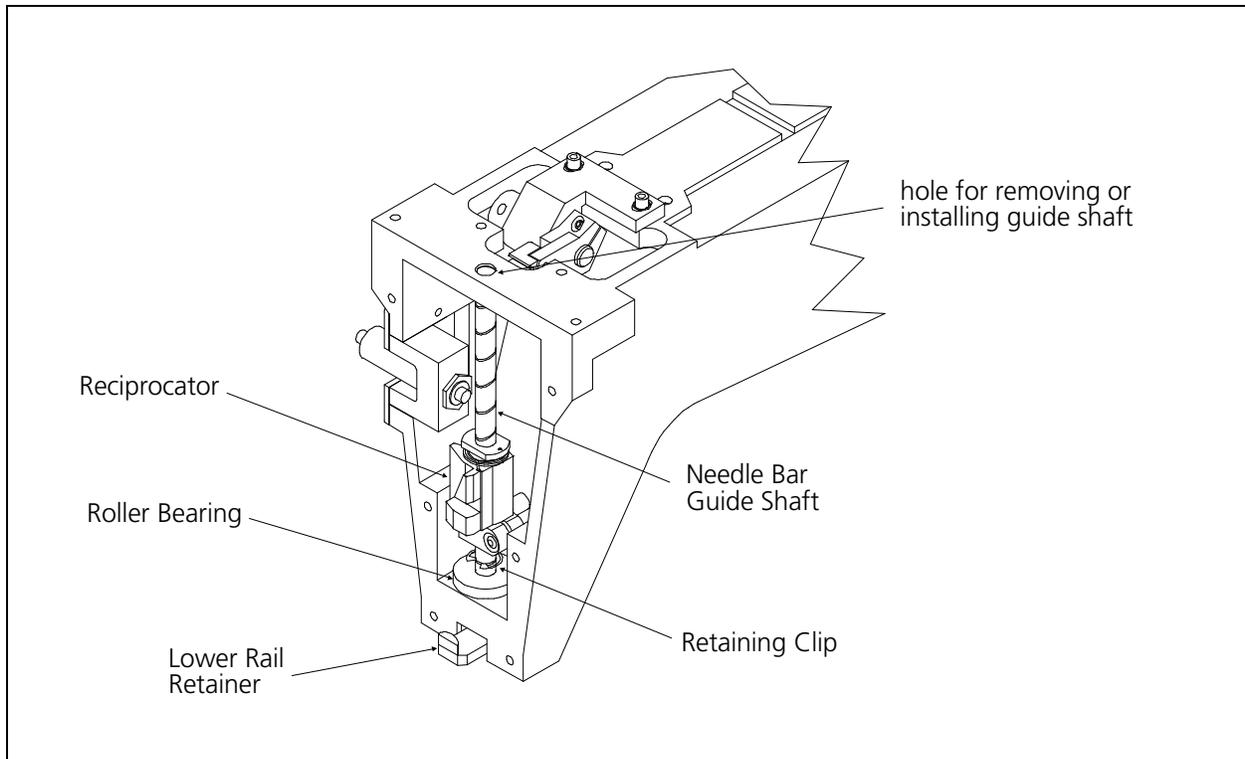


Figure 3 - 32

Installing Needle Case

To reattach the needle case refer to the following procedure:

Head #1

1. Insure the following conditions are set:
 - a) The cross roller bearing is properly installed and centered as described in the section titled *Cross Roller Bearing Centering*.
 - b) The retainer plate assembly bearings are properly adjusted as described in the section titled *Retainer Plate Bearing Adjustment*.
 - c) The bearing retainer plate assembly is clamped from moving left or right by a clamping device on each end of the V-rail.
 - d) The embroidery head is at its mechanical "head up" position.
 - e) The color change cam is in position for a selected needle (preferably needle #5 or #6).

NOTE: For ease of installation, you may wish to stretch a rubber band across the eyelet area of the take up levers to keep them together at the same level.

2. Refer to Figure 3-28 and insert the needle case lower rail into the lower rail retainer. Insure the grabber blade fits into the grabber bar assembly at the bottom of the needle case.
3. Rotate the upper part of the needle case into position on the front of the head as you insure the following alignments:
 - a) All the take up lever slots are positioned onto the take up lever guide rail and the active take up lever gear teeth are engaged with the take up lever drive gear teeth. With the embroidery head still in the head up position, insure the top tooth of the take up lever drive gear engages with the 5th "valley" of the take up lever gears.
 - b) The needle case color change pins fit into the color change cam properly.
 - c) The needle case rests solidly and completely on the bearing retainer plate assembly and is positioned to the right so the right side of the needle case is against the socket head cap screw in the bearing retainer plate as shown in Figure 3-33.

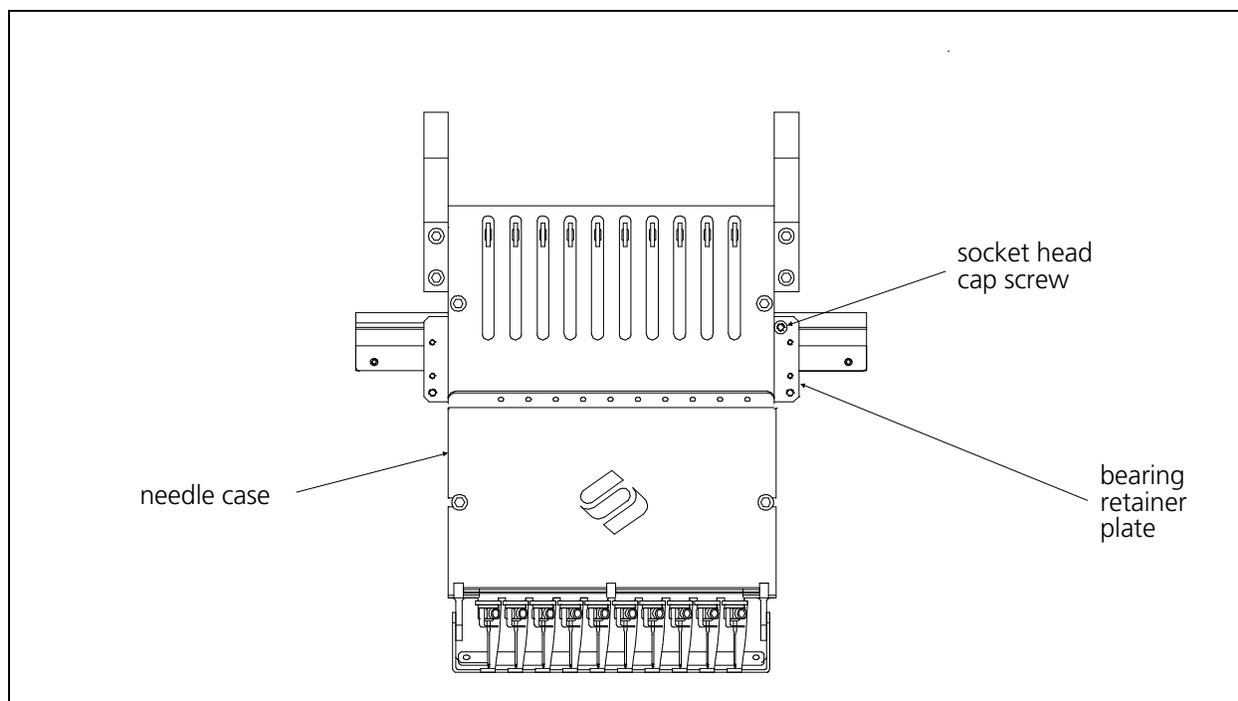


Figure 3 - 33

4. Align the 4 through holes on the upper section of the needle case with the 4 threaded holes in the bearing retainer plate assembly.
5. Install and tighten the 4 socket head cap screws.
6. Reattach the photo sensor interrupter blade to the top of the needle case.

7. Remove the clamping devices from each end of the V-rail and reinstall all covers that were removed during the procedure.
8. Power up the peripheral and position the needle cases to needle #5.
9. Go into the Head Timing menu and bring needle #5 down slowly, using the  key.
10. Check for the needle centered in the needle plate hole.
11. If a slight recentering is required:
 - a) Loosen the four needle case screws installed and tightened in steps 4 and 5.
 - b) Reposition the needle case within the tolerances of the screw holes.
 - c) Retighten the screws, crossing diagonally during the tightening sequence to enable even tightening.

Head #s 2, 3, and 4

1. Insure the following conditions are set:
 - a) The cross roller bearing is properly installed and centered as described in the section titled *Cross Roller Bearing Centering*.
 - b) The retainer plate assembly bearings are properly adjusted as described in the section titled *Retainer Plate Bearing Adjustment*.
 - c) The bearing retainer plate assembly is clamped from moving left or right by a clamping device on each end of the V-rail.
 - d) The embroidery head is at its mechanical "head up" position.
2. Refer to Figure 3-28 and insert the needle case lower rail into the lower rail retainer. Insure the grabber blade fits into the grabber bar assembly at the bottom of the needle case.
3. Rotate the upper part of the needle case into position on the front of the head as you insure the following alignments:
 - a) All the take up lever slots are positioned onto the take up lever guide rail and the active take up lever gear teeth are engaged with the take up lever drive gear teeth. With the embroidery head still in the head up position, insure the top tooth of the take up lever drive gear engages with the 5th "valley" of the take up lever gears.

- b) The needle case rests solidly and completely on the bearing retainer plate assembly and is positioned to the right so the right side of the needle case is against the socket head cap screw in the bearing retainer plate as shown in Figure 3-33.
4. Align the 4 through holes on the upper section of the needle case with the 4 threaded holes in the bearing retainer plate assembly.
5. Install and tighten the 4 socket head cap screws.
6. Remove the clamping devices from each end of the V-rail and reinstall all covers that were removed during the procedure.
7. Power up the peripheral and position the needle cases to needle #5.
8. Go into the Head Timing menu and bring needle #5 down slowly, using the  key.
9. Check for the needle centered in the needle plate hole.
10. If a slight recentering is required:
 - a) Loosen the four needle case screws installed and tightened in steps 4 and 5.
 - b) Reposition the needle case within the tolerances of the screw holes.
 - c) Retighten the screws, crossing diagonally during the tightening sequence to enable even tightening.

Lower Rail Retainer Adjustment

This adjustment affects the forward and backward movement of the bottom of the needle case. Do not make the adjustment so tight that you preload the roller bearing in the head so it wears prematurely. Do not have so much free play that the needle has excessive movement.

1. Install the needle case into the lower rail retainer and attach the needle case to the retainer plate assembly. Refer to the needle case installation procedure.
2. Loosen the screw under the lower rail retainer and push it towards the rear to remove the play between the retainer and the lower rail of the needle case (see Figure 3-34).

Note: If you have the trimmer option, you will have to remove the grabber blade guide assembly to access the screw.

3. When the gap between the needle case bottom rail and the embroidery head roller bearing is between zero preload and .002", tighten the screw under the lower rail retainer.

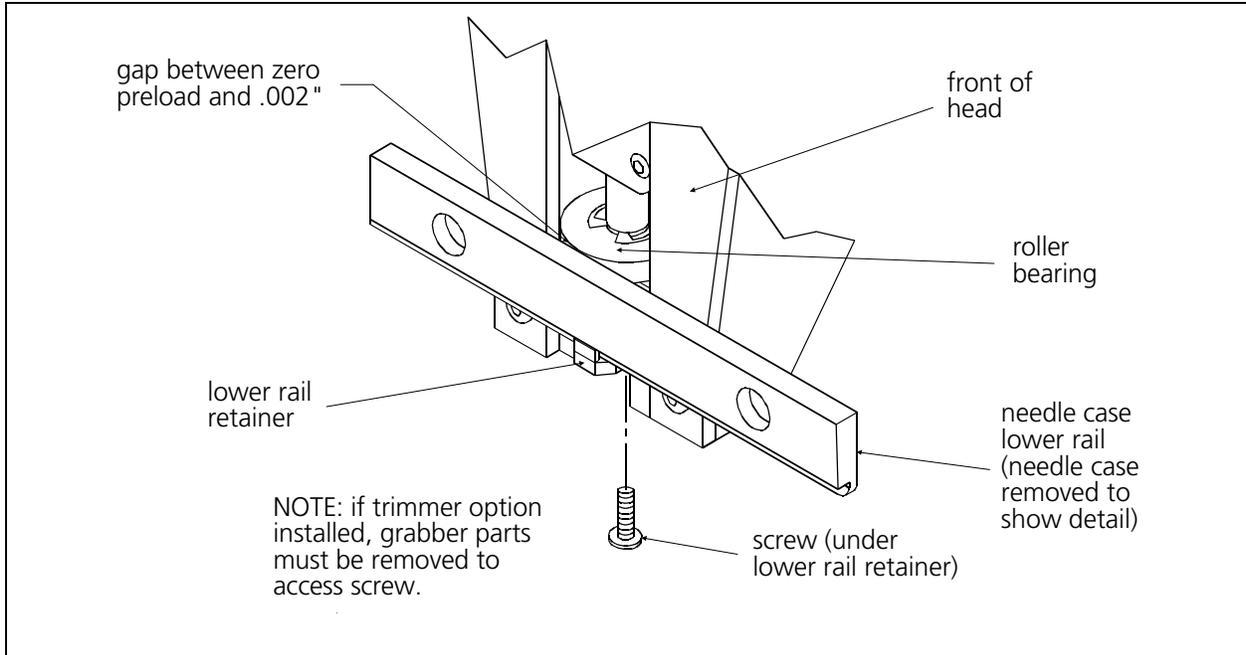


Figure 3 - 34

Rotary Hook

Hook Replacement

This procedure includes steps for setting hook timing during the hook installation process. After completing this procedure, hook timing adjustments are complete and there is no need to refer to any further hook timing procedure.

If you are not replacing the hook but wish to check and adjust hook timing only, refer to that section later in this manual.

1. Move the the table top to the lower position, or remove it and set it aside.
2. Remove the needle plate, both rotary hook covers, and the bobbin case.
3. With the machine ON and ready for operation, press   to switch to the Service/Maintenance Menu. Then press  at the peripheral keyboard until the LCD displays HEAD TIMING MENU.
4. Press  and the LCD displays HEAD TIMING ON.
5. Press   keys. The head rotates to the "Head Up" position and the LCD displays GO TO HEADUP 110.0.
6. Locate the screw that is visible on the right side of the hook assembly as shown in Figure 3-35. Loosen this screw one or two turns.
7. Press the  key 6 times until the second hook screw is visible, also as shown in Figure 3-35. Loosen this screw one or two turns.
8. Press  6 more times and another screw will become visible. This screw will be protruding more from a flat surface than the previous two screws. Loosen this screw one or two turns. The hook assembly is now free on the shaft.
9. Remove the two screws holding the UTC assembly; and allow it to suspend from its cable off the right rear edge of the needle plate bracket.
10. Remove the rotary hook assembly for cleaning and reinstallation, or for replacing with a new one.
11. Press the   keys to again rotate the head to Head Up.

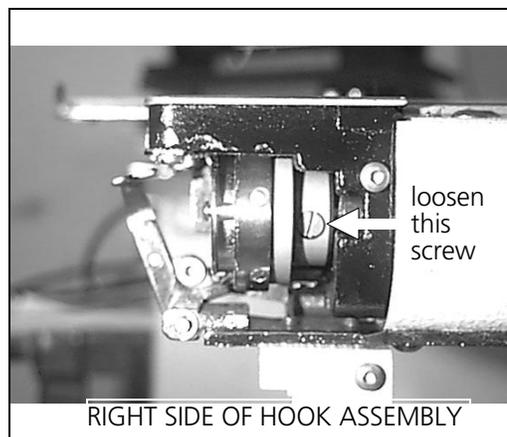


Figure 3 - 35

12. Press the   keys. The head rotates to the "Needle Depth" position without bringing the needle down and the LCD displays NEEDLE DEPTH 180.0.
13. Press   and the head rotates to the "Hook Timing" position. The LCD displays HOOK TIMING 200.0.
14. Clean and replace the current hook, or place a new rotary hook on the hook shaft.
15. Align the hook point to the approximate hook timing position as shown in Figure 3-36.

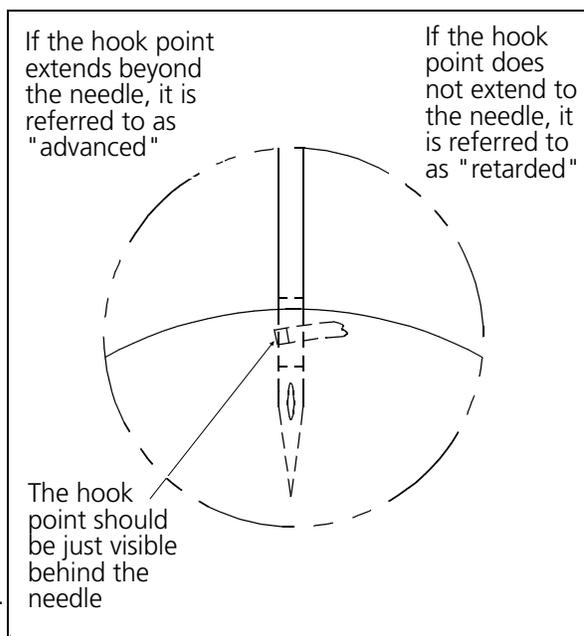


Figure 3 - 36

16. With a good needle installed in the needle bar above the rotary hook, grasp the needle bar clamp and pull down until the needle goes into the slot in the bobbin basket and the needle bar catches securely.
17. Refer to Figure 3-36 for aligning the hook point to the needle.

At the same time, refer to Figure 3-37 and position the hook point so the gap between the needle scarf and the hook point is 0.002" to 0.020" (about the width of a thread).

18. While maintaining the specifications outlined in the previous step, tighten the rotary hook screw that is accessible at the right of the hook assembly.

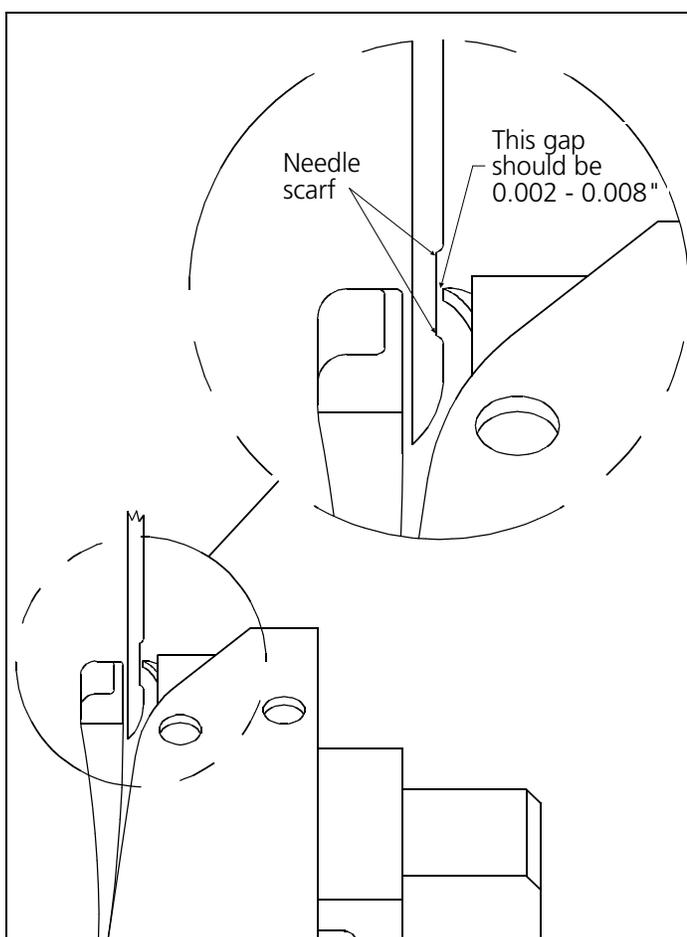


Figure 3 - 37

19. Install the UTC assembly with the retaining finger tab inside the rotary hook bobbin basket notch. Install the screws.

Adjust The UTC Assembly

You must adjust the UTC assembly to a level where the needle will not contact the detection arm during the needle depth procedure.

20. Place the UTC Combination Gauge (p/n 009027-01) from the operator kit between the retaining tab of the UTC and the notch in the hook basket (see Figure 3-38). The gauge should fit with no restriction, nor with too much play (gap should be $.020'' - .040''$).

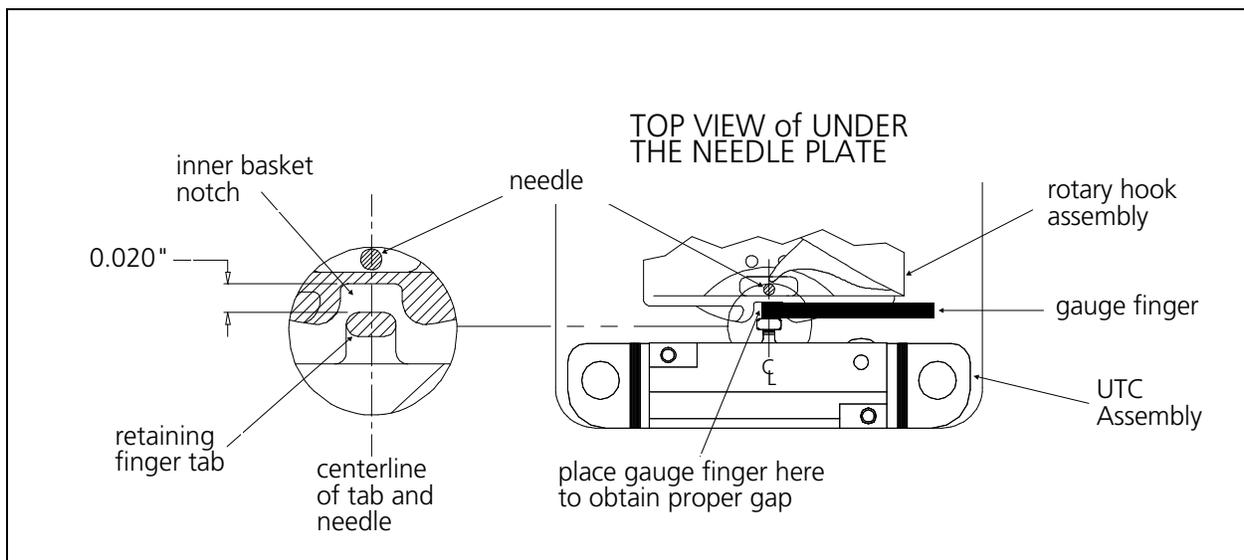


Figure 3 - 38

21. Move the assembly against the UTC combination gauge and at the same time, align the center of the tab to the center of the needle.
22. Tighten the UTC assembly mounting screws, then remove the UTC combination gauge.
23. Use the  key to rotate the hook to the other two HOOK SCREWS and tighten each of these screws to secure the hook assembly.
24. With the correct gap between the retaining tab of the UTC and the basket of the hook verified with the UTC combination gauge, check for a clearance of between 0.008 to 0.012 inches between the UTC detection arm (shown in Figure 3-39) and the needle.

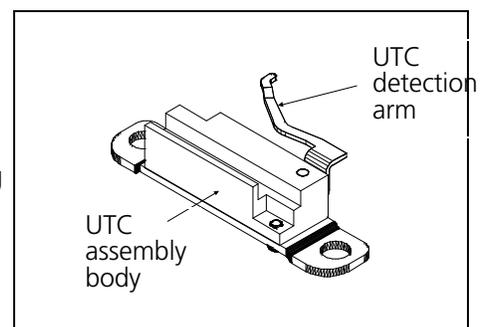


Figure 3 - 39

If the clearance needs to be adjusted proceed with the next step. If OK, go to the Needle Depth adjustment procedure.

25. Slightly loosen the two small screws on the underside of the UTC assembly shown in Figure 3-40.

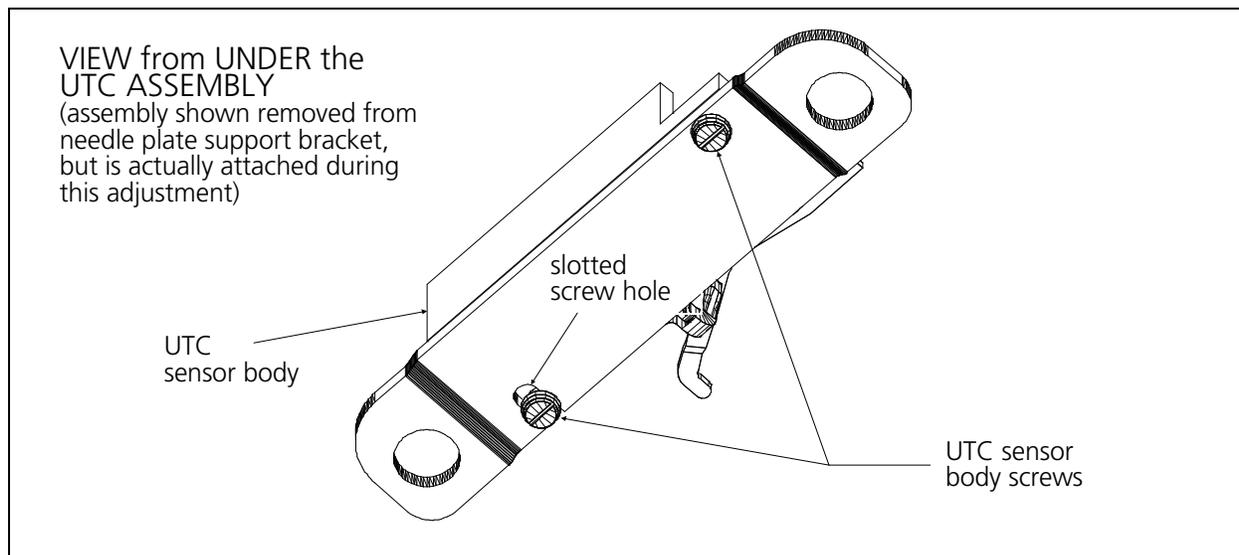


Figure 3 - 40

26. Move the UTC assembly to set the distance between the needle and the detection arm to between 0.008 and 0.012 inches.
27. Carefully tighten the two UTC sensor body screws when the clearance is set.

Needle Depth

If the needle depth is out of adjustment, it must be adjusted carefully for proper embroidery. Follow these steps to adjust needle depth:

28. Remove the lower needle case cover (see Figure 3-42).
29. With the machine ON and ready for operation, press   to switch to the Service/Maintenance Menu. Then press  at the peripheral keyboard until the LCD displays HEAD TIMING MENU.
30. Press  and the LCD displays HEAD TIMING ON.
31. Press   keys. The head rotates to the "Head Up" position and the LCD displays GO TO HEADUP 110.0.

32. Next press   . The head rotates one revolution. The LCD displays ONE REVOLUTION 110.0. The needle bar should be down with the presser foot about 1/4 inch from the needle plate.

NOTE: If the needle does not come down the upper dead stop clamp may need adjustment as described later in this procedure. For now, however, complete the needle depth adjustment by grasping the presser foot and pulling down until the needle bar catches securely. At this time the presser foot will be about 1/4 inch from the needle plate.

33. Press   . The head rotates to the "needle depth" position and the LCD displays: NEEDLE DEPTH 180.0. The needle has reached its lowest point.

34. Look directly into the hook assembly and check the location of the needle's eye compared to Figure 3-41. Not more than 1/8 of the needle's eye should be visible in the hook assembly.

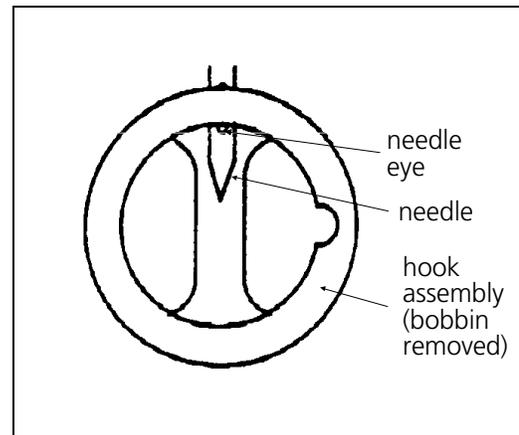


Figure 3 - 41

If the needle's eye is in the acceptable range, skip the next few steps and go to Step 43.

If the needle's eye is not in the acceptable range, continue this procedure with the next step.

35. Loosen the needle bar clamp screw (silver clamp) shown in Figure 3-42.
36. Slide the needle bar up or down until not more than 1/8 of the needle's eye should be visible in the hook assembly. If you twisted the needle bar, return it to its original rotation before continuing.
37. Re-tighten the needle bar clamp screw.
38. Loosen the screw on the upper-dead-stop clamp (black clamp). Push the upper dead stop down to the needle bar clamp. Tighten slightly (but do not turn the upper dead stop).
39. Press  and  simultaneously. The head will rotate to the full needle up position (needle at its highest point) and the LCD displays TOP DEAD CENTER.

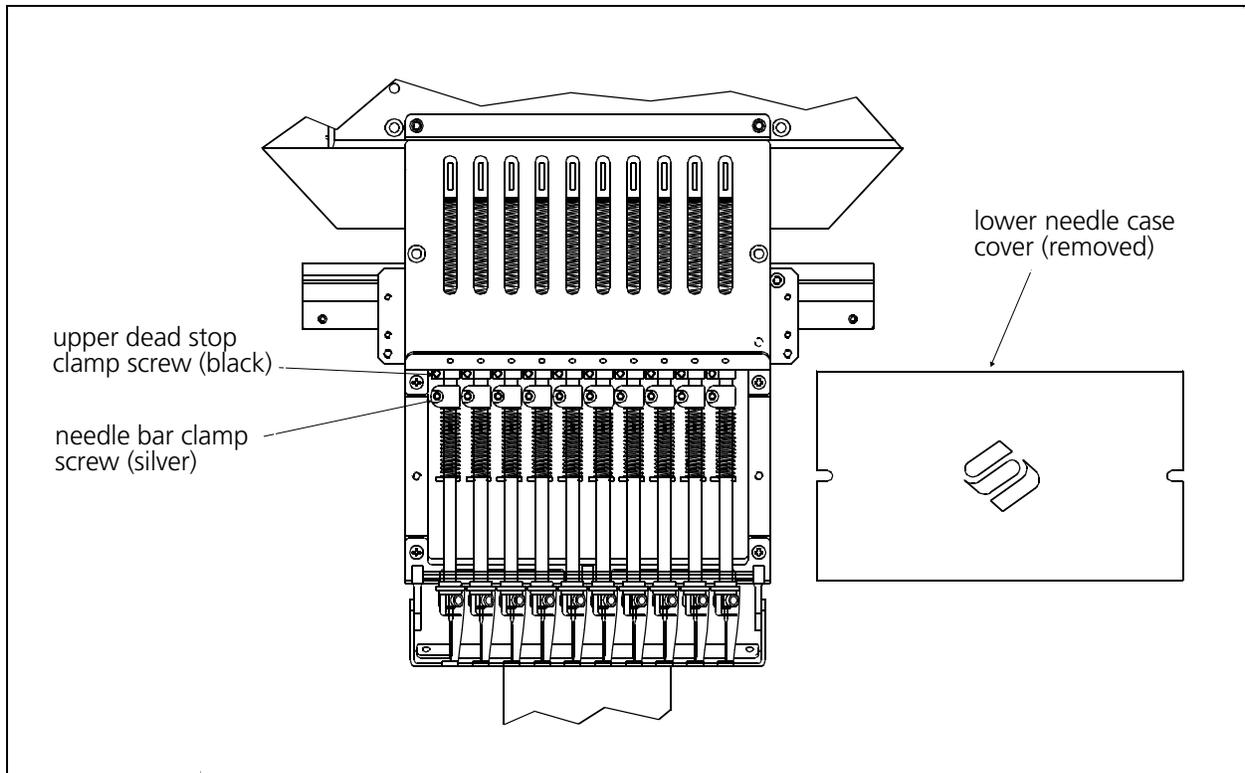


Figure 3 - 42

40. Loosen the screw on the upper-dead-stop clamp again and slide the clamp against the upper stop bumper. The screw must be positioned directly forward. If it is rotated, it may rub the plastic guide plate or catch the needle bar next to it during its down stroke. Tighten the upper-dead-stop clamp screw.
 41. Press  . The head rotates to GO TO HEAD UP 110.0.
 42. Repeat steps 32 through 34 to check the needle depth and that there is no restriction to head rotation.
 43. Repeat the needle depth adjustment for the remaining needles.
- NOTE: After any needle depth adjustment the upper dead stop **MUST** also be readjusted!
44. Replace the lower needle case cover.
 45. Go to the UTC Adjustment procedure located on page 4-33 in Chapter 4 of this manual to make the fine adjustments for the UTC assembly.
 46. After the fine adjustments are set with the UTC, replace the needle plate, both rotary hook covers, and the bobbin case; and return the machine to its operational state.

Hook Timing Adjustments Only

This procedure is for checking and setting hook timing adjustments when the hook assembly is not being replaced. If you are replacing the hook assembly, refer to the preceding section in this chapter. If you suspect your peripheral has gone out of timing due to hitting a hoop, bird nesting, or some other reason, follow these steps:

1. Move the the table top to the lower position, or remove it and set it aside.
2. Remove the needle plate, both rotary hook covers, and the bobbin case.
3. With the machine ON and ready for operation, press   to switch to the Service/Maintenance Menu. Then press  at the peripheral keyboard until the LCD displays HEAD TIMING MENU.
4. Press  and the LCD displays HEAD TIMING ON.
5. Refer to the Needle Depth procedure that immediate precedes this procedure and perform the steps numbered 31 through 44, then return to Step 6 below.
6. Press   keys. The head rotates to the "Head Up" position and the LCD displays GO TO HEADUP 110.0.
7. Hold down  and press  (the display will read NEEDLE DEPTH).
8. Hold down  and press  (the display will read HOOK TIMING).
9. Grasp the needle bar clamp and pull down until the needle goes into the slot in the bobbin basket and the needle bar catches securely.
10. Check to see if hook timing is correct before you proceed. You must check the hook point's alignment with the needle, and you must check the gap. Refer to Figure 3-43 to check the alignment to the needle. Refer to Figure 3-44 to check the gap; there should be a 0.002" to 0.020" gap (about the width of a thread) between the needle and the hook point. Since there is some variation between the needles, check needles 1, 5, and 10; ideally, the smallest gap should be set at 0.003".

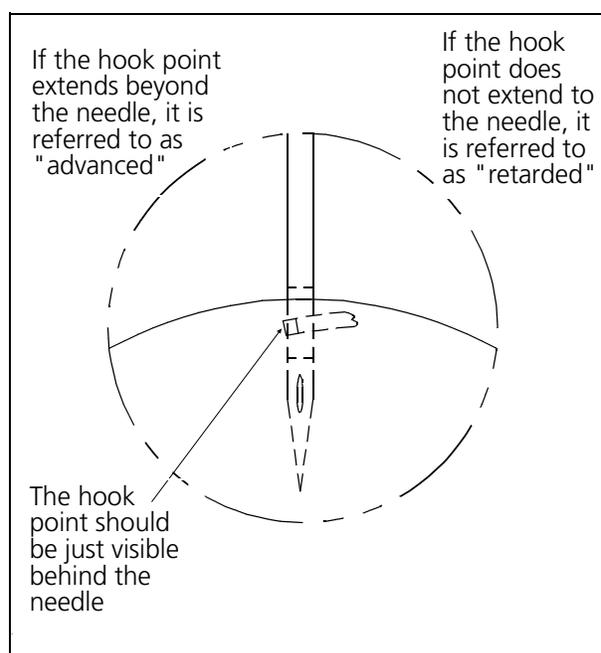


Figure 3 - 43

If hook timing is correct, proceed to the UTC Adjustments in the next procedure. If hook timing is NOT correct, proceed to Step 11.

11. While the hook is still in the HOOK TIMING position, color the screw on the RIGHT side of the hook (see Figure 3-45) with a felt-tipped marker. **DO NOT LOOSEN THIS SCREW AT THIS TIME.**

12. Press  until you see the 2nd screw. Loosen this screw.

13. Press  until you see the 3rd screw. Loosen this screw.

14. Hold down  and press  (the display will read Go To Headup).

15. Hold down  and press  (the display will read Needle Depth).

16. Hold down  and press  (the display will read HOOK TIMING).

17. Loosen the screw on the RIGHT SIDE of the hook (the one that was colored with the felt-tipped marker) while you hold the Hook in position.

18. Line the hook up in the approximate HOOK TIMING position (refer to Figures 3-43 and 3-44).

19. Grasp the needle bar clamp and pull down until the needle goes into the slot in the bobbin basket and the needle bar catches securely.

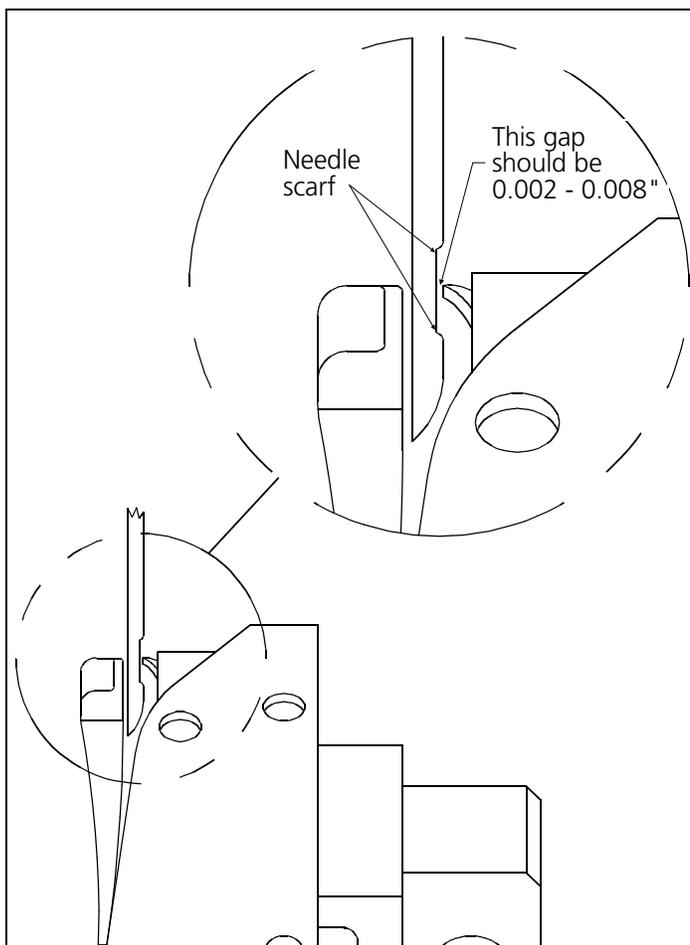


Figure 3 - 44

16. Hold down  and press  (the display will read HOOK TIMING).

17. Loosen the screw on the RIGHT SIDE of the hook (the one that was colored with the felt-tipped marker) while you hold the Hook in position.

18. Line the hook up in the approximate HOOK TIMING position (refer to Figures 3-43 and 3-44).

19. Grasp the needle bar clamp and pull down until the needle goes into the slot in the bobbin basket and the needle bar catches securely.

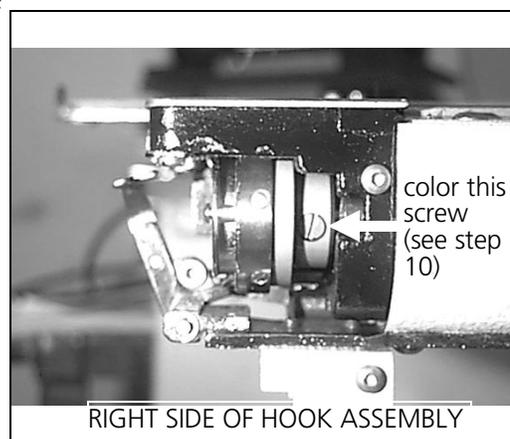


Figure 3 - 45

20. Position the POINT of the HOOK directly behind the SCARF of the needle. Leave a THREAD distance between the POINT of the hook and the needle.
21. Tighten the colored hook screw and check that the setting is correct as shown in Figures 3-43 and 3-44.
22. Press the  key to rotate the the hook to access the other two hook screws and tighten them securely.

UTC Adjustments

22. Refer to the UTC and Needle Depth adjustments on Pages 3-43 through 3-46.
23. After setting the UTC adjustments replace the needle plate, both rotary hook covers, and the bobbin case; and return the machine to its operational state.

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4. Trimmer Maintenance

General

This section of the manual provides parts replacement procedures and various adjustments required during repair maintenance of the embroidery head trimmer system. Information for service maintenance on the rest of the embroidery head is located in Section 3 and the rest of the machine is located in Section 2 of this manual.

These procedures are guidelines for performing repairs and must be used by personnel practicing good maintenance and repair techniques. Refer to the Maintenance Philosophy topics in Section 1 of this manual for discussion of good maintenance and repair techniques, including concerns with static electricity.

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 Warranty is exclusive of, and may be VOID if, poor maintenance practices have caused damage to the equipment.

Sequence of Trim Events

During the trim function, many events occur with a set timing sequence to enable the trimming action to be successful. The following steps provide you with a very general outline (and sometimes brief descriptions) of the major actions that take place during the trim function.

1. While embroidering a design, the trim function is initiated when the embroidery peripheral detects the design code for: a color change, a trim, a set number of consecutive jump stitches, or the end of design.
2. The heads will slow to about 100 stitches per minute, which is the speed range for the trimming action.
3. The picker engages with the current thread loop as it is being formed in the hook and bobbin area. This process is required to provide the correct length for restarting the embroidery next time this thread color is used.
4. The movable knife comes forward to the ready state for trimming. During its forward movement, it separates the top thread from the thread that is looped around the hook. It is here where it "selects" the top thread and bobbin thread for trimming.
5. When the movable knife returns to the "home" position, the selected threads will be cut between the movable knife and the adjustable fixed knife.

6. The beam makes two moves that clears the top thread (now called the tail) out of the material.
7. At approximately the same time the threads are being cut and the beam is moving to clear the tail, the grabber reaches out from behind the needle area and "grabs" the tail, pulling it up and back into the Velcro wiper strip.
8. When the trim is complete the peripheral begins embroidering again automatically.

Trimmer Replacement Procedures

The thread trimmer assemblies lie in three general areas of the head: in and about the hook and bobbin area, on the arm casting behind the front of the head, and in and throughout the cylinder bed. All the replacement procedures for these various parts are grouped together in this section. All the trimmer adjustments are grouped together in the section following these replacement procedures.

Grabber Drive Assembly

The grabber drive assembly is mounted to the left side of the # 2 embroidery head arm casting (see Figure 4-1).

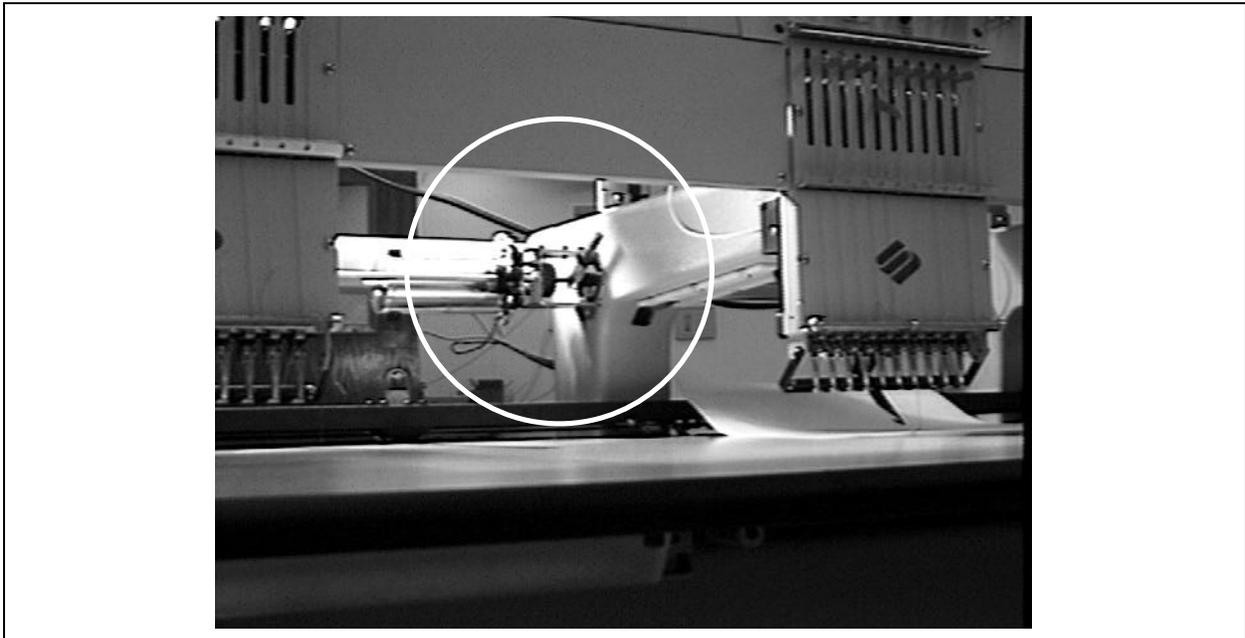


Figure 4 - 1 Grabber Drive Assembly

Grabber Blade Replacement

1. Remove the 4 screws and take off the top grabber blade cover.
2. Remove the two button head screws that secure the grabber blade to the grabber drive assembly where it enters into the embroidery head arm casting (See Figure 4-2).

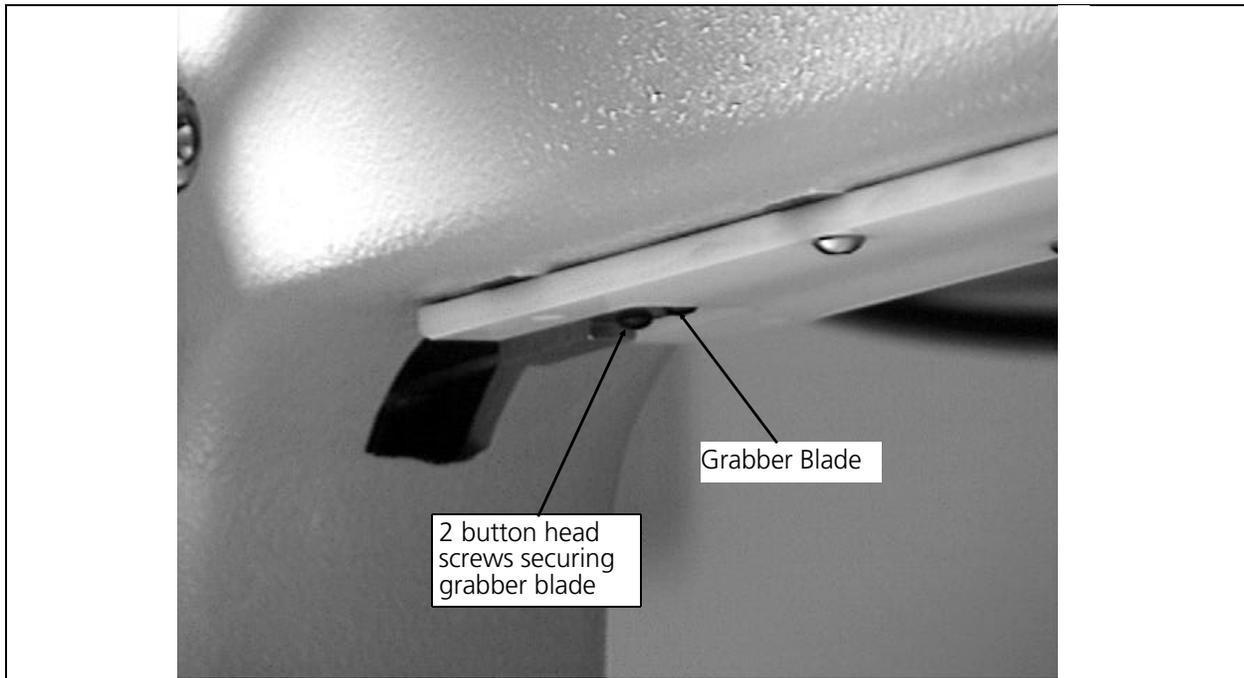


Figure 4 - 2

3. Remove the 4 screws to free the front grabber blade cover (see Figure 4-3). Slide the grabber blade out of the grabber blade guide (just behind the Velcro wiper bar) as you remove the cover and grabber blade.
4. Reverse order of the previous steps to replace the grabber blade.

When reinstalling the grabber blade, be sure to slide the grabber blade into the front blade cover and then the grabber blade guide before installing the screws to attach the grabber blade to the grabber drive assembly at the entry into the arm casting.

When tightening the covers, some positioning adjustment may be required to ensure smooth blade movement.

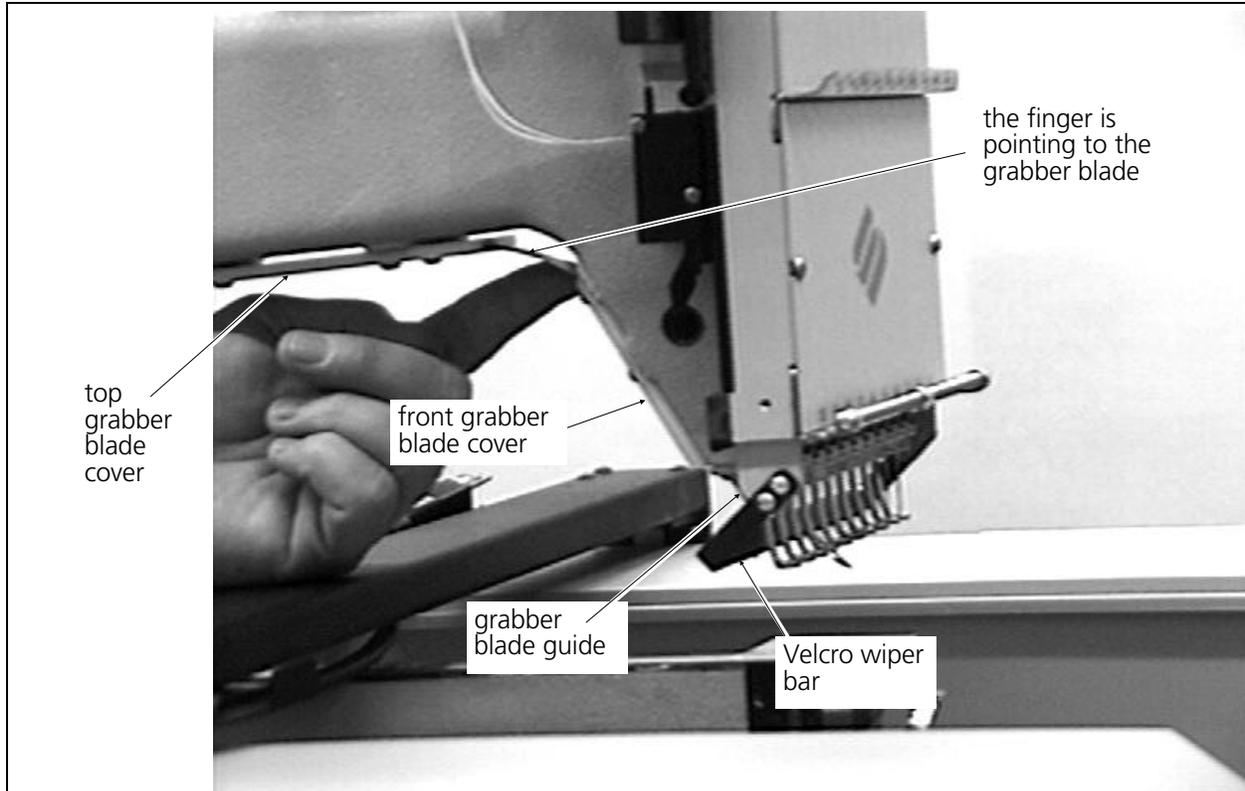


Figure 4 - 3

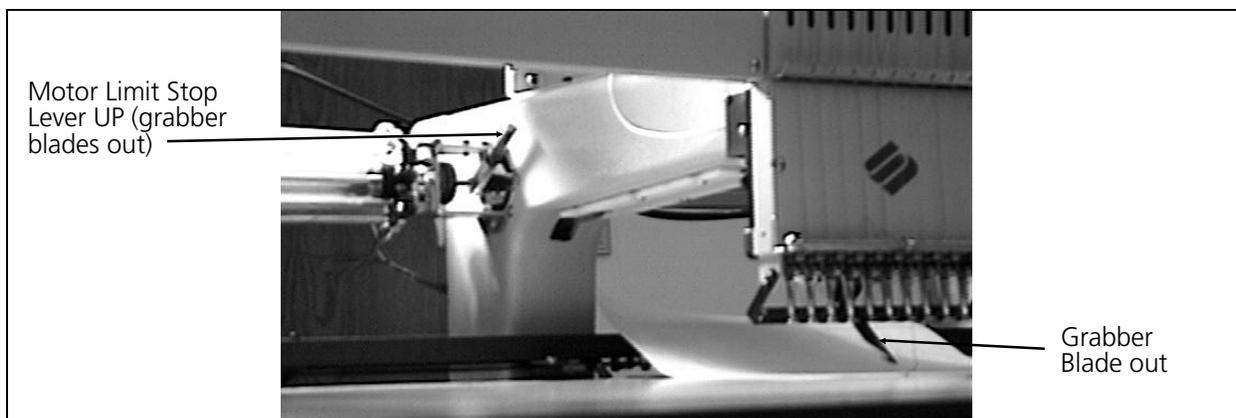
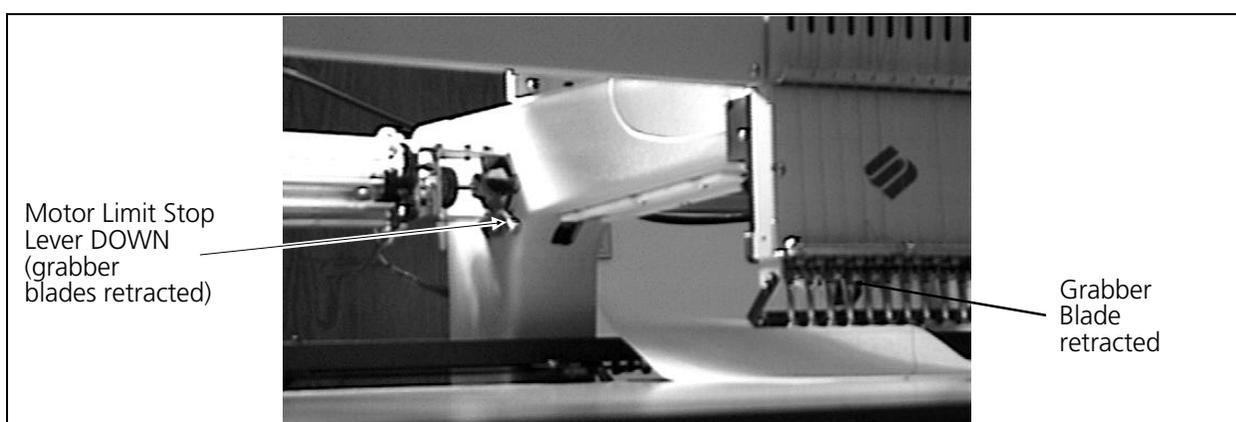
Grabber Adjustments

To check grabber blade travel follow these steps:

1. Insure the embroidery heads are synchronized and position them to headup.
2. Turn the machine OFF, and unplug the power cord from the power source.
3. Manually move the grabber motor limit stop lever up to move the grabber blades all the way out and then down to move the blades back again. (see Figures 4-4 and 4-5).

If you notice any binding in grabber blade movement, find the mechanical bind and correct it before continuing.

DO NOT USE OIL TO TRY TO CORRECT THE BIND!

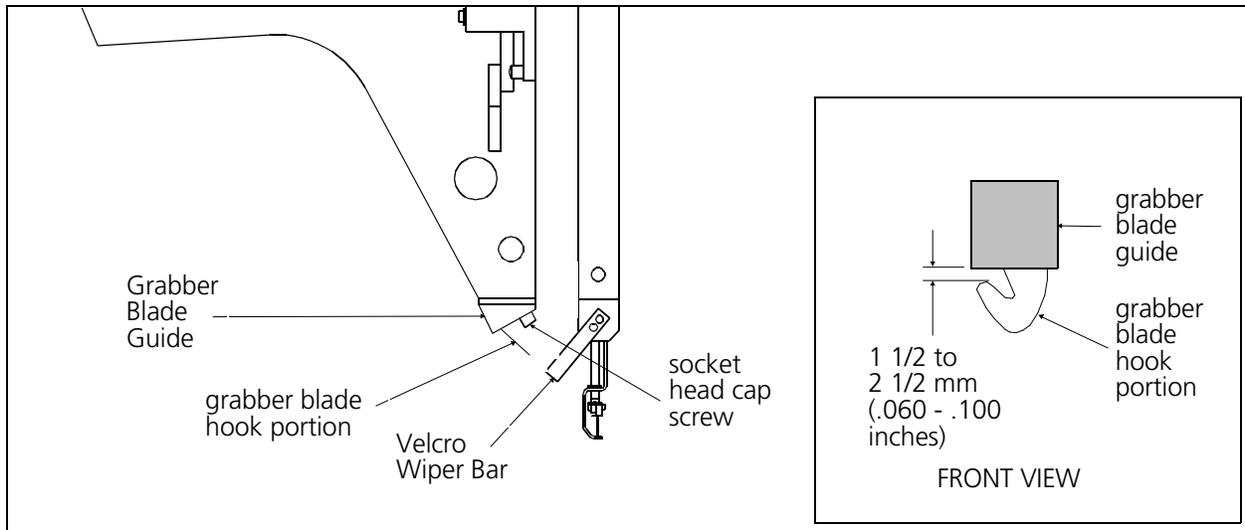
**Figure 4 - 4****Figure 4 - 5**

When fully retracted, the grabber blades should be inside the guide just behind the Velcro wiper bar at the bottom of the needle case area. There are two conditions that must be met at this position for the grabber blades to be correctly adjusted:

- A The grabber blades should be directed toward the middle of the Velcro wiper bar by the the grabber blade guide.
- B With the grabber blades positioned as far back as they will go, they should be inside the grabber blade guide, with just the "hook" portion of the blades extending out the front of the guide.

To Adjust For A:

1. Position the grabber blades as far back as they will go into the grabber blade guides by manually moving the motor limit stop lever down as shown in Figure 4-5.
2. Locate the socket head cap screw in the end of the grabber blade guide (see Figure 4-6).

**Figure 4 - 6**

3. Loosen the cap screw and move the guide until the grabber blade is directed toward the middle of the Velcro wiper bar.
4. Tighten the socket head cap screw in the grabber blade guide.

To Adjust For B:

The grabber blade travel is adjusted at the wire swivel where the transition bracket and guide rod enter into the rear of the head. From the transition bracket, the rod is inserted into the wire swivel and held in place with a set screw.

1. Position the grabber blades as far back as they will go into the grabber blade guides by manually moving the motor limit stop lever down as shown in Figure 4-5.
2. Find the small set screw at the right side of the wire swivel in the grabber blade transition bracket (see Figure 4-7).
3. Loosen the set screw in the wire swivel and position the grabber blade so the hook is protruding between 1.5 and 2.5 mm (.060 - .100 inches) from the guide (see the inset in Figure 4-6).

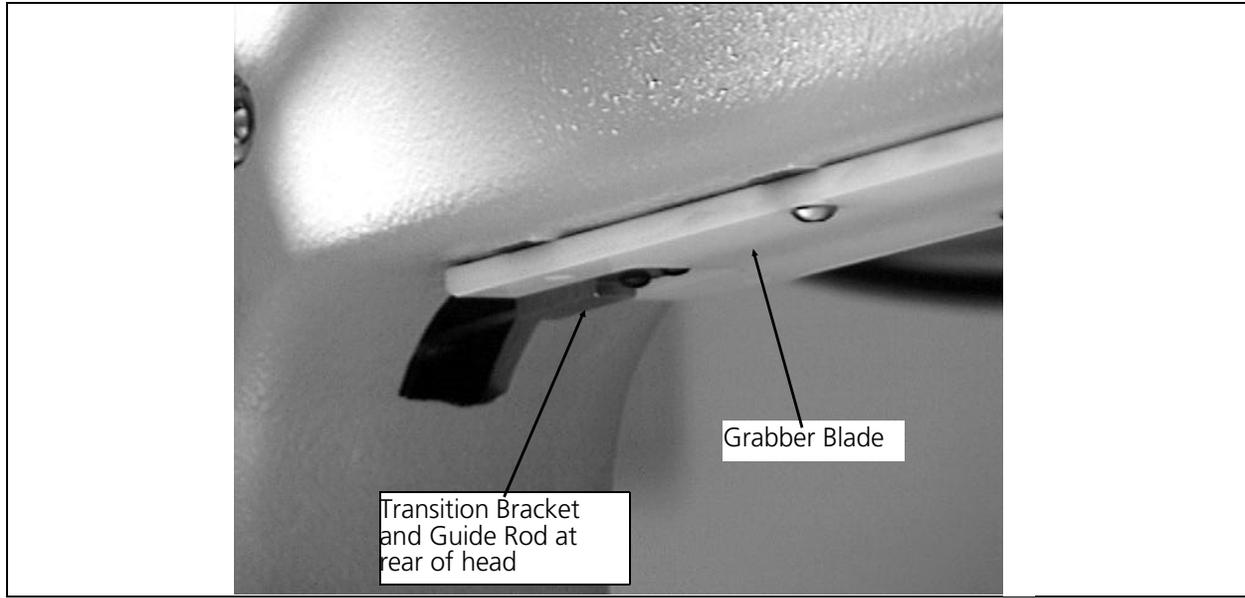


Figure 4 - 7

4. Tighten the set screw in the wire swivel.
5. Replace all covers after making the grabber adjustments.

Trimmer Drive Assembly

Trimmer Cam

The trimmer cam is mounted on the rotary hook shaft in the rear bed. Replacing the trimmer cam requires major embroidery head disassembly and critical adjustments during reassembly. It is recommended that a technician trained in embroidery head disassembly perform this procedure.

Trimmer Solenoid

NOTE; When the trimmer solenoid mount is moved, the movable knife home position may become mis-adjusted. Refer to the movable knife home position adjustment procedure after the solenoid is reinstalled.

1. Remove the head rear bed cover to gain access to the trimmer drive assembly.
2. Refer to Figure 4-8 and mark the position of the solenoid mount in its track on the movable frame. This will aid in returning the assembly to its current position, helping to keep the movable knife home position as close as possible.
3. Disconnect the solenoid in-line connection under the trimmer assembly.
4. Remove the socket head cap screw from the solenoid mount and lift the solenoid and mount out together.

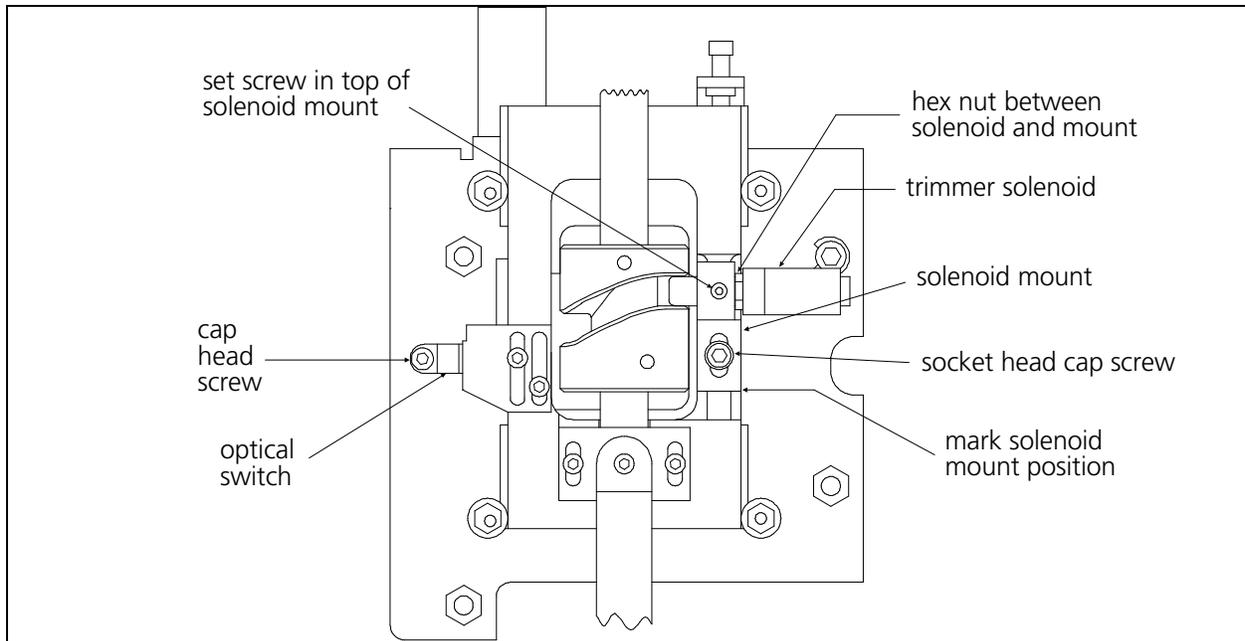


Figure 4 - 8 Trimmer Camming Mechanism

5. Loosen the set screw in the top of the solenoid mount, then rotate the solenoid assembly out of the mount.
6. Rotate a new solenoid assembly into the mount. Do not tighten the set screw in the top of the mount at this time.
7. Reinstall the solenoid and mount to the movable frame.
8. Reconnect the solenoid in-line connection under the trimmer assembly.
9. Refer to the adjustments later in this chapter to adjust for solenoid positioning and movable knife home position. When the trimmer solenoid and mount are reinstalled you may also need to adjust the home stop screw or adjust the solenoid mount to achieve proper travel of the solenoid pin into the cam groove.
10. Reinstall the head rear bed cover.

Picker Solenoid Assembly

This assembly is mounted under the embroidery head in the rear bed. To remove this assembly refer to the following steps:

1. Remove the head rear bed cover to gain access to the trimmer drive assembly.
2. Loosen the nut securing the solenoid to the bracket under the trimmer assembly and allow the solenoid to drop off the bracket.

CAUTION! Be careful not to lose the solenoid return spring in the next step.

3. At the solenoid plunger, loosen the set screw in the picker swivel clamp and remove the picker wire from the end of the plunger.
4. Remove the old solenoid wires from the main connector and transfer the new solenoid wires into the same positions in the connector.
5. Transfer the solenoid return spring from the old solenoid to the new one and reattach the picker wire at the end of the solenoid plunger.
6. Position the new solenoid in the bracket and secure it with the nut.
7. Reinstall the left rear table top (with optional bobbin winder assembly).
8. Install the rear bed cover and refer to the procedure for adjusting the picker when you have finished the installation.

Home Position Optical Switch

1. Remove the cap head screw holding the body of the optical switch in position (see Figure 4-8).
2. Carefully manipulate the switch harness through the cutout in the bracket until you can access and disconnect the in-line connector.
3. Connect the new optical switch to the in-line connector and place the switch in position on the bracket.
4. Reconnect the optical switch with the cap head screw.

Picker Assembly

1. Remove the screws holding the needle plate. Remove the needle plate.
2. Disconnect the picker link from the picker base by loosening the set screw inside the swivel pivot of the picker base (see Figure 4-9).
3. Remove the external retaining ring at right end of the picker base shaft.
4. Slide the picker assembly out of the picker bracket mount.

When re-attaching the picker link to the picker assembly, refer to the alignment section of this manual for the alignment procedure for the picker position.

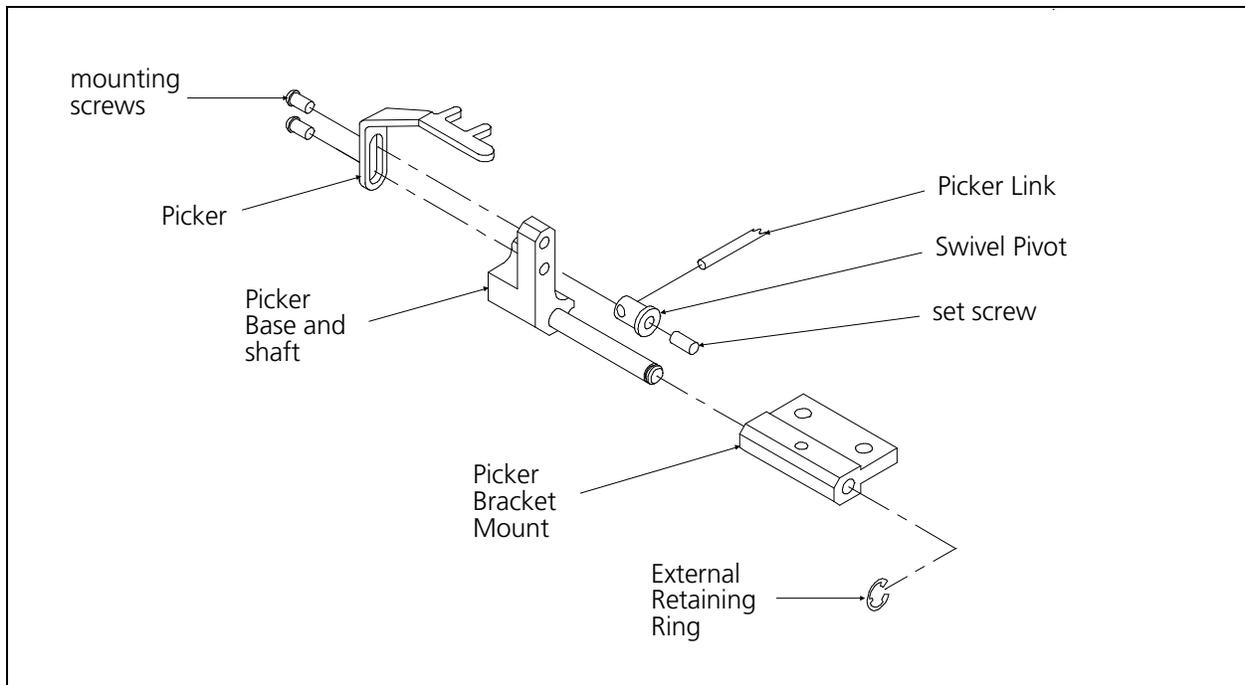
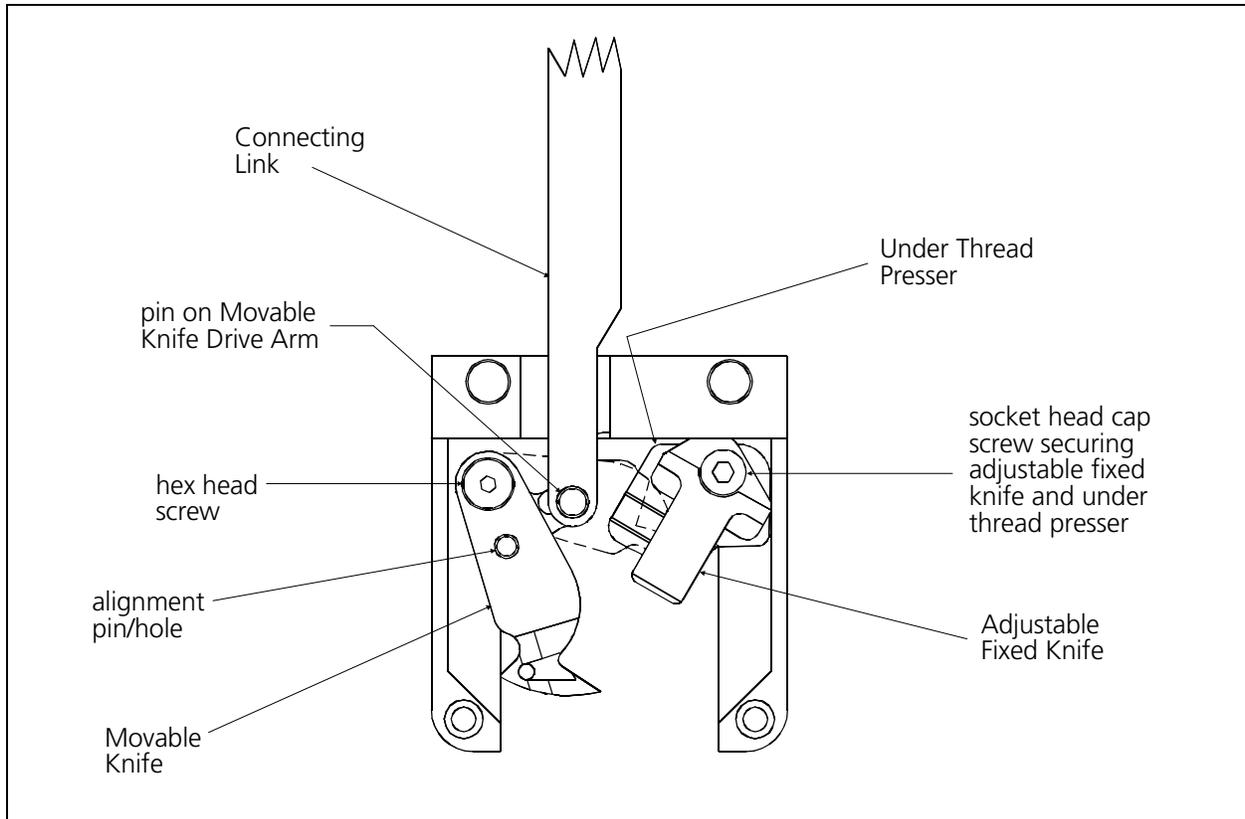


Figure 4 - 9

Movable Knife

1. Remove the screws holding the needle plate. Remove the needle plate.
2. Remove the screws holding the front and rear bed covers and remove the covers.
3. Lift the forward end of the connecting link from the pin on the movable knife drive arm (see Figure 4-10).
4. Push the movable knife all the way back until it stops.
5. By rotating counter clockwise, loosen the hex head screw holding the movable knife to the top of the knife drive arm.
6. Rotate the movable knife out of the adjustable fixed knife, then remove the hex head screw and the movable knife.
7. Place the new movable knife on the top of the knife drive arm, positioning the alignment hole in the knife over the alignment pin in the arm.
8. Apply Loctite 222 screw adhesive (or equivalent) and install the hex head screw and snug it with your fingers.
9. Rotate the knife and arm clockwise until the back side of the knife is resting against the left side of the needle plate bracket.
10. Tighten the hex head screw.

**Figure 4 - 10**

11. After replacing a movable knife refer to the trimmer adjustment procedures later in this chapter for the adjustable fixed knife.

Adjustable Fixed Knife/Under Thread Presser

1. Remove the screws holding the needle plate. Remove the needle plate.
2. Remove the screws holding the front and rear bed covers. Remove the covers.
3. Lift the forward end of the connecting link from the pin on the movable knife drive arm (see Figure 4-10).
4. If the movable knife is positioned under the adjustable fixed knife and under thread presser, rotate it forward to move it from under that area.
5. Remove the socket head cap screw securing the adjustable fixed knife and under thread presser to the top of the needle plate bracket.
6. Remove the adjustable fixed knife and the under thread presser.
7. Replace the required new parts.

8. Install the socket head cap screw to secure the adjustable fixed knife and the under thread presser. Snug the cap screw until the parts are held securely. Do not over tighten.
9. After replacing an adjustable fixed knife or under thread presser, refer to the trimmer adjustment procedures later in this chapter for the adjustable fixed knife.

Movable Knife Drive Arm

1. Remove the screws holding the needle plate. Remove the needle plate.
2. Remove the screws holding the front and rear bed covers. Remove the covers.
3. Lift the forward end of the connecting link from the pin on the movable knife drive arm (see Figure 4-10).
4. Refer to Figure 4-11 and remove the external retaining ring from the bottom of the movable knife drive arm. (Also see Figure 4-17 for retaining ring reference.)

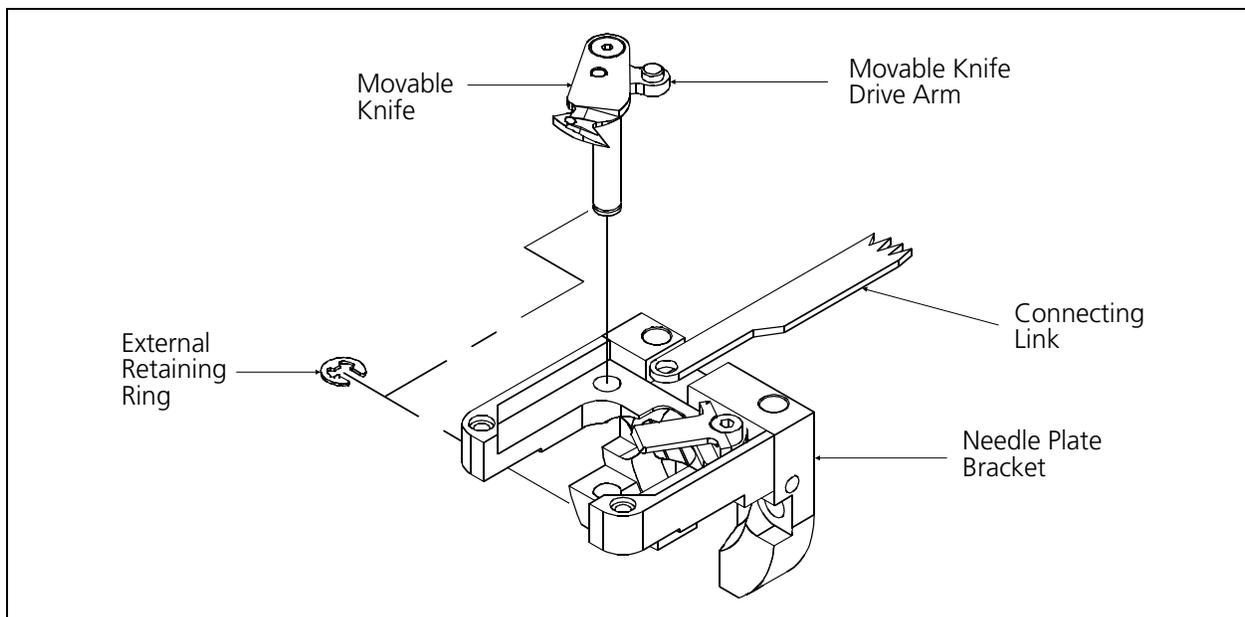


Figure 4 - 11

5. Once this clip is removed, the arm shaft is free to be removed out of the top of the needle plate bracket.

Trimmer Adjustment Procedures

One procedure combining all the required adjustments organized in specific order is presented in this section for providing the best success in making adjustments to the trimmer assembly. All the trimmer replacement procedures are found together in the previous section.

The EMT 10/4T Embroidery Peripheral trimmer system is assembled and thoroughly tested before the machine is shipped. Although the set up of the trimmers should not change during normal use, there are a few things to be aware of to prevent problems.

- Dirt, dust, and thread lint debris can build up and prevent the movable knife (in the rotary hook assembly) from actuating correctly. Keep the area clean and you shouldn't have a problem here. If for some reason you find that the movable knife is out of adjustment a procedure for adjusting it is presented in this section.
- Thread birdnesting around the rotary hook, picker, and UTC sensor arm could cause the knife and/or picker, to become misadjusted.

General

The following procedures provide a guide for adjusting various portions of the trimmer system.

Note: This procedure requires the use of several service tools: a medium screw driver, a small screw driver, a 3/32" hex wrench, a 1.5 mm hex wrench, a 2 mm hex wrench, and a 2.5 mm hex wrench.

Note: In addition to the "standard" tools needed above, you will need a torque wrench (0-250 in/lbs) if making adjustments to the "select" position.

CAUTION! If these adjustments are attempted without using the proper procedures and tools (and without proper training in some cases), machine components may be damaged and operation of the trimmers may become inconsistent.

Z Timeout Errors

An area of concern with the trimmer system is when birdnesting occurs in the hook area. If a birdnest builds up in the hook area, there is a potential that movable knife movement may be obstructed and a mechanical slippage or bending may occur with one or more components of the trimmer system. This is the most probable cause for the trimmer system to create Z timeout errors. When Z timeout errors are a result of the trimmer system, there are two general areas that may contribute to the situation: 1) bent or broken parts in the trimmer cam system, and 2) movable knife select position adjustment.

Damaged Trimmer Cam or Trimmer Solenoid

To check for a damaged trimmer cam or trimmer solenoid, refer to the following procedure:

1. Remove the rear bed cover of the head to expose the trimmer camming area as seen in Figure 4-12.

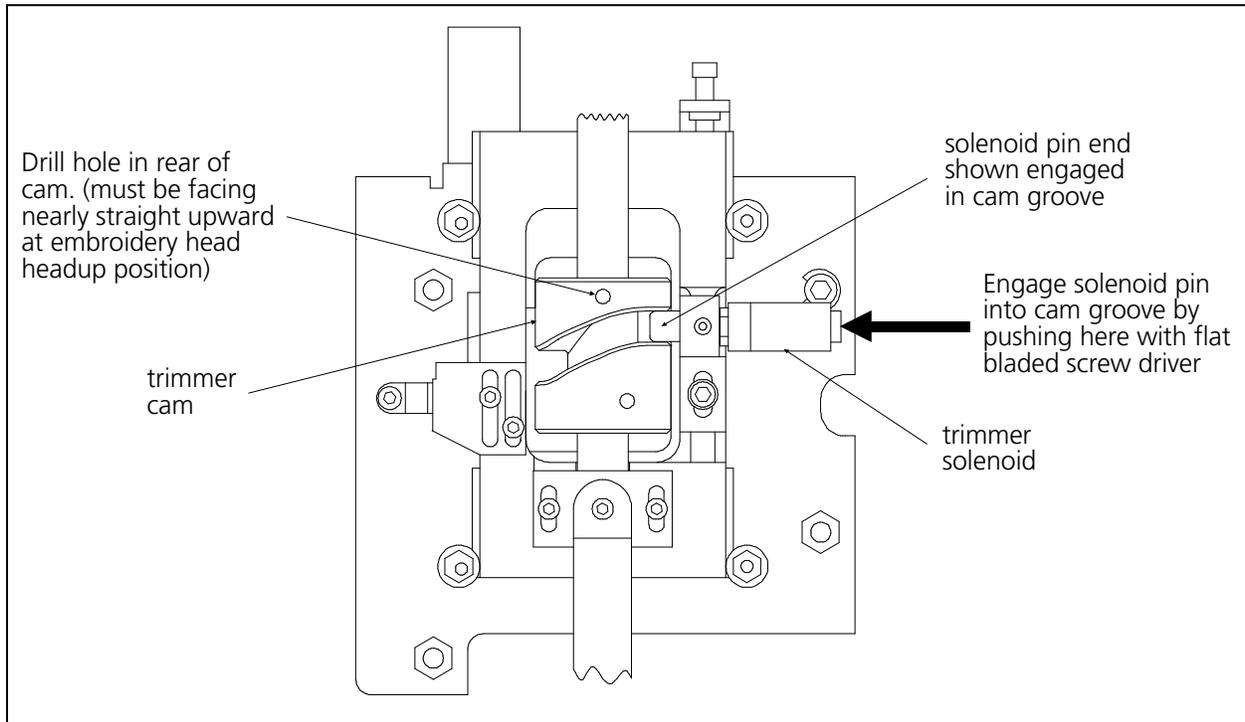


Figure 4 - 12

2. Turn the machine power ON.
3. Go to the HEAD TIMING MENU and press  to turn HEAD TIMING ON.
4. Press the  and  keys simultaneously to go into the "Z pos" mode. On the display you will see: 'Z pos' followed with a numerical indication in degrees.
5. With the 5 mm hex wrench at the right end of the Z drive shaft, slowly rotate clockwise until the number of degrees indicated in the display reads between 280 and 300.
6. Refer to Figure 4-12 and manually engage the trimmer solenoid pin into the trimmer cam groove by pushing the protruded end of the pin inward with a flat bladed screw driver.
7. Hold the trimmer solenoid pin in as you continue to apply clockwise rotation to the Z drive shaft. Rotate the shaft at least one full revolution.

You should not feel any restrictions during the rotation. If you do, you may have a damaged trimmer cam or trimmer solenoid.

NOTE: You may remove the trimmer solenoid for inspection or replacement. However, when the trimmer solenoid mount is moved, the movable knife home position may become mis-adjusted.

8. Refer to the procedure for replacing the trimmer solenoid and remove the solenoid.
9. While the trimmer solenoid is removed, inspect the trimmer cam for damage. If the cam is damaged beyond use, factory service is recommended to replace it.
10. Go to the movable knife home position adjustment procedure after the solenoid is reinstalled.
11. Repeat this procedure to check again for unrestricted cam assembly movement.

Checking "Head Up" Position

Before checking/adjusting movable knife "home" or "select" positions, you should check the cam positions at head up.

1. Remove the embroidery head rear bed cover to expose the trimmer camming mechanisms shown in Figure 4-12.

WARNING! Keep clear of the moving parts that are exposed during the operation of the next step(s).

2. Go to the HEAD TIMING MENU and press  to turn HEAD TIMING ON. Put the heads to the "head up" position by pressing the   combination.
3. Locate the holes in the rear of the cams (see Figure 4-12) and check that they are facing nearly straight upward. If the holes are not facing close to straight upward, the select position may require adjustment. Refer to the select position adjustment in this chapter.

Trimmers Not Trimming Properly

When the trimmers are not providing adequate trim quality, there are three general areas that may be contributing to the situation: 1) The physical condition of the trimmer parts, 2) The Movable Knife "home" position, and 3) The Movable Knife "select" position.

Physical Condition Of Trimmer Parts

Component Identification

Figure 4-13, identifies those components that comprise the trimmer system: the adjustable fixed knife, movable knife, and the under thread presser. These components are covered by the front bed plate and the needle plate (see inset in Figure 4-13). Remove the screws holding these covers to gain access to the trimmer area. You may test the trimmer adjustments without the covers in place, but they must be installed to embroider.

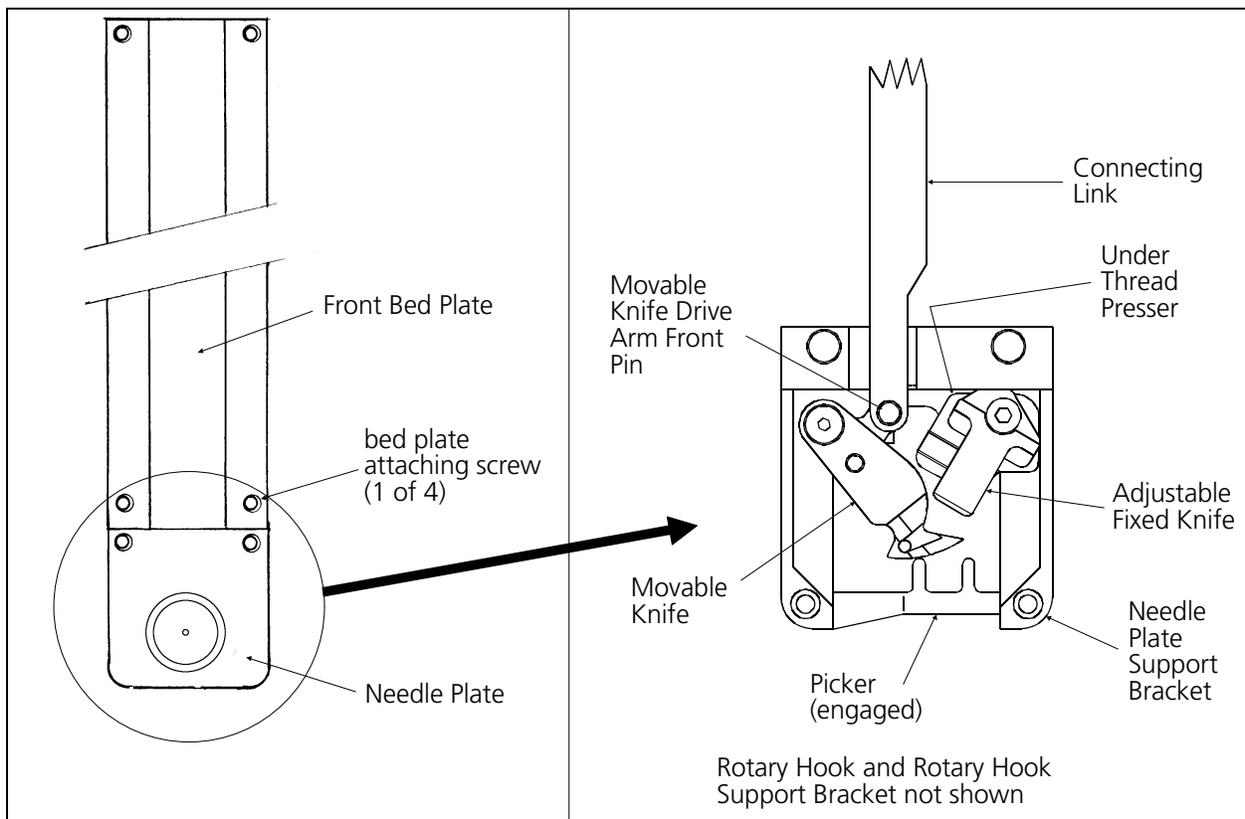


Figure 4 - 13 Trimmer Component ID

Adjustable Fixed Knife

Poor trimming quality and non trimming may be caused by the condition and adjustment of the adjustable fixed knife.

This situation may result if the adjustable fixed knife is worn or is not parallel to the trimming action of the movable knife. Check this condition of the adjustable fixed knife by inspecting the marks left on the surface of the movable knife that is under the adjustable fixed knife. If the marks are more severe in the area that aligns with one edge of the adjustable fixed knife, the adjustable fixed knife may need to be adjusted or replaced, or both. Another method for checking this condition is to perform the "ink wipeoff test" as described in the steps for adjusting the adjustable fixed knife later in this chapter.

Under Thread Presser

The under thread presser shown in Figure 4-14 holds the bobbin thread after a trim. This permits a loop of bobbin thread for the next stitch. While the under thread presser holds the bobbin thread there should only be enough pressure applied to hold the thread in place under the movable knife. If the under thread presser is damaged it can cause problems that look like tension troubles. For example, if the pressure of the under thread presser against the movable knife is too much, it may hold the bobbin thread and not allow a loop to be formed, or it may nick or fray the thread, again making it look like the bobbin tension is incorrect. Another example, would be if the under thread presser is "crumpled" (see Figure 4-14), it does not allow the movable knife to pass under the adjustable fixed knife completely to cut the thread, causing a "no cut" condition. If the under thread presser is damaged it can cause intermittent long tails of the upper thread.

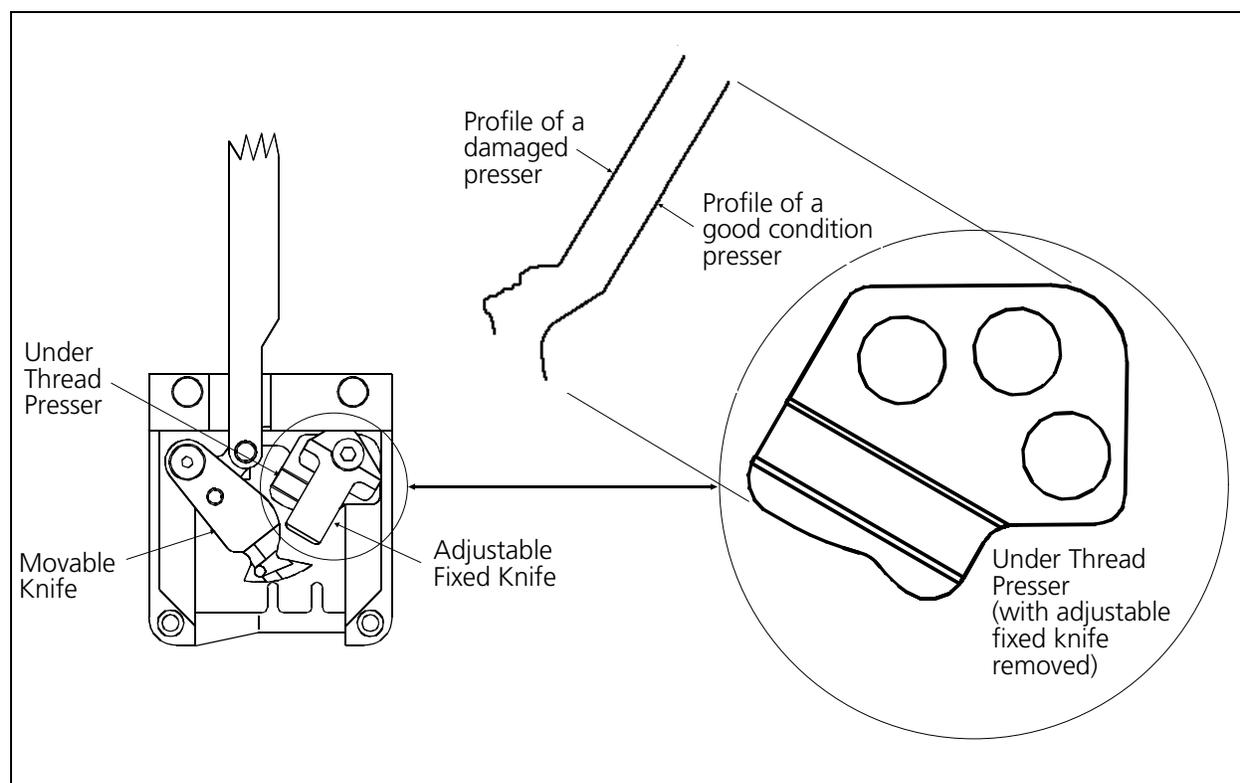


Figure 4 - 14 Under Thread Presser

Checking the under thread presser is done in two parts. First by looking at the part itself to see if there has been any "crumpling" as shown in Figure 4-14.

Crumpling is damage caused by the movable knife hitting the under thread presser. If you see visual evidence of any damage, replace the under thread presser as described earlier in this chapter.

The second part of checking under thread presser is to check if the bobbin thread is in fact being held in place.

1. While the machine is still turned off, remove the font bed cover and disconnect the connecting link from the movable knife drive arm by lifting it from the front pin (see Figure 4-12).
2. Pull the movable knife forward with a small hex wrench hooked behind it.
3. Leaving the bobbin case in the rotary hook, pull off some bobbin thread, and drape it over the movable knife as shown in Figure 4-15.

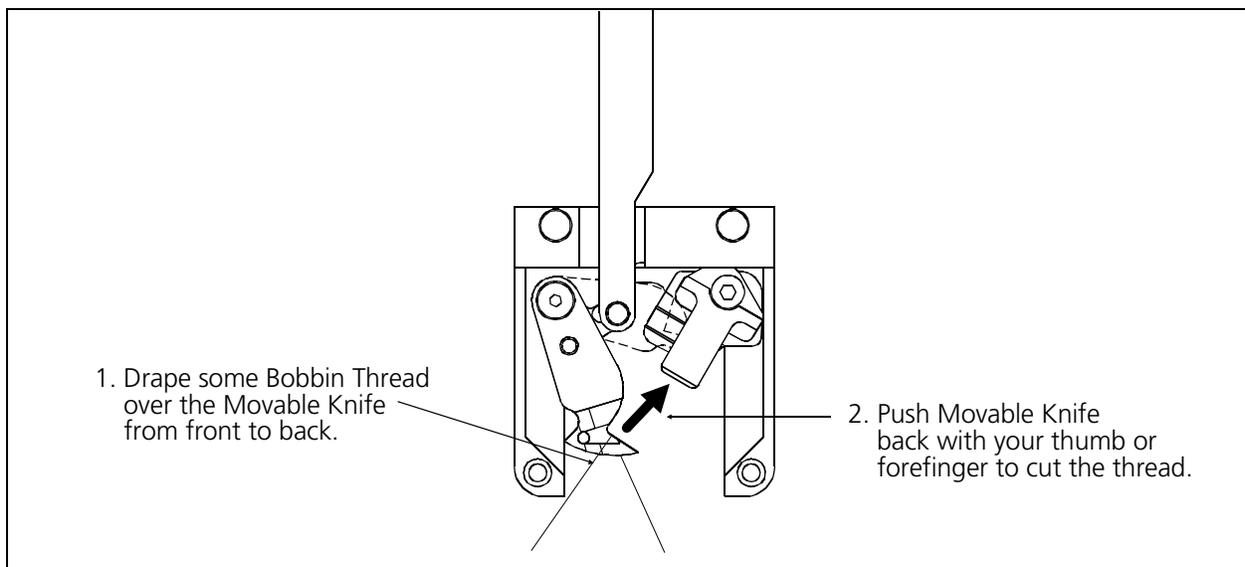


Figure 4 - 15 Checking The Cut

4. With the bobbin thread draped over the movable knife from back to front, gently hold the thread so there is some slack and then push the movable knife back until the thread is cut. This cut should be clean, and should not be frayed.

If the thread is frayed you may need to replace the adjustable fixed knife, adjust the adjustable fixed knife, replace the movable knife, or any combination of these items.

5. The "top" thread should be loose and fall away, because it has no support. The "bottom" thread should be held in place under the movable knife by the under thread presser.

6. If the under thread presser does not provide the required action, replace it and check using steps 2 to 4 again.
7. After you are satisfied with the under thread presser action, re-attach the connecting link (see Figure 4-12).

Adjustable Fixed Knife Adjustment

After replacing the adjustable fixed knife (or movable knife) per the instructions earlier in this chapter it will need to be properly adjusted. Refer to following steps in performing this adjustment.

Ink Wipeoff Test

1. With the machine turned off, disconnect the connecting link from the movable knife drive arm by lifting it from the front pin (see Figure 4-12).
2. Pull the movable knife forward with a small hex wrench hooked behind it.
3. With a black marking pen, mark the areas of the movable knife as shown in the left illustration of Figure 4-16.

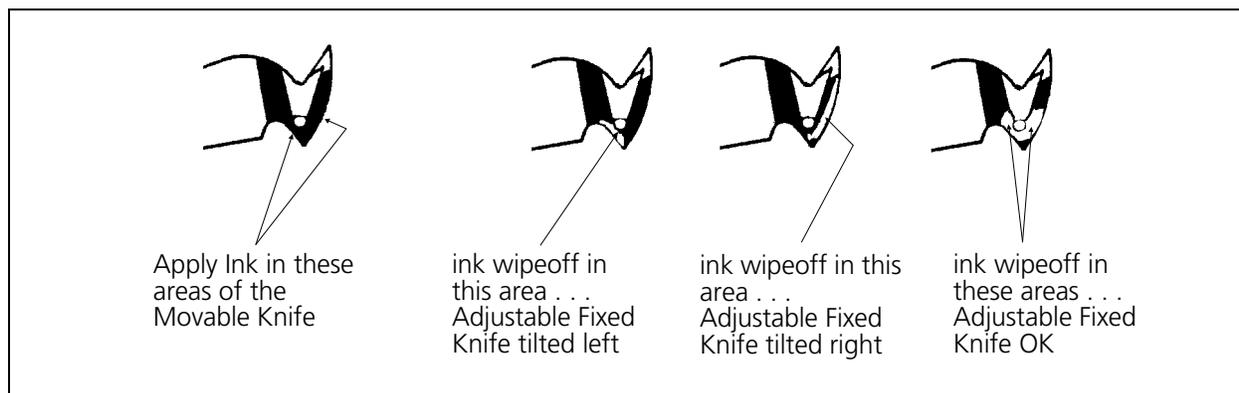


Figure 4 - 16 Ink Wipeoff Test

4. Push the movable knife back under the adjustable fixed knife to simulate the thread cutting action.
5. Again pull the knife forward and inspect where the marking pen ink has been wiped off. Refer to the remaining three illustrations in Figure 4-16 to determine if the adjustable fixed knife needs adjustment.

Knife Adjustment

After performing the ink wipeoff test and determining that adjustment to the adjustable fixed knife is required, follow these steps to perform the knife adjustment.

6. Refer to Figure 4-17 and locate the two small set screws in the bottom of the needle plate bracket directly under the under thread presser.

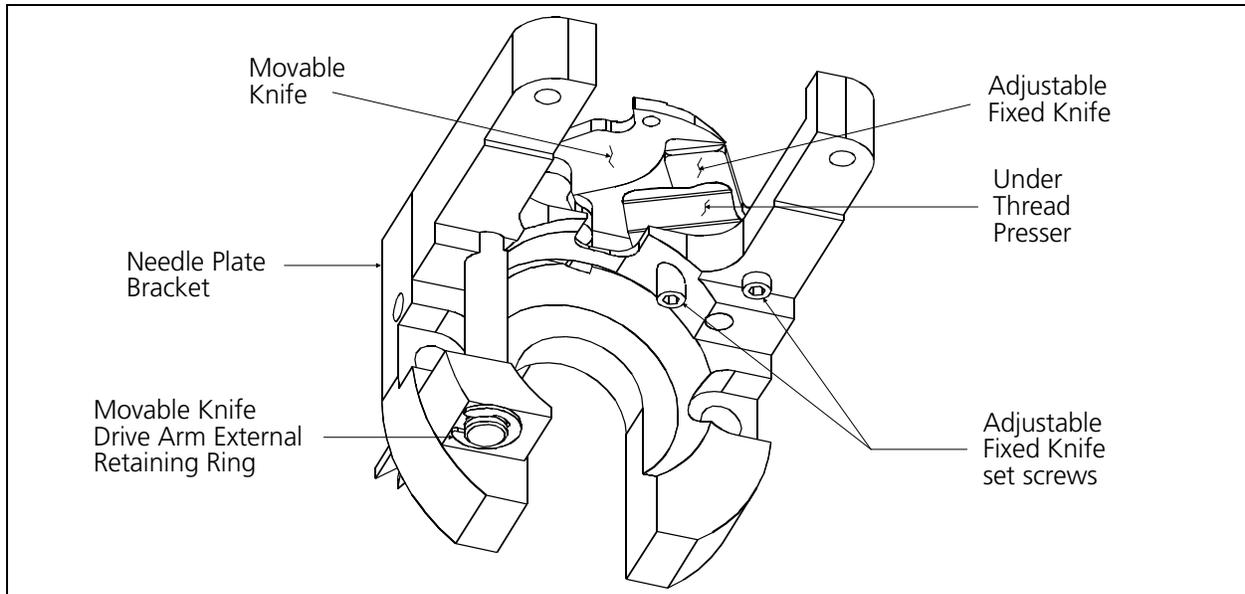


Figure 4 - 17 Underside View of Trimmer Parts

These two set screws together with the larger socket head cap screw that secures the adjustable fixed knife and under thread presser at the top of the needle plate bracket (see Figure 4-10) provide for the knife adjustment.

7. Refer to the 'Ink Wipeoff Test' and determine what direction the adjustable fixed knife is tilted.
- 8a. If the ink wipeoff test indicates the adjustable fixed knife is tilted left, slightly loosen the top socket head cap screw, then tighten the left under side set screw.
- 8b. If the ink wipeoff test indicates the adjustable fixed knife is tilted right, slightly loosen the top socket head cap screw, then tighten the right under side set screw.
9. After either of the adjustments in step 8, perform the ink wipeoff test again to check the position of the adjustable fixed knife.
10. Repeat the previous steps until the ink wipeoff test shows equal ink removal on both sides of the movable knife and the force to move the movable knife is $1/2 \text{ +/- } 1/4 \text{ lbs}$ ($200\text{g} \text{ +/- } 100\text{g}$) of pull.

11. Check the tightness of the top socket head cap screw and recheck the adjustment by performing the ink wipeoff test once again.

Cut Threads

When you are satisfied with the ink wipeoff test, you may check the thread cutting ability by performing actual thread cuts at several locations across the cutting range of the knives. To do this refer to the following steps:

12. With the machine turned off, disconnect the connecting link from the movable knife drive arm by lifting it from the front pin (see Figure 4-12).
13. Pull the movable knife forward with a small hex wrench hooked behind it.
14. Obtain a piece of upper thread from the tensioner assembly and drape it over the movable knife (see Figure 4-15).
15. With the thread draped over the movable knife from back to front, gently hold the thread so there is some slack and then push the knife back until the thread is cut. This cut should be clean, and should not be frayed.
16. Repeat the previous step with the thread positioned at different locations across cutting surface.
17. If the thread is frayed at any location you may need to replace the adjustable fixed knife, movable knife, or both. You must readjust the adjustable fixed knife.

Movable Knife

Home Position

The movable knife home position is where the knife stops under the adjustable fixed knife after completing a trim cycle. This position is shown in Figure 4-18. Notice that when properly positioned, the part of the rear tip of the movable knife that slopes away from the top surface is showing in front of the leading edge of the adjustable fixed knife.

To check that the movable knife is at home position, perform these steps:

1. If the front bed plate is not installed, install it now.
2. Turn the machine power ON.

WARNING! Keep clear of the moving parts that are exposed during the operation of the next steps.

3. Set "home" when prompted to set home on the display.
4. Go to the TRIM MENU and perform a TRIM IMMEDIATE command.

5. The movable knife should be located under the adjustable fixed knife, positioned as shown in Figure 4-18. If the sloped rear tip of the movable knife is not showing in front of the leading edge of the adjustable fixed knife, the "home" position needs to be adjusted. DO NOT Adjust if the knife position looks like Figure 4-18.

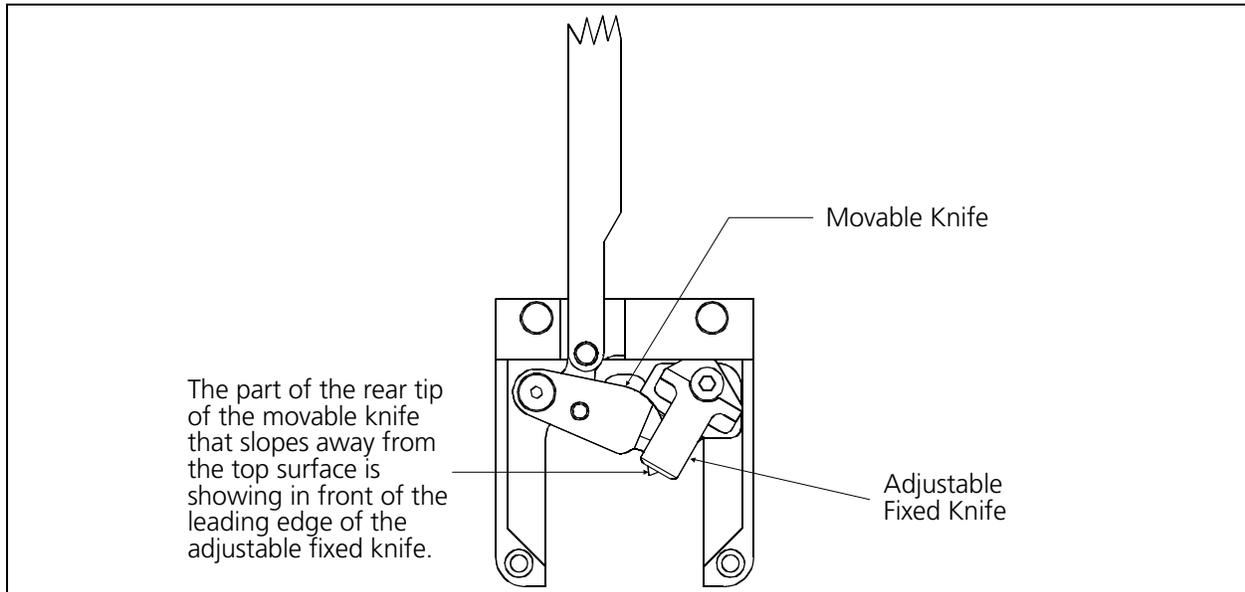


Figure 4 - 18 Movable Knife Home Position

6. To adjust movable knife home position, loosen the two screws at the connecting link drive block in the camming section of the trimmer system (see Figure 4-19).
7. By moving the movable knife, position it to the described home position, allowing the connecting link block to reposition on the camming frame.
8. Snug the two connecting link block screws.

WARNING! Keep clear of the moving parts that are exposed during the operation of the next step(s).

9. Perform a TRIM IMMEDIATE command again and check for the correct home position.
10. Repeat steps 7, 8, and 9 until the movable knife home position is correct.
11. Tighten the two connecting link block screws when the home position is adjusted correctly.

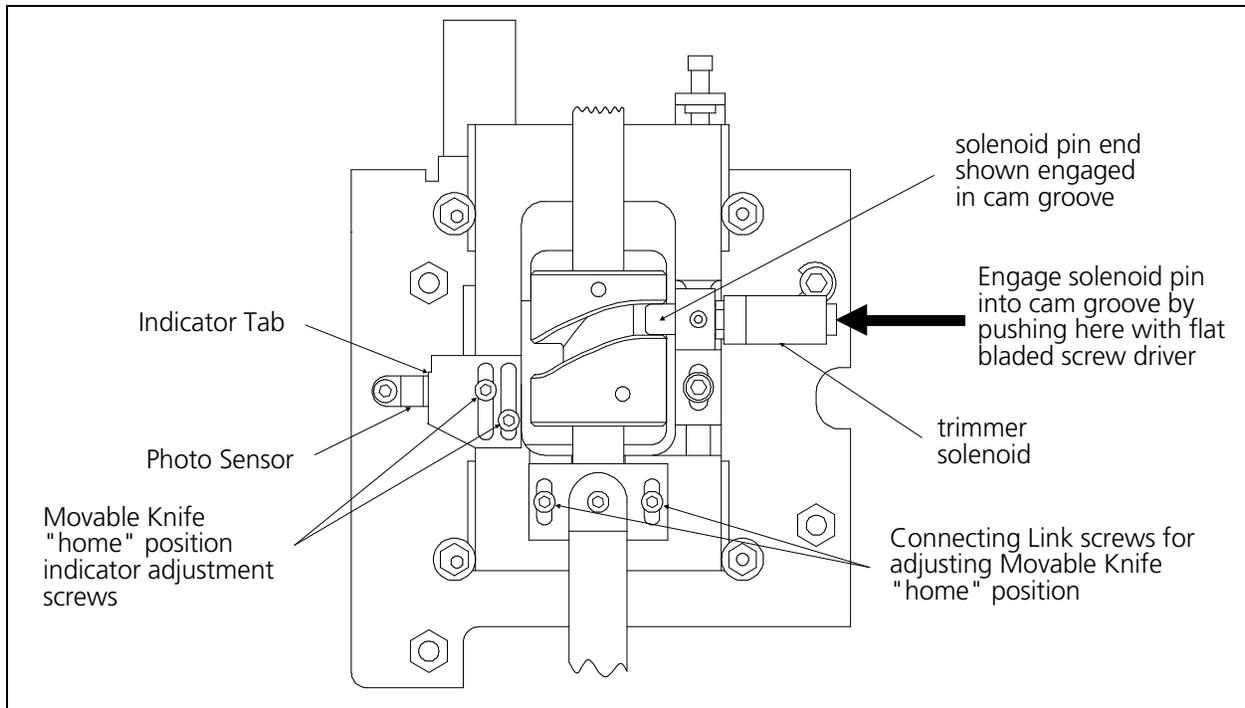


Figure 4 - 19

Home Position Sensor

If the movable knife is mechanically adjusted correctly for home position, but the "Trimmer Not Home" message comes ON, the home position sensor needs adjustment. This adjustment is to move the indicator tab (attached near the cam) to the middle of the photo sensor when the movable knife is at the home position (see Figures 4-18 and 4-19). To make the adjustment:

1. Loosen the two socket head cap screws that hold the indicator.
2. Move the indicator forward or backward the required amount.
3. Retighten the screws.

WARNING! Keep clear of the moving parts that are exposed during the operation of the next step(s).

4. Repeat the TRIM IMMEDIATE cycle and recheck for the message. Repeat the adjustment as needed until the message no longer comes on after the TRIM IMMEDIATE cycle.

Checking Select Position

After adjusting the movable knife home position, you must check for the movable knife "select" position. If adjustment is required refer to Select Position Adjustment procedure immediately after this checking procedure.

1. Replace the standard needle plate on the embroidery head arm (See Figure 4-13). Do not install the raised needle plate used with cap frames.
2. Turn the machine power ON.
3. Go to the HEAD TIMING MENU and press  to turn HEAD TIMING ON.
4. Press the  and  keys simultaneously to go into the "Z pos" mode. On the display you will see: 'Z pos' followed with a numerical indication in degrees.

WARNING! Potential danger exists any time you perform service around a rotating belt. Please use caution during the following steps.

5. Remove the rear bed cover of the embroidery head to expose the trimmer camming area as seen in Figure 4-19.
6. With the 5 mm hex wrench at the right end of the Z drive shaft, slowly rotate clockwise until the number of degrees indicated in the display reads between 280 and 300.
7. Refer to Figure 4-19 and manually engage the trimmer solenoid pin into the trimmer cam groove by pushing the protruded end of the pin inward with a flat bladed screw driver.
8. Hold the trimmer solenoid pin in as you continue to apply clockwise rotation to the Z drive shaft. Rotate the shaft at least one full revolution. Slowly rotate until the entire camming apparatus begins to move forward. Typically, this will read somewhere in the range of 301 to 303 on the numerical display.
9. Before rotating the Z drive shaft any further, place the Melco select position fixture (p/n 995372-01) into the needle plate hole (see Figure 4-20). If you do not have the fixture, you may use one of several substitute items (such as a 1.5 mm bent hex wrench or the butt of a needle).
10. Now continue to slowly rotate the Z drive shaft clockwise until the movable knife just contacts the select position fixture or substitute item (see Figure 4-20).
11. Stop rotation and allow the preload of the movable knife against the fixture to relax.

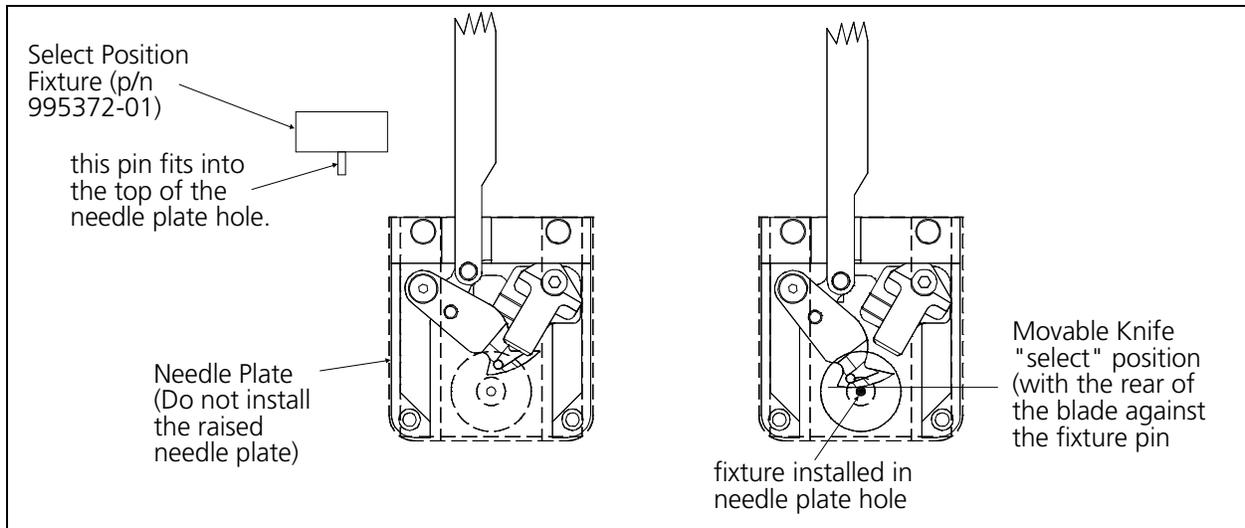


Figure 4 - 20

12. Check the reading of the display to be between 311 and 313 degrees.
13. If the movable knife does not contact the fixture between 311 and 313, or contacts too soon, the select position adjustment may be required.

Select Position Adjustment

Note: This procedure requires 0 to 250 in/lbs torque wrench when making adjustments to the "select" position.

Note: After performing any adjustments to the pulley location in the following steps, you MUST check and most likely need to adjust rotary hook timing. Refer to the hook timing information in this manual.

1. Position the trimmer system to 312 degrees using the previous procedure for checking select position.
2. Press the  key. This will keep the Z shaft from rotating from the 312 position.

3. Loosen the large socket head screw in the locking collar for the Top Bobbin Drive Pulley (see Figure 4-21) and rotate the belt and pulley slightly until the movable knife just contacts the select position fixture (see Figure 4-20).

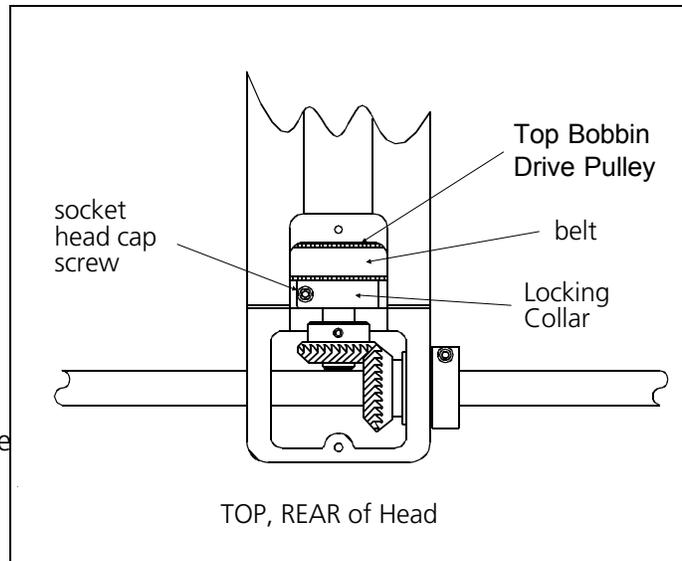


Figure 4 - 21

4. Stop rotating and hold the belt and pulley in place while you tighten the large socket head screw in locking collar to 45 inch lbs (6.22 km) of torque.
5. Remove the select position fixture.
6. Press the  key to rotate the head to the head up position.
7. Perform the select position checking procedure again, to check that the movable knife now just contacts the select position fixture in the needle plate hole between 311 and 313 degrees.
8. Insure all areas loosened to adjust for select position are properly retightened before continuing.
9. Refer to the hook timing information in this manual. for the procedure to reset hook timing.

Picker Finger Position

If the cap frame option is not part of your system, you may refer to the following procedure to center the picker fingers, should it become necessary.

If your EMT 10/4T has the cap frame option, you must give centering priority to the cap frame driver. When the cap frame driver is centered properly, the picker fingers will automatically come into proper center alignment. This is because the dovetail clamp for the cap frame driver is fixed to the same bracket as the picker fingers.

1. Loosen the two picker/dovetail bracket screws on the cylinder arm shown in Figure 4-22).

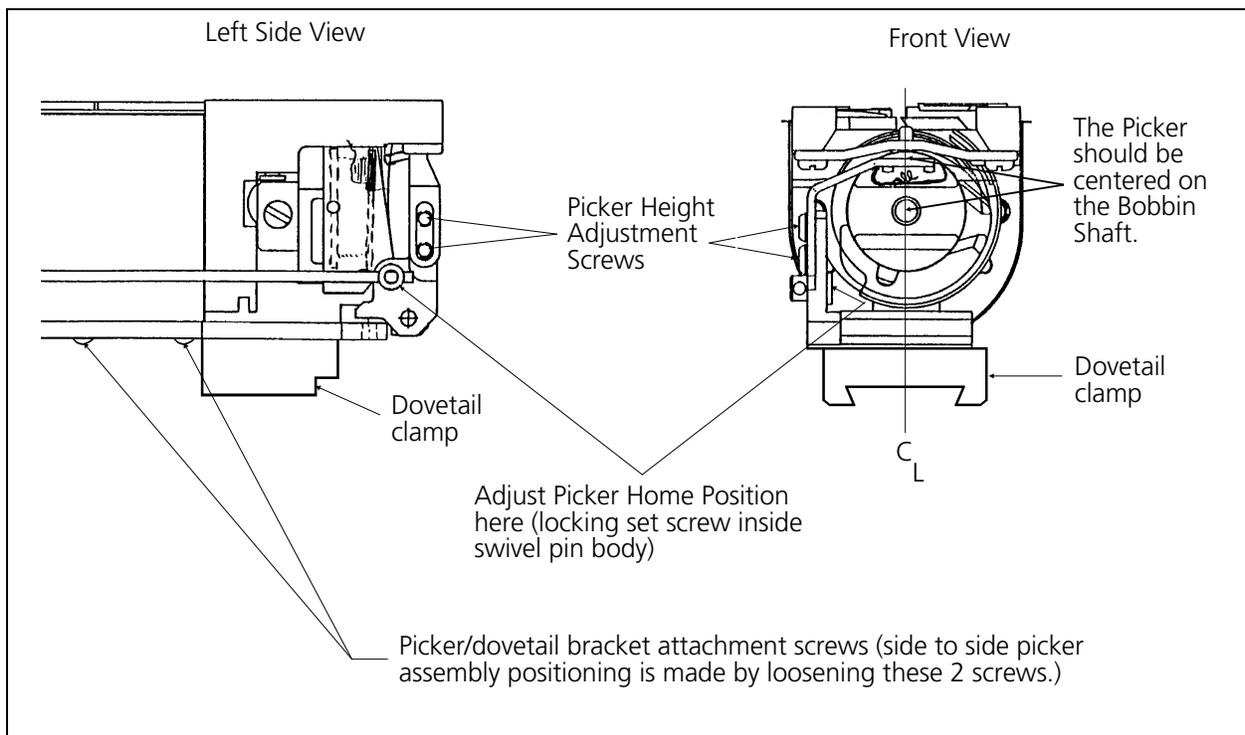


Figure 4 - 22

- 2a. Move the bracket left or right until the picker fingers are centered on the needle shaft.

OR

- 2b. With both trimmers and cap frame options on the machine, move the bracket to center the installed cap frame driver on the embroidery head arm.

3. Retighten the screws.

Picker Home Position

Note: This procedure requires the use of a special service tool: the Melco picker set fixture (p/n 995339-01).

1. Install the picker set fixture (shown in Figure 4-23) to set picker home position.

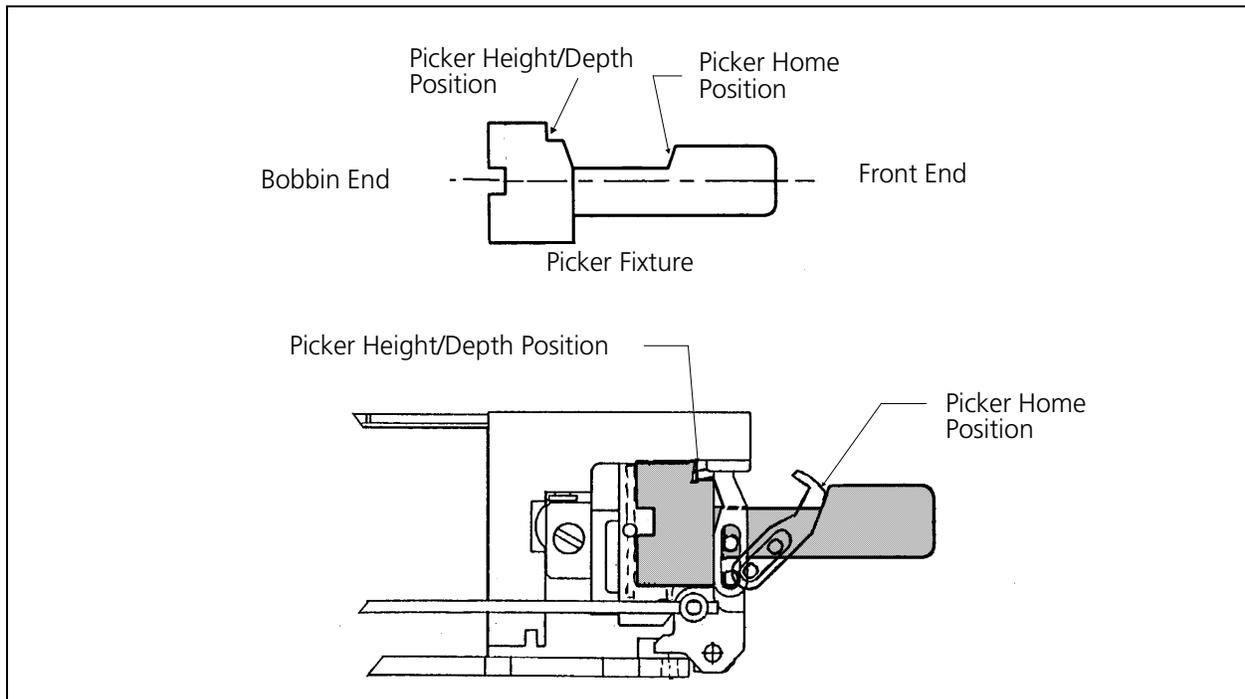


Figure 2 - 23

2. Loosen the set screw inside the swivel pin body shown in Figure 4-22.
3. Move the picker until it rests in the fixture at the picker home position as shown in Figure 4-23.
4. Retighten the set screw.

Picker Height/Depth Position

Note: This procedure requires the use of a special service tool: the Melco picker set fixture (p/n 995339-01).

1. To adjust the picker height/depth position, manually push the picker into place as shown in Figure 4-23.
2. Loosen the 2 screws on the left side of the picker as shown in Figure 4-22.
3. Position the height/depth of the picker against the fixture location and retighten the 2 screws.

Under Thread Control (UTC) Replacement

To remove the UTC assembly refer to the steps that follow:

1. With the machine in the head up position, turn the power switch OFF.
2. Remove the table top insert from the machine to access the Hook and UTC area.
3. Remove the needle plate, front bed cover, and right side rotary hook cover to access the UTC assembly including the sensor cable and connection to the harnessing in the bed.
4. Disconnect the sensor cable from the harness inside the bed and remove the cable from around the needle plate support bracket (see Figure 4-24).

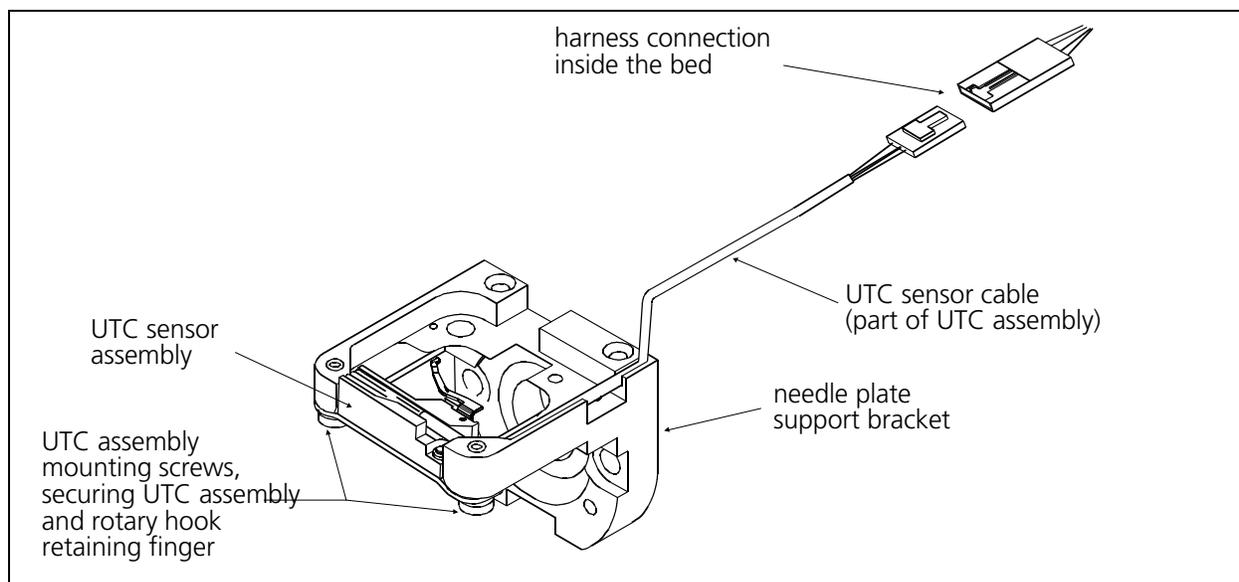


Figure 24

5. Remove the 2 UTC assembly mounting screws that hold the UTC assembly and rotary hook retaining finger to the bottom of the needle plate support bracket (see Figure 4-24).

To attach the UTC assembly, refer to the steps that follow.

6. Connect the sensor cable from the new UTC assembly to the harness inside the bed as indicated in Figure 4-24.
7. Rotate the rotary hook inner basket to position the notch to the top so the retaining finger tab will fit into the notch properly when the UTC assembly is attached.

- Place the UTC assembly under the needle plate support bracket as shown in Figure 4-25 and install the 2 UTC assembly mounting screws.

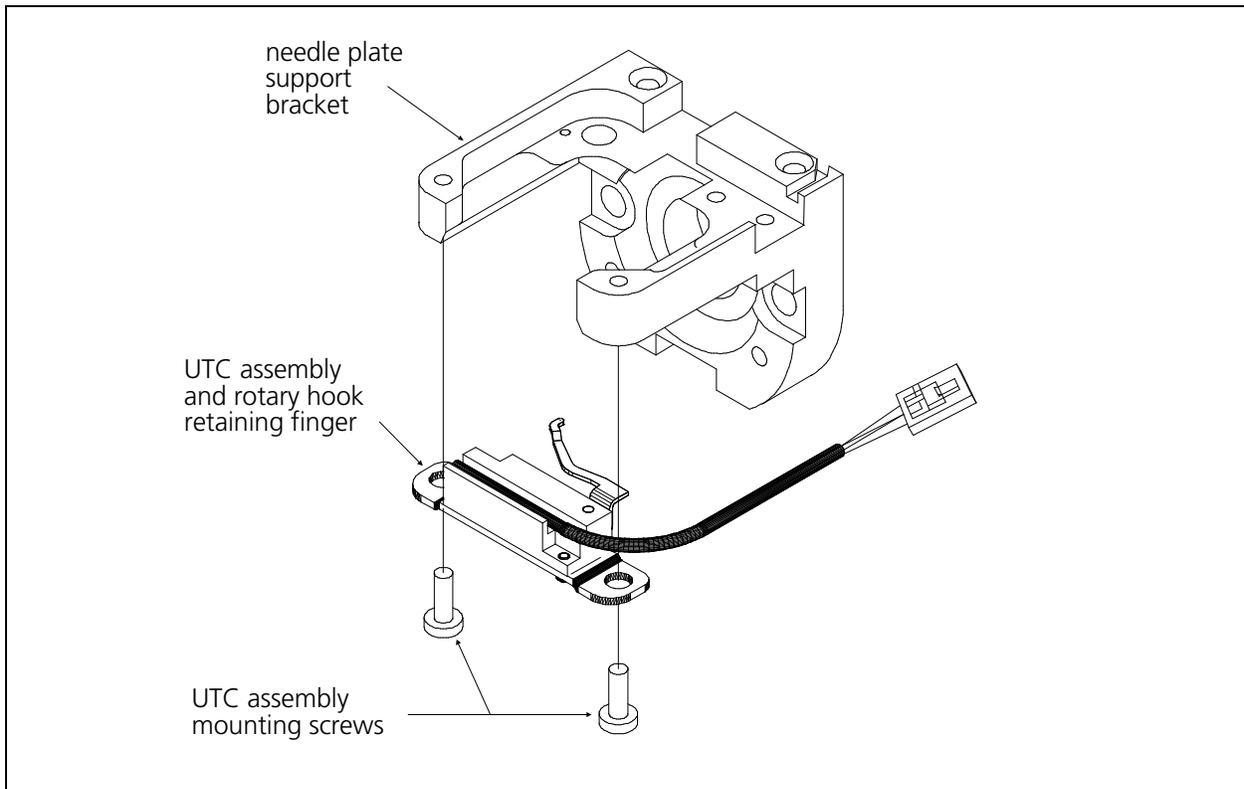


Figure 25

- Perform the UTC adjustments.

UTC Adjustments

It is very important that you follow these instructions any time the rotary hook or UTC is loosened or moved. Please follow the instructions in the order they occur.

Note: The procedures in this section require the following special tools:
 1) a small straight blade screw driver with a thin blade, and
 2) the Melco UTC combination gauge part number 009027-01. (This tool is located in the Melco tool kit that came with the machine.)

Rotary Hook Retaining Finger Positioning

1. Attach the UTC assembly as described earlier in this procedure.
2. With the machine ON and ready for operation, press   to switch to the Service/Maintenance Menu. Then press  at the peripheral keyboard until the LCD displays HEAD TIMING MENU.
3. Press  and the LCD displays HEAD TIMING ON.
4. Press   keys. The head rotates to the "Head Up" position and the LCD displays GO TO HEADUP 110.0.
5. Hold down  and press  (the display will read NEEDLE DEPTH).
6. Slightly loosen the 2 UTC assembly mounting screws from under the needle plate support bracket.
7. Place the finger of the UTC combination gauge (see Figure 4-27 for diagram of the gauge) between the retaining finger tab and the rotary hook inner basket notch (see Figure 4-26).

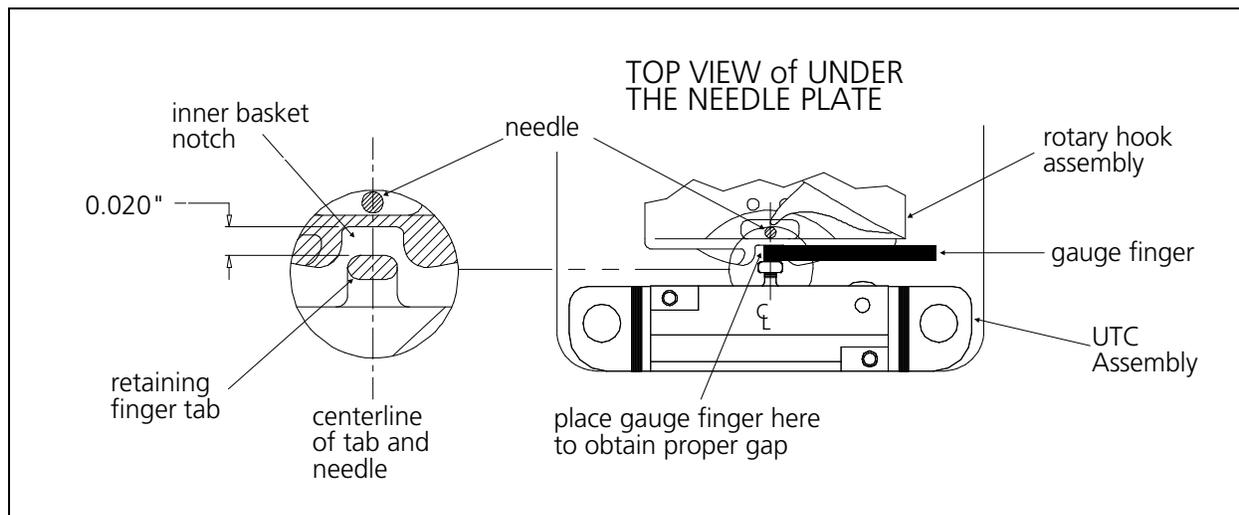


Figure 26

8. Position the UTC assembly until the gap between the retaining finger tab and the rotary hook inner basket notch is set to the thickness of the gauge finger. The gap is 0.020 inches as shown in Figure 4-26.
9. Additionally, align the center of the retaining finger tab to the center of the needle as indicated in Figure 4-26.
10. Tighten the UTC assembly mounting screws.
11. Place the UTC Combination Gauge on top of the needle plate support bracket as shown in Figure 4-27 and check that the UTC detection arm does not touch the bottom surface of the gauge which represents the bottom of the needle plate when it is installed.

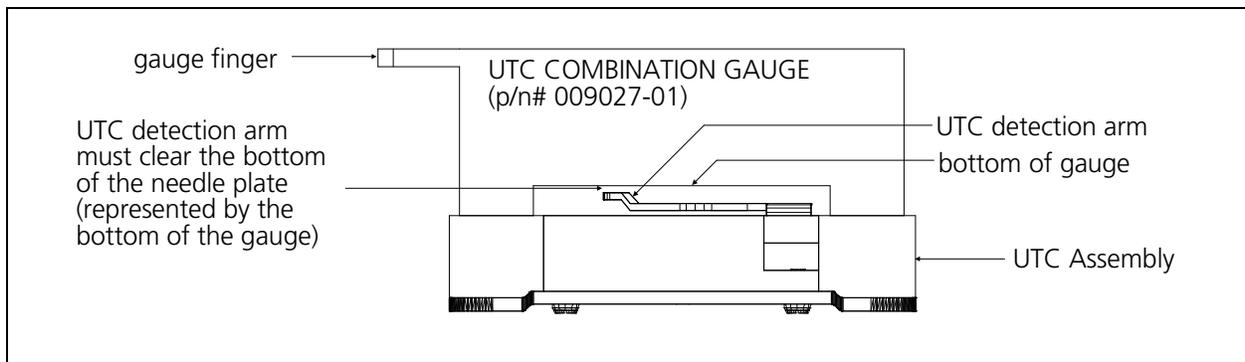


Figure 27

12. If the arm touches the gauge, carefully reshape the arm slightly until it clears.
13. Refer to Figure 4-28 and lift the connecting link off of the movable knife assembly.

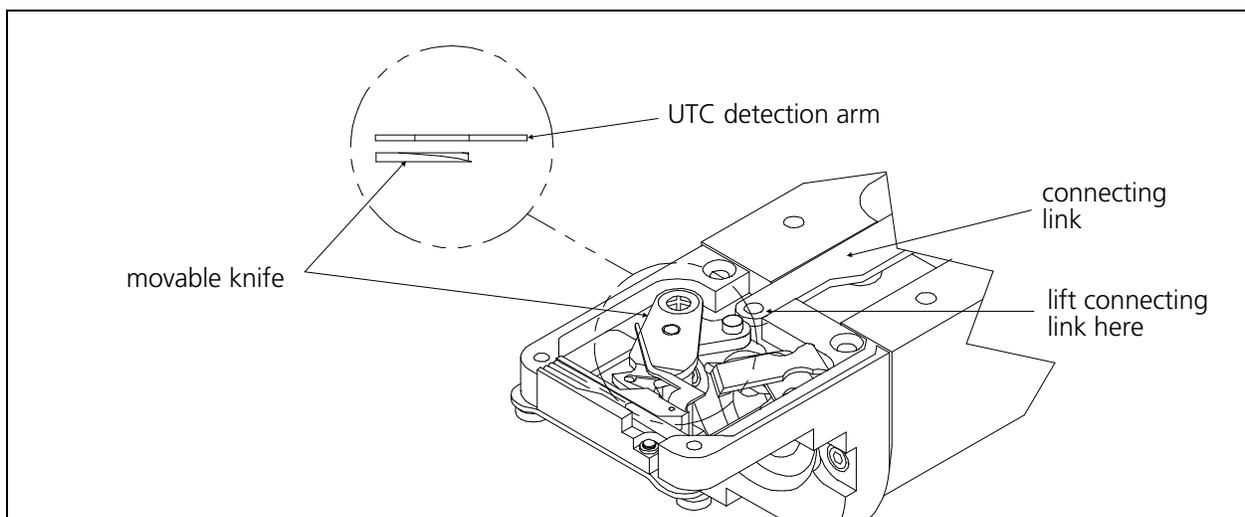


Figure 28

14. Check that the movable knife clears the UTC detection arm by physically moving the knife under the UTC detection arm and back.
15. If the knife touches the arm, reshape the arm slightly until it clears then repeat steps 8 through 11.
16. Re-attach the connecting link to the pin on the movable knife assembly.

Caution! When installing the covers, be sure not to pinch the UTC Assembly wires!

17. Re-attach the right side rotary hook cover, the needle plate, and the front bed cover.

Sew Test

We now must actually embroider onto properly hooped material to prove the adjustment is proper. A special design named UTCTEST comes on a disk with your machine. Load the design into your EDS software or disk drive and send it to the sewing peripheral.

The primary purpose of the UTC is to signal when the bobbin thread runs out or breaks. The UTC has a mechanical arm that is bumped by the bobbin thread during every stitch. When the sensor is not bumped for the number of consecutive stitches that are set as "Bobbin Count," the machine stops, backs up, and beeps.

If the UTC is too close to the needle, it may not react reliably in detecting the absence of bobbin thread. If the UTC is too far away from the needle, it may falsely indicate that the machine is out of bobbin thread when it indeed has bobbin thread.

Additionally, if the bobbin tension is set too loose, it may also falsely indicate that the machine is out of bobbin thread when it has bobbin thread.

Preliminary Checks

The following must be checked before performing the embroidering:

1. Check that the bobbin tension is within the proper adjustment specifications as described in the operation manual.
2. Verify that the BOB. COUNT in the BOBBIN MENU is set to 5.

Perform The Test

During the embroidering:

A) Check that the UTC detects an absence of bobbin thread when you run out of bobbin thread and displays the CHECK BOBBIN message.

1. Test for this by wrapping a foot or so of thread around an empty bobbin.

2. Embroider the test design until the thread is completely used.
3. Repeat steps 1 and 2 until the bobbin runs out at least once in both directions of diagonal stitching in the test design.
4. If the sensor does not detect when the bobbin runs out of thread, slightly loosen the UTC sensor body at the screws shown in Figure 4-29, and at the slotted screw hole (left side) move the sensor a very small amount away from the needle. Re-tighten the screws.

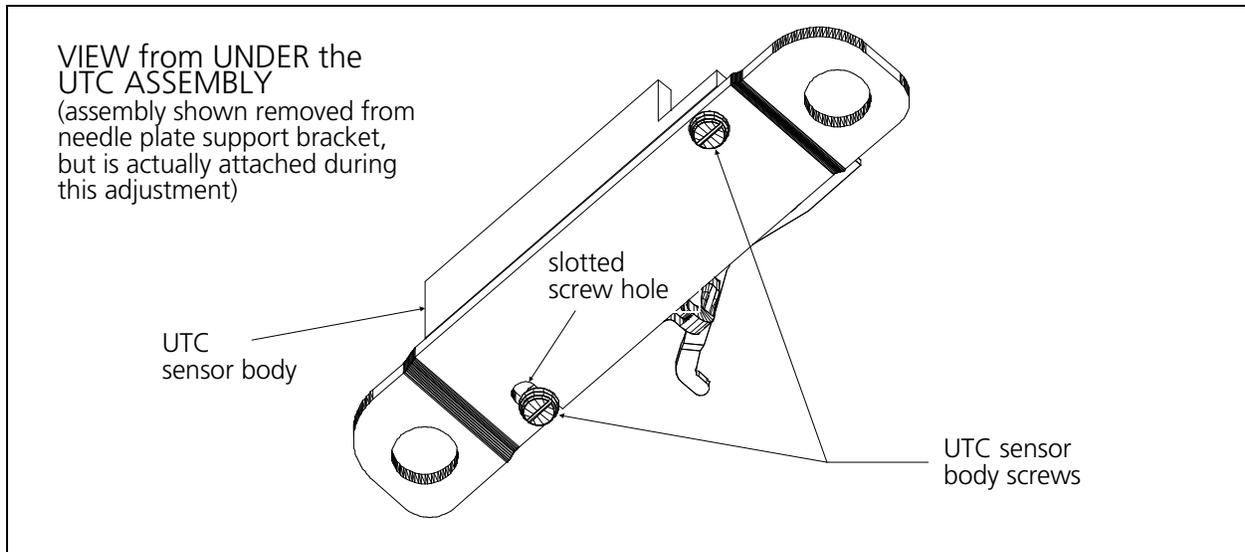


Figure 29

- B) Check that the UTC does not falsely signal the CHECK BOBBIN message when thread is still on the bobbin.
1. Test for this by simply sewing with the test design. For reliable results, embroider the design for at least 5 minutes, or about 4000 stitches at 750 stitches per minute.
 2. If you get false CHECK BOBBIN messages, slightly loosen the UTC sensor body at the screws shown in Figure 4-29, and at the slotted screw hole (left side) move the sensor a very small amount closer to the needle. Re-tighten the screws.

5. Accessory Adjustments

Wide Angle Cap Frame

The Wide Angle Cap Frame (also referred to as "WACF") has several adjustable components. Refer to this section for instructions on how to properly adjust these components.

Cap Supports

If you are experiencing registration or sew quality problems in parts of your design, you may need to adjust the cap supports (Figure 5-1).

- For registration or sew quality problems in the lower part of a design (nearest the brim) move the cap supports toward the driver.
- For registration or sew quality problems in the upper part of a design, move the cap supports away from the driver.

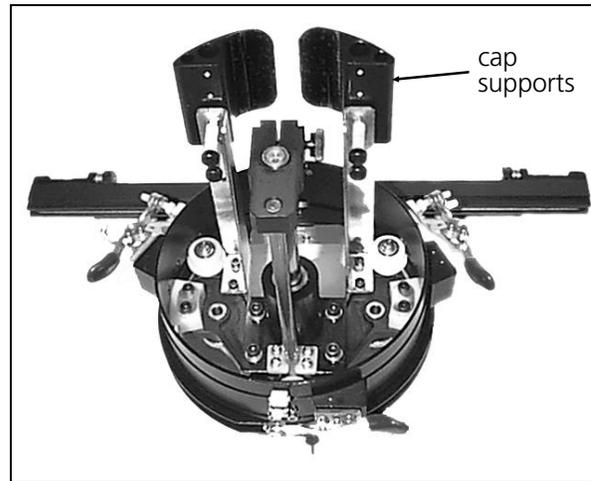


Figure 5 - 1

To move the cap supports, follow these instructions:

1. Loosen the 4 thumb screws (2 on each side) holding the cap supports (Figure 5-2).
2. Slide the cap supports in or out; make sure you move both sides equally. Use the ruler marks on the cap supports to verify this.
3. Tighten the 4 thumb screws.

Use the scales on the cap support arms to help you properly align the cap supports.

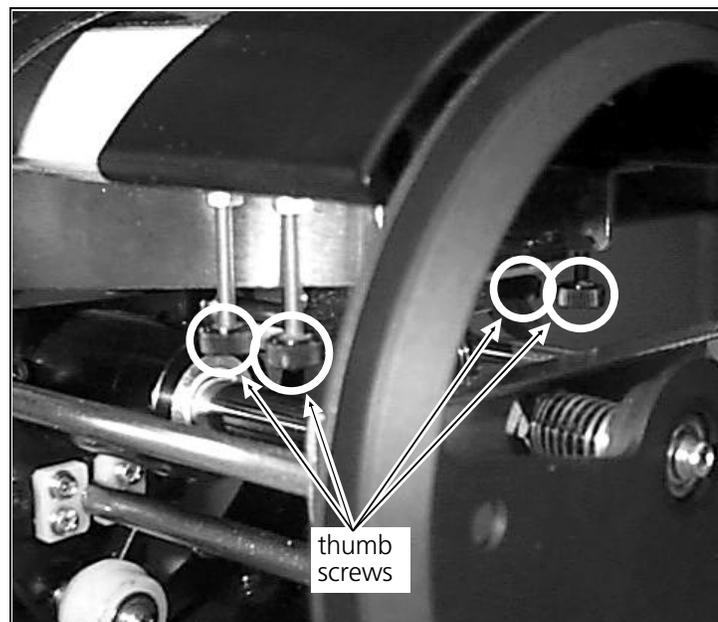


Figure 5 - 2

Cap Support Pads

Check the pads under the cap supports regularly (see Figure 5-3). When pads become worn, they must be replaced. Follow these instructions to replace the pads:

1. Remove the old pads.
2. Clean the surface with a solvent such as isopropyl alcohol.
3. Remove the paper from the new pads (provided in the operator kit), exposing the adhesive surface.
4. Attach the new pads to the cap supports, and trim the new pads even with the supports.

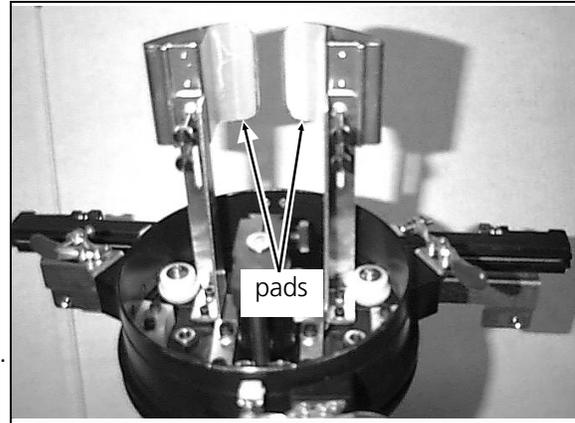


Figure 5 - 3

Driver Bar Cable

The driver bar cable, when tensioned properly, moves the driver precise amounts during embroidery. If the cable tension falls out of adjustment, embroidery quality may suffer.

To check the cable tension, look at the spring coils holding the cable. The coils should be closed (as shown in Figure 5-4).

If the coils are open (Figure 5-5), tighten the cable by pulling on the cable slightly with your fingers as you tighten the thumb screw.

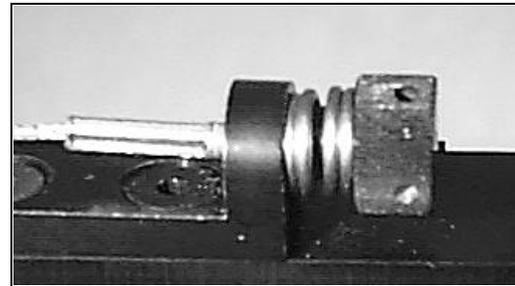


Figure 5 - 4

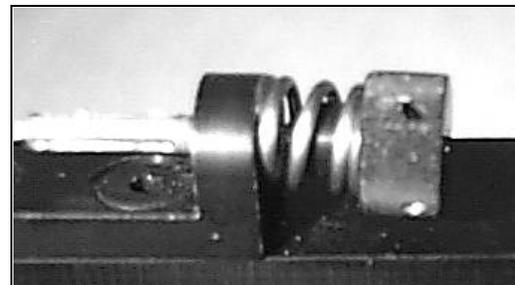


Figure 5 - 5

Caution! Do not over-compress the coils or you may cause excessive wear to the cable terminal. Figure 5-6 shows an over-compressed coil.

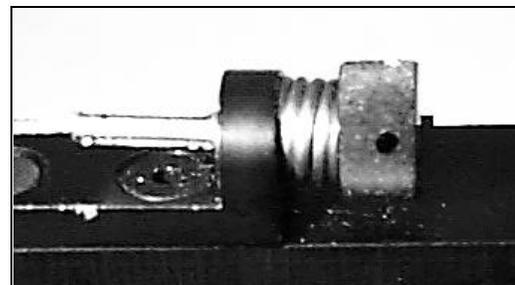


Figure 5 - 6

Spindles On The Clamps

The clamps form a positive lock on the frame when it is installed on the driver. The clamps press the spindles against the rollers on the driver to form this lock. If the frame can move when it is installed on the driver, you should adjust the spindles.

To adjust the spindle, follow these steps:

1. Loosen the upper nut on the spindle slightly (see Figure 5-7).
2. Move the spindle down until the upper nut contacts the spindle arm.
3. Tighten the lower nut on the spindle.

Caution! Do not over-tighten the nut or you may damage the spindle.

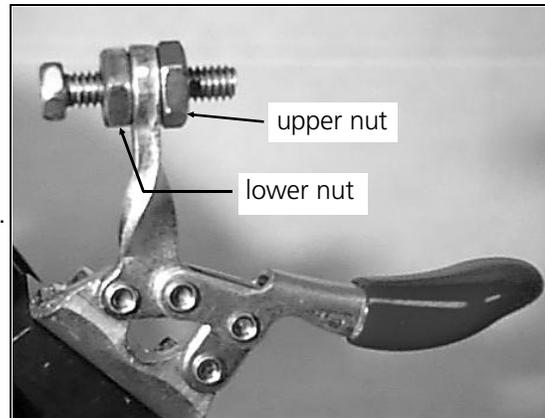


Figure 5 - 7

4. Close the clamp. You should hear an audible "Click" when the clamp is closed. You should not need excessive force to close the clamp. If you NEED excessive force to close the clamp, you have moved the spindle too far. Loosen the lower nut and reverse the process.
5. With the clamp closed, try to move the spindle up and down. If the spindle moves, go to step 1 and repeat the procedure.

Clip Posts

The clip posts are where the clips are attached when hooping a cap. The posts are extendible, and should be extended fully into the crown of a cap. Unless you switch between high- and low-crowned caps often, you will not need to make this adjustment regularly.

To adjust the posts, follow these steps:

1. Use the 2mm hex wrench to loosen the 2 set screws on each post (Figure 5-8).
2. Slide the outer cover of the post out for high-crowned caps and in for low-crowned caps.
3. Tighten the 2 set screws on each post.

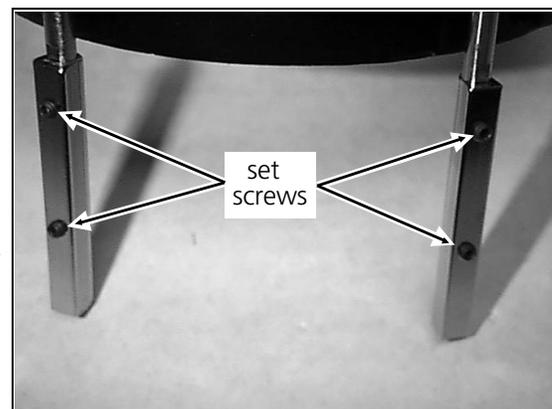


Figure 5 - 8

Cap Frame

The strap on the cap frame may need to be adjusted for different cap materials. The factory adjustment will suffice for most cap types, but if you need to adjust it, follow these steps:

1. Close the cap frame but do not fasten the latch. Make sure the strap is in the groove on the locator (see Figure 5-9).
2. Loosen the 2 wing nuts on the strap (Figure 5-10).
3. Slide the frame (loosening or tightening its grip on the cap) to its new position.

Caution! Do not overtighten the strap on the cap frame. If the strap is too tight (and the clip is difficult to close) you may damage the frame.

4. Retighten the 2 wing nuts.

Note: For normal to heavy-duty cap materials, the latch on the end of the strap is attached at the outer-most two screw holes (see Figure 5-11).

With very thin cap material you may not be able to get the strap tight enough with the wing nut adjustments described above. To obtain a tighter strap with very thin cap material, remove the 2 screws shown in Figure 5-11. Move the latch to the inner-most screw holes as shown in Figure 5-12 and secure the latch with the same screws and nuts.

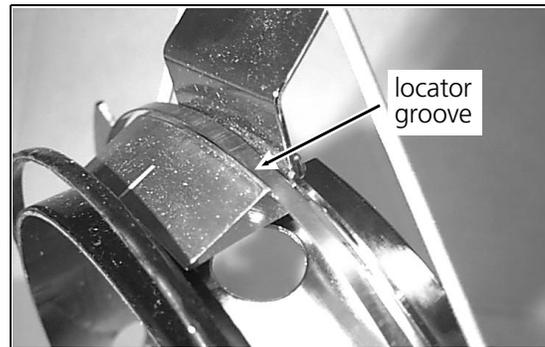


Figure 5 - 9

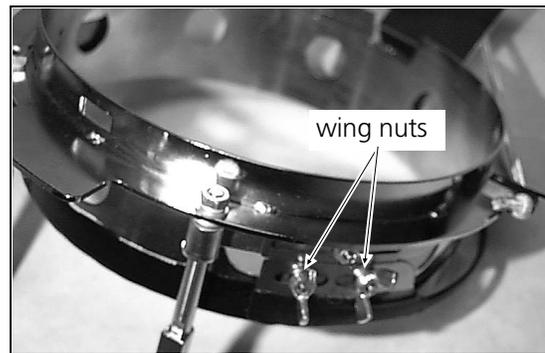


Figure 5 - 10

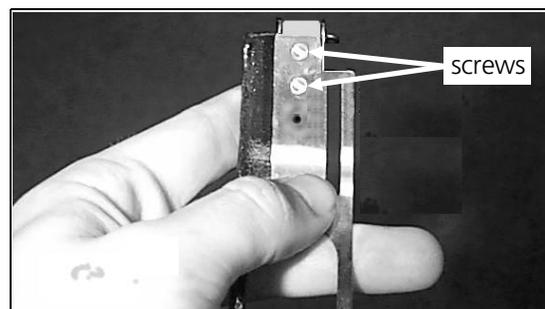


Figure 5 - 11

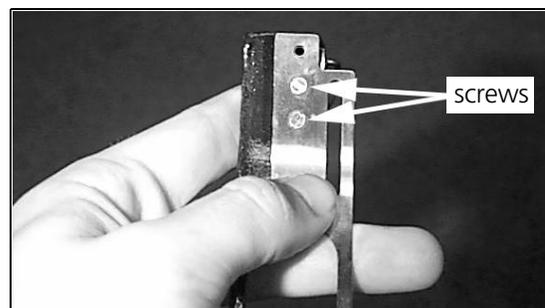


Figure 5 - 12

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