

Gammill®

MACHINE MANUAL

GAMMILL.COM



Gammill, Inc.
Machine Manual

Version 1.0
April 2015

Gammill, Inc.
1452 W. Gibson
West Plains MO 65775
Website: <http://www.gammill.com>

Copyright © 2015 by Gammill, Inc.

Reprinting or copying this manual either whole or in part is strictly prohibited without written permission from Gammill, Inc. of West Plains, Missouri.

Table of Contents

1. QUILTING SYSTEM FEATURES	1-1
SEWING HEAD FEATURES	1-1
QUILTING STAND FEATURES.....	1-6
SELECTING A LOCATION FOR YOUR QUILTING SYSTEM	1-8
Length.....	1-8
Width.....	1-8
Floor.....	1-8
Power Requirements	1-8
2. THE QUILTING STAND	2-1
FABRIC LEADERS	2-1
HAND WHEELS.....	2-1
PICK-UP ROLLER LIFTER	2-1
CLEANING THE CARRIAGE, TRACKS AND TABLE	2-1
SWIVEL CASTERS.....	2-2
ADJUSTING STAND HEIGHT	2-2
3. SUPPLIES	3-1
SPARE PARTS.....	3-1
BATTING	3-1
PINS.....	3-1
SCISSORS	3-2
MEASURING TAPE	3-2
MACHINE OIL	3-2
4. LOADING THE QUILT	4-1
PIECED TOP	4-1
BACKING FABRIC.....	4-2
BATTING	4-2
DETERMINE LOADING DIRECTION	4-2
PINNING VS. FLOATING THE TOP	4-3
PREPARING THE LAYERS FOR QUILTING	4-5
ADJUSTING THE ROLLERS.....	4-5
CLAMPING THE SIDES.....	4-5
STABILIZING THE QUILT	4-6
5. THREAD.....	5-1
CHOOSING THREAD – TYPES OF THREAD.	5-1
Thread Weight and/or Thickness.....	5-1
Cotton	5-2
Polyester	5-2
Poly/Cotton.....	5-2
Monofilament.....	5-2
Decorative	5-3

CHOOSING THREAD COLOR	5-3
6. THREADING THE MACHINE	6-1
Using Cone Thread.....	6-1
Using Spool Thread	6-2
Thread Guides and Thread Posts.....	6-3
Intermittent Tension	6-3
Thread Break Sensor.....	6-3
Rotary Checkspring Assembly.....	6-3
NEEDLES.....	6-3
Parts of a Needle.....	6-4
Installation	6-4
BUILT-ON BOBBIN WINDER	6-5
Winding the Bobbin.....	6-5
STAND-ALONE BOBBIN WINDER.....	6-6
BOBBIN AND BOBBIN CASE	6-7
Bobbin Case.....	6-7
Tension Adjustment.....	6-7
Anti-Backlash Spring.....	6-7
Bobbin Case Damage	6-8
7. STITCHING MECHANISM.	7-1
HOW THE MACHINE SEWS	7-1
MOTOR AND HAND WHEELS.....	7-2
Adjusting the Motor Belt Tension	7-3
Motor Brushes	7-3
Motor Jams.....	7-3
NEEDLE BAR	7-4
Needle Bar Stability	7-4
Adjusting the Needle Bar Height.....	7-4
ROTARY HOOK SHAFT	7-5
Stability of Rotary Hook Shaft.....	7-5
ROTARY HOOK ASSEMBLY	7-5
Hook Retainer Bracket (Finger) Adjustment.	7-6
Rocking Finger	7-6
HOPPING FOOT ADJUSTMENT	7-7
NEEDLE PLATE AND THROAT PLATE	7-9
Removing the Throat Plate.....	7-9
REPLACING HANDLE SWITCHES	7-10
MAINTENANCE & REPAIR OF BUILT ON BOBBIN WINDER	7-10
8. TROUBLESHOOTING STITCH QUALITY PROBLEMS	8-1
HOW A STITCH IS MADE.....	8-1
CHECKING AND ADJUSTING STITCH QUALITY	8-2
TROUBLESHOOTING THREAD PROBLEMS	8-3

Top Thread Frays and Breaks	8-3
Loops on Bottom.....	8-4
Skipped Stitches.....	8-4
"Eye Lashes" or "Railroad Tracks"	8-4
Pokies	8-5
9. USING THE SEWING HEAD	9-1
CLEANING AND OILING	9-1
Centralized Lubrication System	9-1
10. BASIC SEWING TECHNIQUES	10-1
BRINGING UP THE BOBBIN THREAD	10-1
At the Start of Stitching	10-1
At the End of Stitching.....	10-1
CROSSOVER THREADS	10-1
SECURING STITCHES.....	10-2
RIPPING OUT STITCHES	10-2

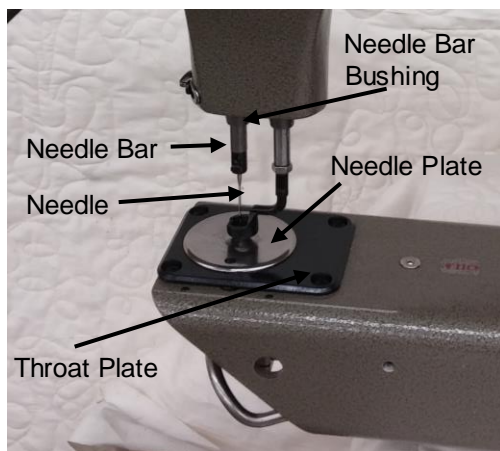
1. Quilting System Features

This chapter briefly describes the features of your Gammill Quilting Machine.

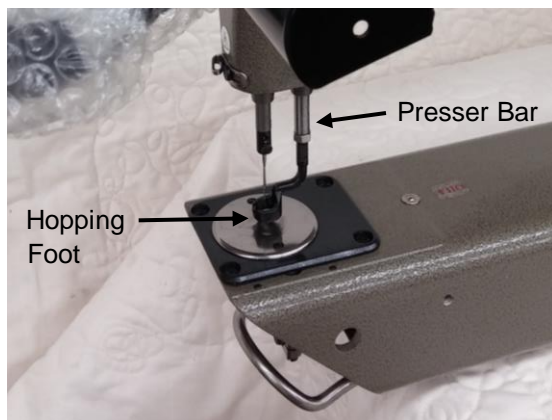
Sewing Head Features

Gammill quilting machine heads use industrial needles with round shafts. The needle is inserted into the needle bar which moves up and down to form the stitch. This bar can be adjusted up or down to the proper machine timing height.

The round needle plate is attached to the top of the square throat plate. The small hole in the needle plate restricts movement of the thread as the stitch is formed. Three of the four screws on the throat plate can be removed and the throat plate rotated off the machine for access to the rotary hook assembly for cleaning or timing.

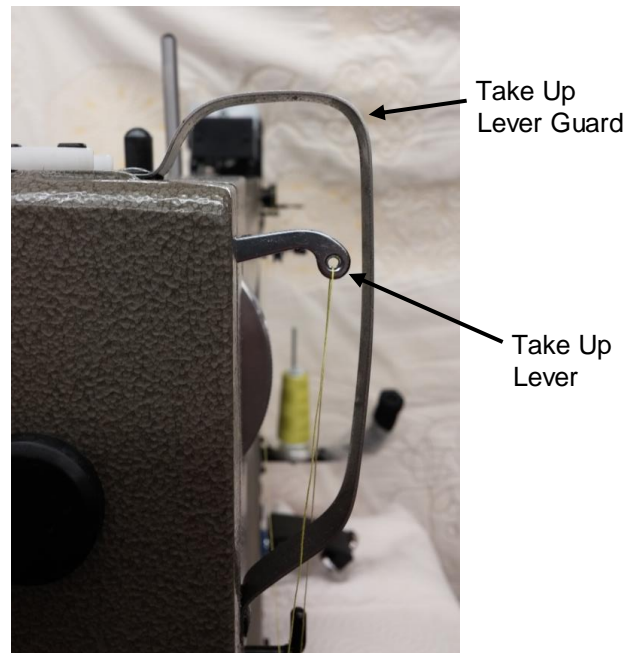
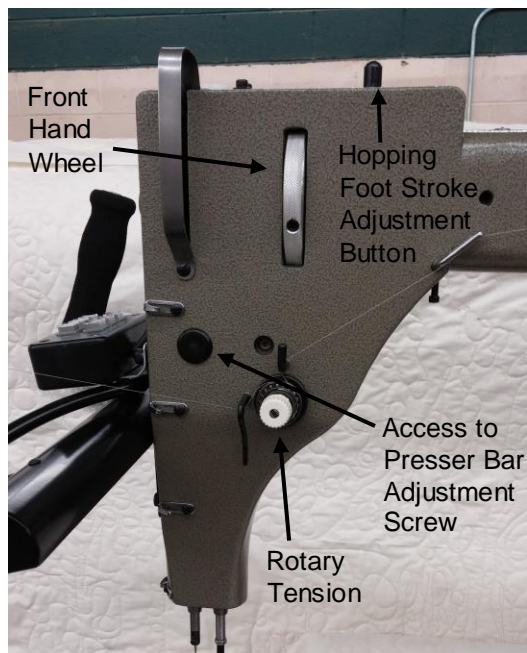


Attached to the presser bar, the hopping foot rises and lowers with the movement of the needle to press and release the fabric as the stitch is formed. The hopping foot can be used with rulers and templates and its height and stroke can be adjusted for proper stitch formation.

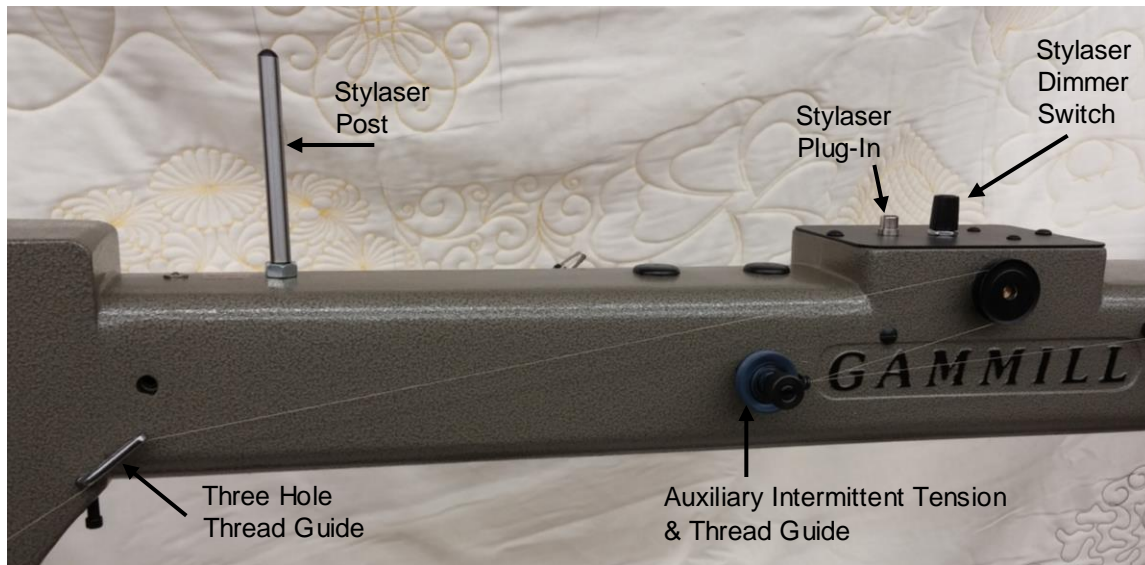


The front hand wheel is used to manually raise or lower the needle. The take-up lever box houses the take-up lever. The Rotary Checkspring Assembly is the housing for the checkspring. The tension on the spring is set at installation. The white knob should be flush with the post and should not be turned. All adjustments to the tension are made using the Intermittent Tension (see pg. 1-3). The hopping foot stroke adjustment button is used to adjust the hopping foot.

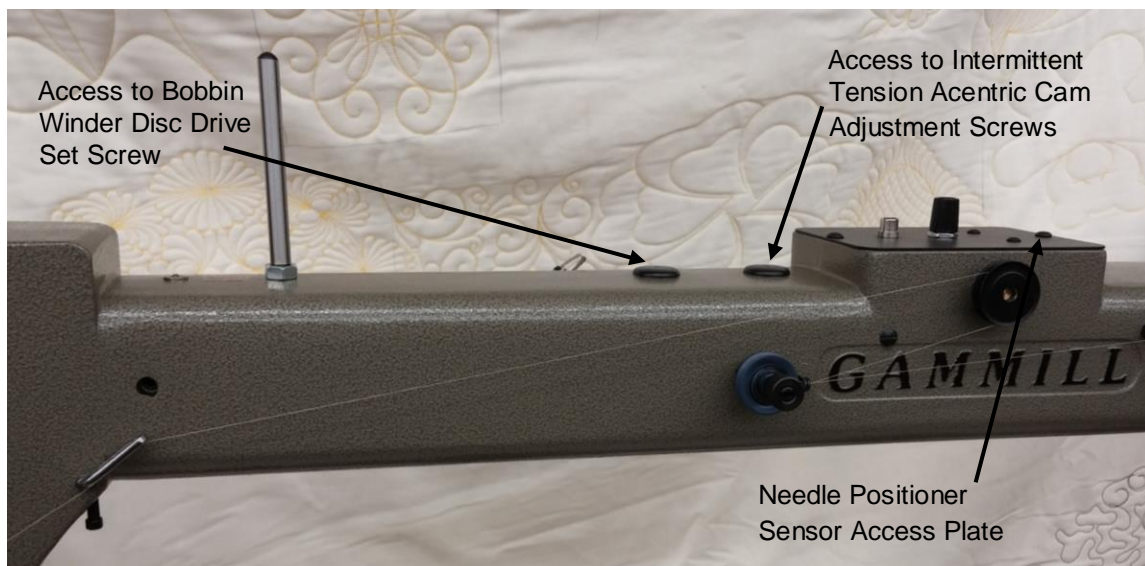
The thread take-up lever is located behind a guard and is used to eliminate the slack in the top thread as the stitch is formed. Adjustments to the presser bar are made via the presser bar adjustment screw.



The intermittent tension is used to set the top thread tension and its thread guide directs the thread into the discs.

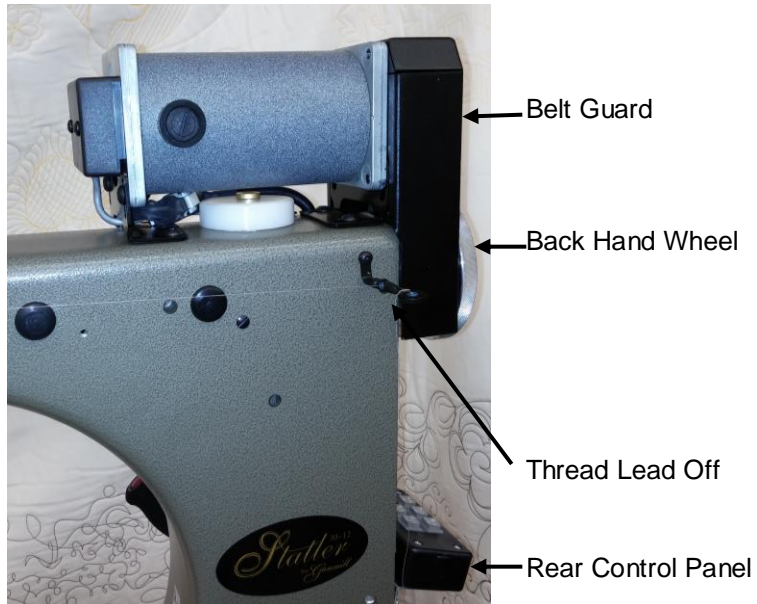


The picture below shows the access locations for the bobbin winder driving disc set screw and the intermittent tension acentric cam adjustment.

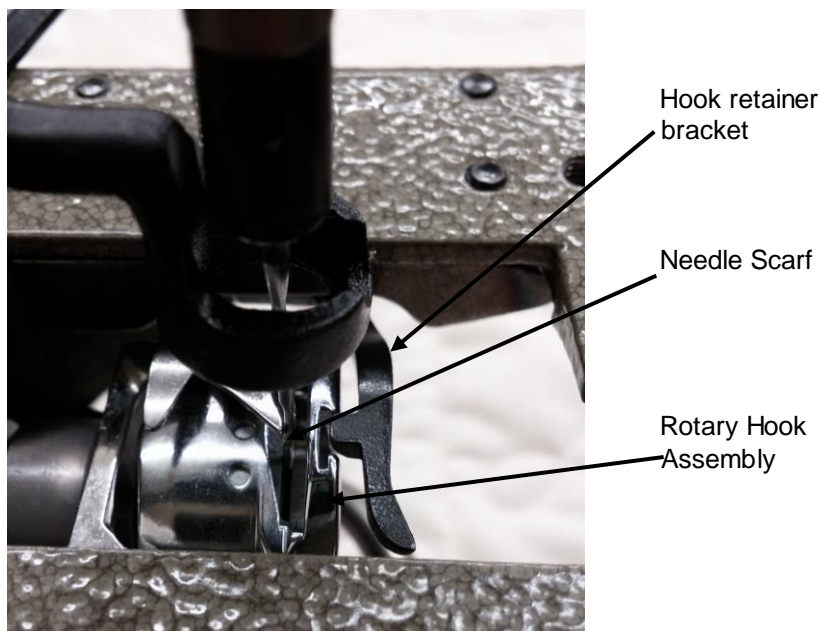


The belt guard shields fingers, hair, jewelry and other objects from becoming caught in the motor belt. The back hand wheel is used to manually raise and lower the needle.

The first thread guide is located just above the cone and is threaded from the bottom up, then from back to front.



The close up picture below shows the throat plate removed. The hook retainer bracket holds the bobbin case in position as the stitch is formed.



The hook point of the rotary hook assembly rotates around the bobbin case and is timed to the movement of the needle bar to form a stitch. The “timing point” is defined as when the hook is positioned directly behind the needle. At the timing point, the hook should be close to the needle, but not touching it.



Hook Point of the Rotary Hook Assembly

The bobbin case houses the filled bobbin. The thread escapement is where movement of the rocking finger allows the thread to pass between the hook retainer bracket and the notch on the hook.



Thread Escapement

Filled Bobbin

Rocking Finger

Quilting Stand Features

The picture below shows the major features of the Gammill Quilting Stand.



1. Hand Wheel
2. Pick-Up Roller
3. Tabletop
4. Tracks
5. Backing Roller
6. Top Roller
7. Pivotal Access Rod
8. Carrier Roller
9. Pivotal Access Arm
10. Pivotal Access Pin
11. Pick-Up Roller Lifter

Top Roller	Holds the quilt top for quilting.
Backing Roller	Holds the backing fabric for quilting.
Pick-up Roller	Holds the completed portion of the quilt during quilting. This roller is located inside the throat of the machine.
Carrier Roller	Holds the quilt layers up and even with the pick-up roller during quilting.
Pivotal Access Bar	Located on the pivoting rod between the Carrier and Top rollers.
Fabric Leader	This thick canvas fabric is attached to the top, pick-up and backing rollers and is used to pin the quilt layers to the rollers.
Hand Wheel	Attached to one end of the pick-up, backing and top rollers and used to quickly turn the rollers.
Pick-up Roller Lifter	As the completed quilt is rolled onto the pick-up roller the thickness of the completed quilt causes drag on the sewing head. Turn this crank to lift the pick-up roller off the sewing head for smoother movement.
Tabletop	Used to hold and position patterns. It is equipped with gear teeth for using the WorkStation™ (included) and Design Center (optional).
Tracks	Set of two tracks used for holding and guiding the Crosstrack along the length of the table.
Pivotal Access Rod	On the Pivotal Access system, these rods hold the Carrier Roller, Top Fabric Roller and the Stabilizer Bar.
Pivotal Access Pin	Holds the Pivotal Access in place during quilting. This pin is pulled out to allow the top roller and stabilizing bar to pivot for access to the batting.

Selecting a Location for Your Quilting System

Quilting systems are large, bulky pieces of equipment and the operator must have access to at least three sides of the system. You should have adequate space to locate and efficiently use your quilting system.

Length

The standard length for a quilting system is 12 feet. The hand wheels attached to the side of the rollers add another 6 to 8 inches of length. Add another 18 inches to each side for space to walk around. For a 12-foot table, the ideal length of the space is $12' + 6" + 18" + 18" = 186"$ or $15 \frac{1}{2}$ feet.

If this space is not available you might consider placing the side without the hand wheels against a wall. This would allow you to walk around three sides and reduce the length requirement to $14 \frac{1}{2}$ feet and $16 \frac{1}{2}$ feet for the 12 foot and 14 foot tables, respectively.

Width

In addition to the actual width of the table with rollers attached, and the space needed to stand on both sides, you need to add the space required when the needle of the machine is moved as close to the pick-up roller as possible. For the 22 and Classic models we recommend 8 feet in width and for the Optimum you will need $8 \frac{1}{2}$ feet.

If your location does not meet the width requirement you might consider adding casters to the table legs. Casters make it easy to move the machine around so it can be moved out of the way against a wall when not in use.

Floor

The floor should be level if possible; however the table legs have level adjustments on each leg. If the floor is uncarpeted you might consider adding thick pieces of rubber under each leg to dampen vibration and/or noise.

For your comfort and for longer quilting sessions, you might consider adding mats designed for those who stand for long periods of time. Usually these mats are rubber or similar cushioned material and can be purchased at large home improvement stores.

Power Requirements

In the United States you will need a 110 grounded power supply. In Europe you will need a 220 power supply.

To be prepared for unexpected power surges it is recommended to purchase a surge protector. When the machine is not in use, we recommend that you unplug it.

2. The Quilting Stand

Fabric Leaders

The fabric leaders are thick canvas material affixed to the pick-up, backing and top fabric rollers. You will notice that new leaders are stiff and it might be a little difficult at first to pierce the fabric with pins as you attach the fabric layers. Consider using corsage pins, which are long with a thick, strong shaft and hold up to the thicker canvas fabric. As you complete quilts you will notice less stiffness and the pins should be easier to place.

Hand Wheels

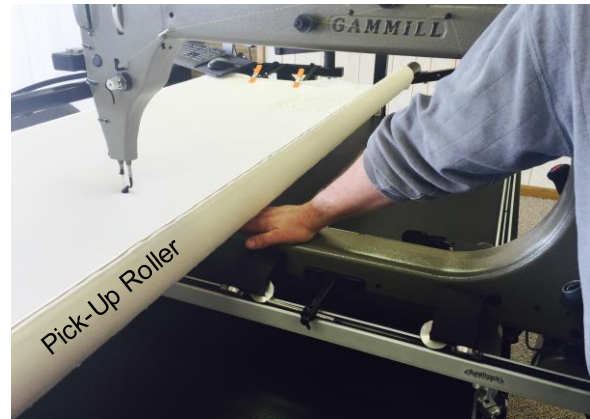
Hand wheels are attached to the pick-up, backing and top fabric rollers and are used to quickly and easily turn the rollers. The pick-up roller handle wheel also has a handle for even faster rolling. Hand wheels not only speed up the rolling process but they reduce repetitive motion in your wrists and hands.

Pick-up Roller Lifter

As the quilt is completed and rolled onto the pick-up roller, it fills the area inside the throat. As the quilt becomes thicker around the pick-up roller it begins to create drag on the sewing head. This makes it difficult and sometimes impossible to move the machine.

Your Gammill quilting system includes a one-step pick-up roller lifter. You need only turn a crank on one side of the table to raise or lower the pick-up roller evenly across the table. The crank is located on the same side as the hand wheels.

The distance between the pick-up roller and the sewing head should be the thickness of your hand.



Tip: If your machine is hard to move, check your pick-up roller / quilting machine clearance, adjust as required.

Tip: If the quilt layers bounce as you quilt, the pick-up roller is too high. Turn the handle to lower the pick-up roller to the desired height.

Cleaning the Carriage, Tracks and Table

Dust, lint and oil can fall onto the table, tracks, cross-track, and wheels. It is important to clean these areas daily to prevent buildup of dust and lint.

Use a soft brush in the tracks on the table and cross-track. Other ways to clean inside the tracks is to use a vacuum cleaner, air compressor or scraps of batting or fabric. It is important to clean the table area before a quilt touches it. Often this means that you need to clean the area before loading the quilt and again before unloading the quilt.

Swivel Casters

This set of four, heavy-duty swivel casters are affixed to the legs of the table. If you need to move your machine around the room, these casters make it easy for one person to do the job. The casters do add about four (4) inches to the height of the table so you might need to adjust the table to the proper height for you. Two of the casters lock in position to prevent the table from rolling during quilting.

Adjusting Stand Height

The table legs include height and level adjustments. At the bottom of the legs you can set the desired height by placing screws in predrilled holes. To make finer adjustments in height and/or to level the table, there is a level adjustment at the bottom of the leg. Turn the level adjuster until the desired height is reached.

3. Supplies

Spare Parts

We recommend that you have the following spare parts on hand:

Run/Stop and Needle Position Switches
Needles
Rotary tension check spring
Encoder O-Rings
Bobbin winder O-Ring
Bobbin winder spindle spring
Bobbin case
Bobbin case anti-backlash spring
Bobbin case spring
Needle set screw

Batting

Your quilting system has a built-on batting holder located under the table. This batting holder spans the length of the table and has a design similar to that of a paper towel holder. It easily lifts off the braces holding it in place. Insert the holder into the cardboard tube in the center of the batting and replace the holder. The batting can now be dispensed from under the table.

To easily measure and cut the desired length of batting:

Use your long measuring tape to measure the length, being careful not to stretch the batting.

With scissors, make a snip about 1" long to indicate where to cut the batting.

From the back of the machine and with the machine parked off to the side, bring the portion of the batting you will cut off, up and over the pick-up roller. Place the

snip along the track on the table and smooth out the batting.

Use the track as a guide to cut the batting straight across.

The most common batting size on a roll is 96" wide and generally comes folded and rolled. This makes the roll of batting about 48" wide. If you have a 12-foot table you can store two of these rolls underneath it. A 14-foot table can store three of these rolls.

Pins

Pins are the best way to attach the quilt layers to the fabric leaders and in some cases to baste certain areas of the quilt as it is being stitched. One example is pinning the sides of the top to hold it in place.

Since the leaders are made of thick canvas fabric you will need long, strong pins to pin the layers to the leaders. The longer pins mean that it takes fewer pins for each quilt, resulting in less time to complete a quilt. Corsage or hat pins have a nice large head that are easy to grip and a long, thick shaft to hold up to frequent use.

A pin cushion or magnetic pin dish that is handy and easy to work with might also be needed.

Scissors

Two types of scissors are recommended: one pair of long, sharp scissors for cutting batting and one pair of small, blunt end scissors for clipping threads as you quilt.

The long blade scissors make quick work of cutting batting and the small, blunt end scissors are easy to use when clipping threads near the quilt. The blunt end lessens the chance that the fabric will be cut while trimming threads.

Measuring Tape

A long, 120" measuring tape is useful for measuring large quilt tops, backings and battings.

Machine Oil

When oiling the machine, use only a clear oil that is made specifically for sewing machines. Sometimes this oil is called "White" oil even though it is clear. Oil that is yellow should be discarded.

4. Loading the Quilt

If the quilt layers are properly prepared before loading the quilt, you will find that quilting is a pleasant task producing beautiful results. A little patience and planning before jumping into the quilting will prevent mistakes further down the line.

Pieced Top

If you are a professional quilter you will be asked to quilt a wide variety of tops: everything from wonderfully pieced, flat quilt tops pressed to perfection to poorly pieced scraps of inferior grade fabrics.

If a quilt is out of square, no amount of quilting will make it square. However, poor quilting techniques can skew a well-pieced quilt top out of square. Try to identify and correct potential problems before loading the quilt. Some ideas for identifying potential problems are listed below.

Does the quilt lie flat? – Often when we hold or fold a quilt top it appears to be relatively flat. However when that quilt top is laid on top of the batting we can immediately see that the edges are wavy or there is fullness in the interior. Some fullness can be quilted out but trying to quilt an area with a large amount of fullness often results in puckers and pleats in the quilt top. Some parts of the quilt top may need to be ripped out and re-pieced or you and/or your client should be willing to accept some amount of puckers and/or

pleats. If possible, try to lay the quilt top flat on a large floor area while customer is present. Measure the width and length in several places to compare each measurement to the next.

Are the seams pressed correctly? Most quilt makers press their seams as they piece the top, however sometimes there are problems in how the pressing was done. If the seams are pressed open it will be difficult, if not impossible, to stitch in the ditch because there is no ditch. If the seams are pressed to one side, often the ditch starts on one side but the pressing changed direction and the ditch ends up on the other side. If you are stitching in the ditch you will need to follow the ditch to whichever side it goes.

Wavy Borders – Some quilts have an hourglass shape where the top part is a certain width, then the middle section of the quilt is not as wide and the bottom part becomes wide again. This is usually due to the way the borders are pieced. If a strip of border fabric is attached to the quilt and the excess clipped off, this usually means that the fabric was stretched as it was sewed making the border strip longer than the side of the quilt to which it is stitched. Wide borders can be especially prone to becoming wavy as well as heavily pieced borders or borders with bias edges.

A quick way to check for wavy borders is to lay the top on a hard, flat surface and take a look at it.

Measure the edge of the border then measure the seam line where the border meets the quilt interior. If the outside measurement is larger, you will have waves. Small waves in solid borders can generally be "quilted out" by meander stitching in the area. Straight line quilting, such as grid work, is harder to "quilt out" fullness and, indeed, you might get puckers by quilting straight lines. If the borders are significantly wavy then the quilter has three choices: have the customer remove the borders and piece them correctly, pay the quilter to remove the borders and piece them correctly, or agree that the quilt will most likely have puckers.

Backing Fabric

Backing fabric should be pressed and the selvedge edges should be trimmed off. For machine quilting, especially custom quilting, you will have many starts and stops. Encourage your clients to choose busy backing fabrics that will hide the starts and stops stitching over previous stitches, and changes in thread color.

Check the location of the seam and check to see if the design is directional so the top of the quilt is the same on both sides. Backing seams that are perpendicular to the rollers may form puckers. To prevent this always check the backing seam by running your hand against the back of the quilt after advancing the quilt. A backing seam that was not properly pressed tends to form pleats along the seam. You can smooth out any excess fabric and clamp the sides to keep the backing flat.

If the backing seam is parallel to the rollers then the tension of the layers between the rollers is generally enough to smooth out any puckers along the seam line.

Batting

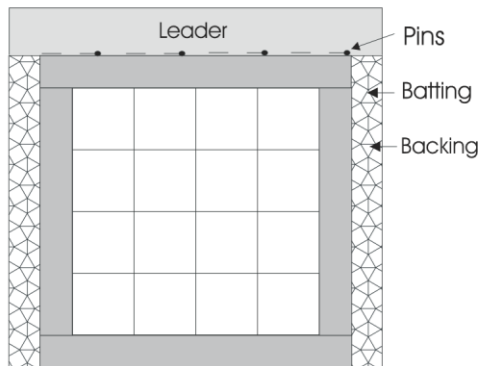
Your quilting machine is capable of stitching through a variety of batting materials and thicknesses. Always choose batting that is recommended for machine quilting. Battings made for hand quilting are generally thinner and are difficult to work with on the quilting machine.

Packaged battings will have areas that are stretched out a little from the folding and should be fluffed in the dryer before loading onto the quilt. Read the manufacturer's instructions for proper care. Open the package, unfold the batting completely and toss it in the dryer along with a damp wash cloth for a little moisture. Tumble for 10 to 15 minutes. The batting will now lay flat on the machine. Batting that is stored on a roll generally does not need to be fluffed before use.

Determine Loading Direction

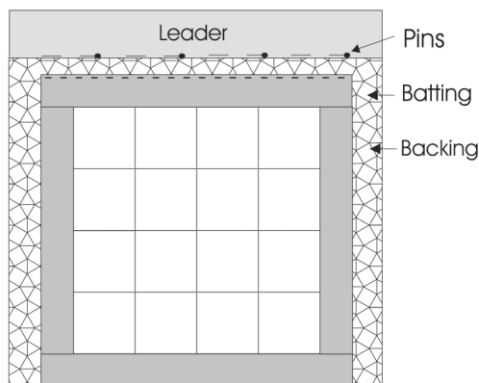
Before loading the quilt, determine the best loading direction. Most quilts are rectangular, so they are narrower than they are long. If possible, always pin the longer edges to the roller, as this will require the least number of advances and it will offer the maximum quilting space.

Pinning vs. Floating the Top There are two methods for loading a quilt: pinning the top and floating the top. For the pinning version, the edge of the quilt top is pinned to the pickup roller canvas along with the batting and backing layers as shown below.



This type of quilting works well for stitching all-over, edge-to-edge patterns. However, if you are using rulers or templates and you want to stitch completely off the edge of the quilt top, the pins are in the way of not only the stitching but the rulers and templates as well.

To solve the problem of getting the pins out of the way you can float the quilt top as shown below.



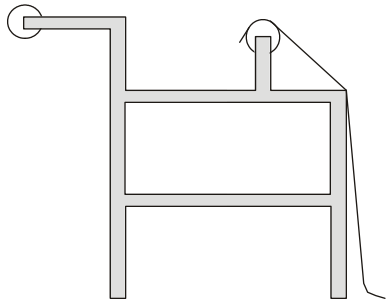
Instead of pinning the quilt top to the pick-up leader, it is basted to the backing and batting. Because the quilt top is floating on top of the batting and backing and away from the leader, you are free to stitch right off the edge of the quilt top. The opposite edge of the quilt top is pinned to the top roller or you may choose to completely float the top. If you have a quilt top with irregular edges, such as Grandmothers Flower Garden or Double Wedding Ring, floating the top makes loading the quilt easy.

In the instructions that follow we will use the pick-up roller to help hold the top and backing as we load the quilt. The quilt top is loaded first then the backing and finally the batting. As you read through the instructions you can choose which method to use to load your quilt. If you plan to float the top completely, without pinning any edge to the top roller, start the instructions at Load the Backing below.

Load the Top Roller

The quilt top is loaded first. Find the center of the long edge and mark it with a pin.

From the back of the machine, lay the quilt top, right side up, over the pick-up roller with the marked edge facing front. Smooth out the quilt top along the pick-up roller and let it drape over the table and onto the floor. The pick-up roller helps keep the top flat as you pin and/or roll it onto the top roller.



At the front of the machine bring the top roller leader up and over the stabilizer bar. Use one clamp from each side to hold the leader as you pin. Use the Velcro to hold the clamps to the frame and to pull the leaders taut.

Line up the pinned center of the quilt top with the marked center of the leader and pin it in place. Moving from the center out toward the right side, pin baste every 6-8" until you reach the end. Repeat for the left side.

Pin the remaining areas of the quilt top to the leader by pinning halfway between two pins. Continue dividing spaces in half until the entire edge of the quilt top is pinned to the leaders. You might need to ease in the fabric for some areas, but take care not to stretch the fabric. You will notice that the pinned edge of the fabric folds over itself slightly when it is rolled onto the roller.

Remove the clamps and roll the quilt top onto the top roller, making sure the quilt top remains smooth as it is rolled.

Load the Backing

Measure and mark the center of the backing as you did for the quilt top. From the back of the machine, lay the backing fabric, wrong side up over the pick-up

roller, with the pinned center edge facing the front of the machine.

Smooth out the backing along the pick-up roller and let it drape over the table and onto the floor as you did for the quilt top.

At the front of the machine, pull the backing leader up and over the stabilizer bar and hold it in place with the clamps. Pin the backing to the backing leader. Remove the clamps, set the backing roller ratchet so it moves in one direction and begin rolling the backing onto the backing roller. Roll until about 8" of the backing is hanging towards the back, over the pick-up roller.

Place the edge of the backing fabric along the edge of the pick-up roller leader. Pin the backing to the leader as close to the edge as possible. If you will be pinning all three layers, you should pin baste the backing to the pick-up roller at this point. To pin baste simply place the pins about 3-5" apart instead of head to tip. When the backing is rolled between the rollers, the pinned edge of the backing folds over itself where it is pinned to the leaders.

Float the Top

1. Unroll the pick-up roller "pick-up roller" until the pinned edge is about 3" away from the roller and set the ratchet so the roller does not turn.
2. Lay the batting on top of the backing fabric.
3. Lay the quilt top on top of the batting.

4. Pin baste the top and batting to the backing fabric every 8".
5. Baste across the top edge of the quilt top. Continue with Preparing the Layers for Quilting below.

Pin Three Layers

Place the batting over the backing fabric and over the pickup roller, having the backing and batting edges even. If you prefer, you can pin baste the batting and backing to the pick-up leader, however, it is not necessary.

Unroll enough of the top fabric to place it on top of the batting with the edges even with the batting/backing edges. Starting from the center and working out, pin all three layers to the leader.

Unroll the pick-up roller until the pinned edge is about 3" away from the roller and set the ratchet so the roller does not turn.

Roll the backing roller until the backing is taut.

Smooth out the backing, then roll the top roller until the top is taut. Continue with Preparing the Layers for Quilting below.

Preparing the Layers for Quilting

Once the top, backing and batting are loaded and before you begin quilting, make sure the layers are properly adjusted so they lay flat. This means that they should be taut between the rollers and clamped at the sides. Once adjusted, the rollers and clamps hold the layers flat and even for proper stitch quality and even quilting.

Adjusting the Rollers

When adjusting the rollers, do not stretch the fabric too tightly. A lightly taut fabric allows a small amount of shift in the fabric as the needle moves in and out of the layers. This slight shifting helps avoid needle deflection which reduces broken needles and torn fabric. Stretching the fabric between the rollers can lead to poor stitch quality and/or skipped stitches as well as distortion of the completed quilt.

Clamping the Sides

Included with your Gammill quilting system are two sets of side clamps with Velcro™ straps. These clamps are used to hold the sides of the layers as you quilt them together.



After the rollers are adjusted to the correct tautness, place two clamps on each side of the quilt layers clamping the batting and backing fabric only. It is recommended that the top fabric not be clamped. This allows you to stitch completely to the end or off the quilt top without having the clamps in the way. Secure the Velcro straps to the sides of the table frame without stretching the fabric.

Tip: Cut your batting and backing fabric 8" larger than your top. This allows

plenty of excess and keeps your fabric clamps away from your machine.

Note: The sides should be clamped before stitching begins. To prevent puckers or fullness at the sides, you should complete all the quilting inside the working surface before basting the sides.

Stabilizing the Quilt

If you are doing a large amount of custom quilting, including stitch in the ditch, outline quilting, patterns in blocks, and borders, or if you plan to heavily quilt the entire piece, the quilt should be stabilized first. Stabilizing the quilt keeps it flat and square during quilting, which means the finished quilt will also be flat and square. Stabilizing should be the first stitching you do and includes stitch in the ditch around blocks, borders and sashes. In larger areas that you do not plan to stitch in the ditch, you can stabilize by adding basting stitches that are removed later.

Each time the quilt is advanced, stabilize the working surface from the center out. Baste the sides, advance the quilt and continue until you reach the end. Baste the bottom edge. Once the entire quilt is stabilized, the top fabric can be unpinned from the top roller. Now the stabilized quilt is attached to the pick-up and backing rollers only and can be rolled forward and backward to complete all the detailed stitching.

Once the quilt is completely stabilized you can move on to decorative stitching, trapunto, etc. By stabilizing first, you know each block or other area is free of puckers and pleats, and that heavy

quilting in some areas won't distort the blocks around it. Here are some guidelines for stabilizing the quilt: Prevent puckers on the back by making sure the backing fabric is smooth before stitching each area. After you advance the quilt to the next area to be quilted, smooth out the backing with your hand and clamp it so it is taut but not stretched.

Go to the back of the machine and run your hand under the backing fabric to feel for places in the backing that are bunched up. It is not uncommon for bunching to occur at a seam line or on a backing that is not squared up properly. Be especially careful when the backing seam runs perpendicular to the rollers. Visually check the backing from one end of the table by bending over and looking under the layers each time the quilt is advanced and re-clamped.

Tip: Place a mirror on the table or on the floor to quickly view the backing. Inexpensive, full-length wall mirrors can be purchased at discount stores and are thin enough that they do not obstruct operation of the machine.

Baste along the edges of the quilt as you go. Each time you roll the quilt, stabilize the interior sections first and then baste the borders. The edge basting may need to be removed before you can stitch the border designs, but for now, it will keep the edges neat and square.

When numerous thread changes are required, stitch all the areas of the quilt that use the same thread, advancing or reversing the quilt as needed. When stabilizing the quilt, use the thread color

or type that is most important or that is used the most throughout the quilt. Then, change threads and repeat the process. Some quilting techniques, such as stitching in the ditch or grid work, are completed faster if you can stitch them continuously over the entire, quilt, so plan to change each thread color or type just once.

Thread changes are time-consuming but working this way saves you time especially if you are using many different threads on a single quilt.

Zippers

Zipper leaders are a set of zippers that allow you to remove a quilt from the frame by simply zipping it off the canvas leaders. The zip ends are zipped off and the fabric layers are basted or pinned to the edge. After all the edges have been basted to the leaders you simply zip them back on, roll the fabric onto the rollers and the quilt is loaded. If you use your home machine to baste, consider using wash away thread in the top or bobbin. Once the quilting is complete you simply spray water on the basting and it dissolves away...no ripping out. Zipper leaders allow you to take an unfinished quilt off the frame if you need to start another project or if someone else wants to use the machine. If you have trouble standing and pinning the fabric to the leaders, the zipper leaders can be zipped off and the fabric basted to them as you sit at your sewing machine. Some quilters with arthritis in their hands find this helpful and less painful as well.

You could simply pin the fabric to the leaders or you can use your sewing

machine. If you are using your sewing machine to baste the fabric to the leader you should pin baste first to be sure the fabric is not stretched. Start at the center and work out to each side. Once the pin basting is complete you can use the sewing machine to baste. This is an extra step but the advantages are that the fabric will not be stretched and you will not have sharp pins to deal with as you zip the leaders on/off.

As you prepare to baste the fabric to the leaders take care to keep the loading orientation in order for both top and backing fabric. Take special care if the backing and top fabrics are directional. Jotting down a quick diagram can help you keep track of all the directions and edges.

Tip: Mark the canvas with the notation "Fabric Side" so that the proper orientation and direction is achieved.

The steps for loading a quilt using zipper leaders are:

Check that the quilt top and backing fabric are both square. You will need perfectly straight and square edges to baste or pin to the straight edges of the leaders.

Unzip the top fabric leader. Baste the lower edge of the quilt top (the edge that will be quilted last) to the leader.

Zip the top fabric leader back on and roll the quilt top onto the roller.

Unzip the backing leader. Baste the lower edge of the backing to the leader.

Unzip the pick-up leader. Baste the upper edge of the backing to the leader. At this point you will have leaders basted to two edges of the backing.

Zip the backing leader to the backing roller and roll the backing onto the roller.

Bring the remaining unzipped leader with attached backing up and over the stabilizer bar and zip onto the pick-up roller. Roll the pick-up roller until the backing is taut between the pick-up and backing rollers.

Place the batting on top of the backing.

Bring the top edge of the quilt top up and over the stabilizer bar and place on top of the batting. Baste across the top edge of the quilt top to hold it in place.

5. Thread

There are a wide variety of thread choices to consider for your new quilting system. From the basic cottons, polyesters and blends to decorative threads... most can be used for your quilting techniques and designs.

Use the cone holder for larger cones of thread and the horizontal spool holder(s) for smaller spools of thread. You can even use two threads at once for a blended look.

If you plan to try new threads, we recommend that you test samples first to be sure the thread is strong enough to meet your needs. Once you are satisfied with the thread's sewing performance and the look that it produces, you can purchase larger quantities.

You will need a convenient place to store the thread and bobbins. Both should be stored in a drawer or cabinet (away from light) to prevent fading and dust build up.

Choosing Thread – Types of Thread

Use cone thread for basic quilting such as blending the quilting into the background, stitching borders and blocks, or any day-to-day quilting techniques. When purchasing cones of thread, it is a good idea to purchase two cones, one for the machine and one for the bobbin winder.

Whenever possible you should consider using the same type and/or brand of thread in the top as you do in the bobbin. This often results in better stitch

quality than if you mixed two different types of thread (such as cotton and polyester). Problems can occur when using two threads of different thickness and/or weight. However there are exceptions. When using expensive decorative threads in the top you can achieve good stitch quality by using a good cotton or polyester thread in the bobbin. Mixing these threads will save you a little money because you are not using the more expensive thread in the bobbin.

Most quilters choose thread based on how the thread sews and the look of the stitches in the quilt. Each of us has our own personal taste and, with the variety of threads available, we can easily find the right thread for us and for the quilting techniques we employ.

Thread Weight and/or Thickness

Threads are manufactured in a variety of thicknesses and/or weights so you can choose a thinner thread for one look and a thicker thread for another.

An excellent source for information on thread types, how thread is manufactured, and how to read the labels can be found on the website of American Efird (A&E) at <http://www.amefird.com>. Look for "Technical Information" and you will find a wealth of information on thread size, thread selection and numerous Technical Bulletins.

Often the thread label includes a "Tex" number that indicates thread weight. Sometimes, but not always, the Tex

number can be in indication of thread strength. The A&E website describes the Tex number as follows:

The Tex size is a measurement of the gram weight of 1000 meters of greige or un-dyed or finished thread. Examples include: T-18 - T-27 for lightweight sewing; T-30 - T-50 for medium weight sewing, etc.

The metric size is the most common system used in Europe and is the number of 1000-meter hanks per kilogram (or number of 496 yd hanks per lb.). Examples include: 180 - 120 for light weight sewing, etc.

The yarn size is a measurement used for the number of 840 yd hanks per pound and is many times also referred to as the spun size. The yarn size generally includes both the yarn size and number of ply. Examples include: 46/2 representing 46's cotton count - 2 ply.

Tip: Purchase high quality quilting thread and your quilting experience will be more enjoyable!

Cotton

Cotton threads are made from long or short cotton fibers. The long fibers make the thread stronger, and they generate less lint than the shorter fibers. Good quality cotton threads are colorfast and non-bleeding. There are several brands of thread manufacturers that produce good quality cotton thread on cones. When using cotton thread in the top, use cotton thread in the bobbin. Cotton threads generally produce a lot of lint so

be sure to clean out the bobbin area often to prevent lint build up.

Variegated cotton thread on cones is also widely available and these threads look wonderful on scrappy quilts when using an all-over, edge-to-edge quilting design. Choose a solid color cotton bobbin thread that coordinates with both the backing fabric and with the variegated colors in the top thread.

Polyester

Polyester threads are strong with a slight elasticity. They are colorfast and non-bleeding. Polyester threads generally produce less lint than cotton threads.

Poly/Cotton

Blended polyester/cotton offers the strength of the polyester core wrapped with the softness of cotton. This is an excellent choice of thread for learning to use the machine but it also has a very pleasing look when stitched into a quilt.

Monofilament

Monofilament thread is made from polyester or nylon with the polyester being more heat resistant than the nylon. This means that you can iron the polyester monofilament on a higher heat setting without it melting. Monofilament thread is used when you want to show the effect of quilting but not the stitches or thread. Some quilt shop owners want to concentrate on the fabrics, pattern and piecing techniques to sell supplies but they do not necessarily want to draw attention to the quilting, so they use monofilament.

Other times to use monofilament thread are for T-shirt quilts where there can be vastly different colors in the quilt top and different ways to quilt each block. In this case you may wish to use monofilament thread to stitch an all-over, edge-to-edge design. The clear thread blends well with any color and the edge-to-edge design gives even coverage of quilting over the entire quilt.

When using monofilament thread in the top, use cotton or polyester threads that blend with the backing fabric in the bobbin. Monofilament thread has a good deal of stretch so you may need to loosen the top thread tension quite a bit to get good stitch quality. This thread also likes to "unsew" itself so be sure to secure the stitching well.

Decorative

Decorative threads include embroidery threads, metallic threads and any other threads used for decoration but not for strength. Often these threads, since they are designed for decorative purposes only, are not as strong as cotton, polyester, blends or monofilament. Therefore, unless the quilt is made for purely decorative purposes such as an art quilt, you should use cotton, polyester or monofilament thread over most of the quilt for strength. After the layers are sufficiently quilted with the strong thread, you can then add the quilting with the decorative threads.

Since these threads are made for decorative use you will need to test them in your long-arm machine. Look for threads such as polyester embroidery threads that are made to be used in high-speed embroidery machines.

These threads are generally stronger and hold up to industrial use on the long-arm machine. Rayon threads are often made from short fibers and are therefore prone to breaking so be sure to test a brand before purchasing large quantities.

Fabrics are woven with horizontal and vertical threads and have a bias on the diagonal. There is little stretch when fabric is pulled along the vertical or horizontal threads. There is little stretch but when the fabric is pulled along the diagonal line, it has a large amount of stretch. Quilting stitches placed along the vertical or horizontal threads of the fabric give the quilt added strength by reducing the area of the diagonal stretch. However when lines of quilting are stitched along the bias, the stitches are in danger of breaking if there is significant stretch along the diagonal. If you plan to quilt diagonal lines along the bias of a quilt you should plan to include additional stitches in the vertical and horizontal directions as well. Even some of the strongest threads cannot hold up to stretching along the bias.

Choosing Thread Color

Before we talk about choosing thread color you should understand the concept of "pokies." Pokies are dots of thread that poke through from one side to the other such as the top thread poking through to the back and vice versa. No matter how well you adjust the tension for both threads there will be instances where pokies happen. Most often they appear in tight curves or in points. When pokies appear on a quilt, either the front or back, the eye is instantly drawn to them in a distracting way which takes

the focus away from the piecing and quilting designs. To minimize pokies in your quilt, you should always use the same thread color on both the top and bobbin.

Another factor to consider when choosing thread color is the backing fabric. The quilting thread is the only part of the quilt that affects the look of both sides of the quilt. Often quilters choose a backing fabric without considering how the quilting looks. Solid muslin is a favorite of many quilt makers but can be a disaster for some types of quilting. Solid fabrics tend to show every wobble and bump and all the backstitches for securing threads. Consider using a busy backing fabric that coordinates with the top fabrics.

Choosing a thread color can be difficult at times and your first, more obvious choice can often be completely wrong for the quilt. The best way to be sure you choose the perfect thread color is to compare several choices of the actual thread. Unwind a portion of each of the cones and lay them across the quilt top. Instantly you will see which ones are not right and which ones are possibilities. Begin eliminating threads one by one until the best one is left. That is the thread you should use.

6. Threading the Machine

In this chapter you learn the following:

Proper threading of the machine including the top and bobbin threads.

Adjusting the tension for both threads.

Checking stitch quality.

Improper threading of the machine can result in poor stitch quality and broken threads. If you are experiencing numerous thread problems, the first thing you should do is check that the machine is properly threaded. Often it is as simple as the thread being out of a single thread guide.

Using Cone Thread



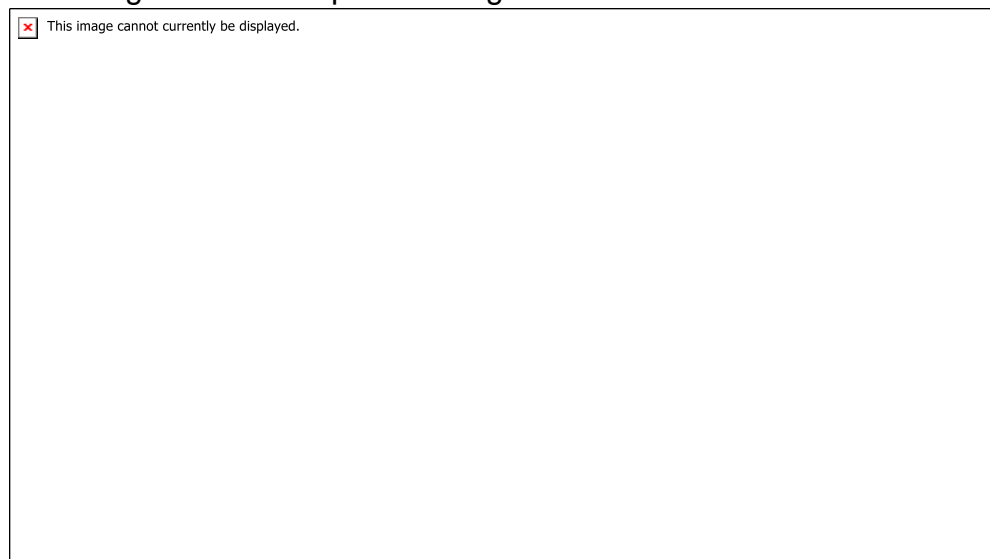
1	Cone holder	Place the cone on the cone holder as shown. This holder can be rotated about the handle and should be positioned such that the center of the cone is directly below the first thread guide.
2	Thread Lead Off	This thread lead off has two holes. The first hole is parallel to the floor and the second is parallel to the wall. Thread the first hole from bottom to top then thread the second hole from back to front.
3	Thread Post	Thread from back to front.

4	Intermittent Tension	Thread through the small post before threading counter clockwise through the intermittent tension device, approximately 3/4 of a turn. Then back out through the small post.
5	Thread Break Sensor	Thread counter-clockwise around the thread break sensor, two times around. For a more slippery thread you may need to go around a few more times.
6	Thread Guide	This guide has three holes. Do not use all three holes. Use the first and last holes only. The first hole threaded from the bottom up and the third hole is threaded from the top down.
7	Rotary Checkspring Assembly	Thread over the first post, clockwise around the rotary tension wheel 1 ¾ times, over the checkspring and under the second post. The thread must be wound around the rotary checkspring assembly 1 ¾ times.
8	Take-Up Lever	Thread from back to front.
9	Thread Guides	Thread through all thread guides from top to bottom.
10	Needle	Thread the needle from front to back of machine.



Using Spool Thread

When using spool thread, the spool is placed on the horizontal spool holder. The thread should come off the spool from the bottom so that the spool rotates clockwise when the thread is pulled. Rotate the spool holder so it is perpendicular to the upper arm. Begin threading with the first post leading to the intermittent tension device as shown below.



Note: The horizontal spool holder should be set perpendicular to the upper arm as shown above.

Changing Thread

It is not necessary to re-thread the machine each time you change thread. Simply cut the old thread before the first thread guide, leaving the machine threaded. Put the new spool or cone on the machine and tie the end to the old thread that is still in the machine. Unthread just the needle and pull the old thread until the new thread appears. Cut off the old thread and thread the needle with the new thread. The tension should be checked each time a new thread is added.

Thread Guides and Thread Posts

The purpose of these elements of the thread path is to position the thread for other elements such as the tension devices, needle and the take-up lever. Thread guides and posts may seem unimportant, but if one is omitted or improperly threaded you can have as poor stitch quality as you do if the tension is improperly set or the timing is off.

Intermittent Tension

This first tension device is used to add tension to the top thread. The tension is needed to prevent slack in the thread as the take-up lever moves down. The take-up lever moves up to pull out any slack in the top thread as the stitch is completed. The intermittent tension consists of a thread guide just before it and two symmetrical discs. The thread runs between the two discs and the tension is adjusted by a knob which moves the discs closer or farther apart to create or reduce tension on the thread.

The intermittent tension is the tension adjustment device for the top thread.

Tightening or loosening the pressure between the two discs adjusts the tension.

Thread Break Sensor

When the top thread breaks, the thread break sensor stops turning and sends a signal to the computer which notifies you of a thread break.

Rotary Checkspring Assembly

The rotary checkspring device consists of a thread post, wheel with adjustment knob, a check spring, and finally another post. The thread is placed over the first post, wrapped around the wheel, over the check spring and under the second post. The assembly should be adjusted so that, as the thread is pulled from the needle, the wheel turns.

Caution: Be careful the thread does not come out of the wheel's shallow groove.

Needles

Gammill machines are designed to use standard length industrial machine needles in a variety of sizes. For most quilting operations, Singer system 1955 series MR 3.5, MR 4.0 or MR 5.0 are recommended, where the higher the number, the thicker the shaft.

When stitching thick fabrics or tops with thick intersections, the larger MR 5.0 needle will give better results. The thicker, stronger needle easily penetrates the thicker fabric and reduces needle and thread breaks.

Tip: It is recommended that the needle be changed after each quilt. The points become blunt with use and may cause damage to the fabric or result in poor stitch quality.

Parts of a Needle

The picture below shows a properly inserted needle.



The top part of the needle is called the shank. The shank is inserted into the needle bar and a set screw holds it in place. The area of the needle between the shank and the eye is called the shaft. There is a groove at the front of the needle that runs the length of the shaft and faces away from the machine. The groove provides a space for the thread on its way into the fabric layers. Without the groove, the thread would break as it enters the fabric. So, in addition to having the eye face toward the front of the machine, make sure the side with the groove is facing you, not the machine.

The concave area in the back of the needle is called the scarf. The scarf faces the throat of the machine and provides a place for the thread to form a tiny loop as the needle is raised out of the fabric. The hook on the bobbin race takes this loop of top thread and loops it around the entire bobbin case to form the stitch.

Installation

Unlike home sewing machine needles, the shank of an industrial needle is round. There is no flat edge to ensure proper installation of the needle in the needle bar. Instead, you must check that the eye of the needle is facing straight toward the front of the machine.

Loosen the needle bar set screw and insert the shank into the needle bar making sure the needle is inserted as far as it can go.

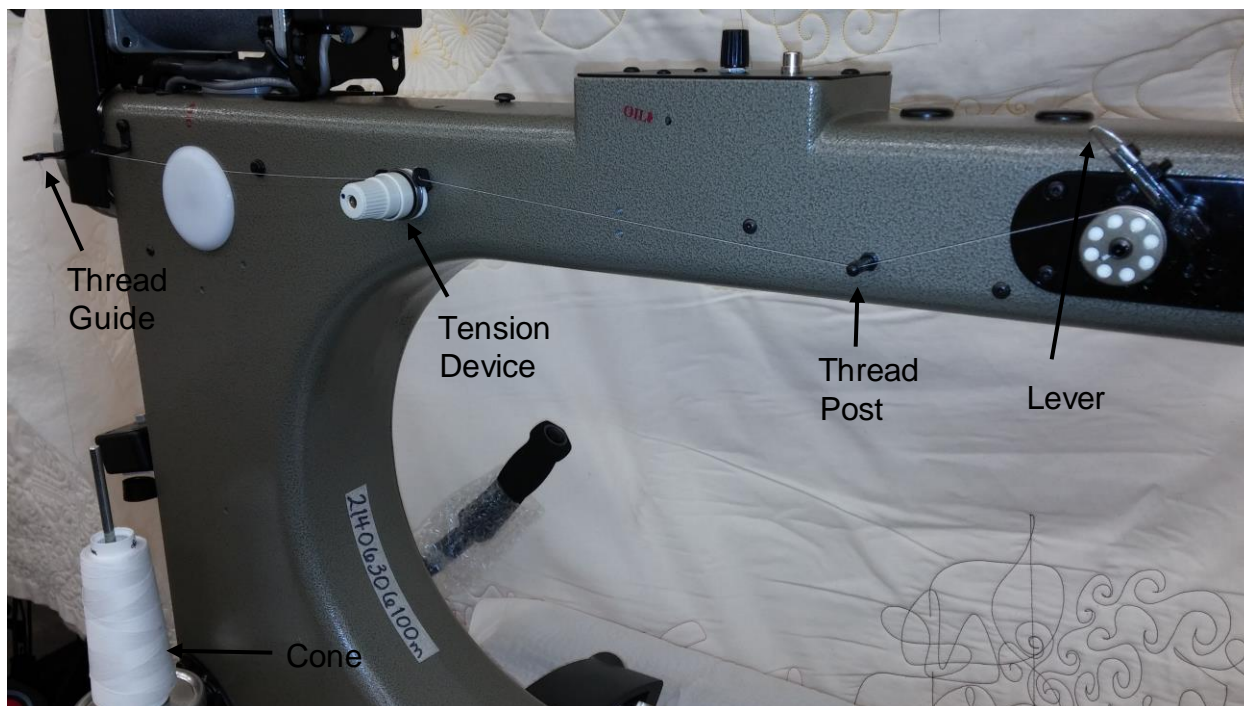
Rotate the needle so that the long groove is facing directly out to the front of the machine.

Tighten the set screw.

Built-On Bobbin Winder

Your Gammill sewing head includes a built-on bobbin winder. The bobbin winder is powered by the motor and winds the bobbin as you sew. The winder shuts off automatically when the bobbin is filled. You might find it more convenient and efficient to purchase two cones of thread in the same color, one for the needle and one for the bobbin winder. This allows you to take advantage of the automatic bobbin winder as you sew.

Winding the Bobbin



1. Place the cone on the cone holder. The cone holder should be adjusted so the top of the cone is directly under the first thread guide.
2. The thread guide consists of two holes. Bring the thread from bottom to top then from back to front of this thread guide.
3. Next bring the thread to the thread guide just before the tension device and go counter clockwise $\frac{1}{2}$ turn around the discs of the tension device. Be sure the thread is securely between the two discs.
4. Next bring the thread to the thread guide just after the tension device then to the thread post just before the bobbin winder.
5. Lift the lever and place the bobbin on the winder.
6. Wind the thread clockwise around the bobbin about 8 times.
7. Lower the lever and pick-up lever $\frac{1}{4}$ " so that bobbin thread will wind evenly. The bobbin will now wind each time the motor is turned on. When the bobbin is full, the lever will release and the bobbin will stop winding.

If the bobbin is unevenly filled, realign the thread guide spindle by loosening the locking nut and screwing the spindle outward or inward to align the spindle hole with the center of the bobbin. Also, make sure there is a moderate tension on the winding thread.

Tip: If the tension device is too tight then the thread will "push" out of discs and the bobbin will wind loose.

Stand-Alone Bobbin Winder

Instead of using the built-on bobbin winder, many quilters prefer to purchase a stand-alone bobbin winder. This winder consists of a thread holder, tension disc, spindle and motor all attached to a wooden base. A foot pedal controls the electric motor.

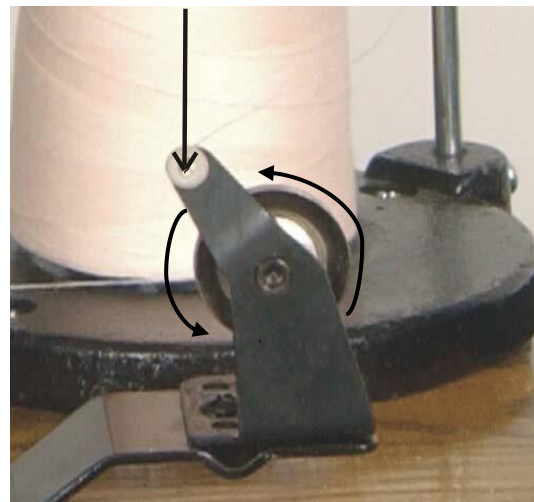


Attached to the spindle is a large wheel. When the bobbin is ready to be wound, the large wheel engages the motor via a lever that the operator manually engages. This lever automatically disengages the motor when the bobbin is full.

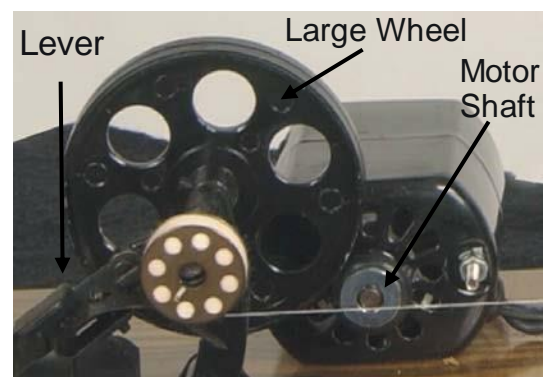
While standing with the spindle and motor on your left and the thread holder and tension disc on your right, place an empty metal bobbin on the spindle and place the thread on the cone holder. Bring the thread up to the thread guide just above the top of the cone. The

thread guide should be positioned directly above the center of the cone.

Bring the thread down to the tension disc thread guide then around the tension disc from right to left as shown below.



Bring the thread under and around the bobbin in a clockwise direction winding 8-10 times around the bobbin. The picture below shows a full bobbin.



Press on the lever until the large wheel engages the motor shaft.

Press the foot pedal and wind the bobbin. When the bobbin is full, the lever releases to disengage the motor and the bobbin stops winding.

Bobbin and Bobbin Case

The bobbin supplies the bottom sewing thread. All Gammill quilting machines manufactured today use size “M”, the large size bobbins. Metal bobbins are filled with thread by using either the built-on bobbin winder or the stand-alone bobbin winder.

Bobbin Case

The bobbin case is removed from its shaft and the loaded bobbin is inserted inside it. The thread goes from the bobbin, through the tension slot in the bobbin case, and is caught in the top thread loop to form the stitch.

Insert the bobbin case into the hook assembly. You should hear and feel the click that indicates proper engaging of the case in the assembly. If the click is not heard, remove the bobbin case and reinsert it. An improperly inserted bobbin case can lead to broken needles, timing issues, and damaged bobbins and bobbin cases.

Tension Adjustment

The bobbin tension should be adjusted at the start of each quilt and/or whenever you change from one type of thread to another. Check the bobbin tension first and then adjust the top

thread tension to make any further tension adjustments.

Two screws are located on the side of the bobbin case. The largest one is used to adjust the bobbin thread tension. Generally, only slight adjustments to the left (loosen tension) or to the right (tighten tension) are needed to adjust bobbin tension.

Follow these steps:

Insert the bobbin in the bobbin case. The bobbin should be placed so that when looking at the bobbin it turns clockwise when the thread is pulled.

Place the thread into the slot on the side of the bobbin case, then into the tension slot.

Bobbin tension should be loose. If you hold the bobbin in your palm and drop your hand the bobbin case should stay in your hand but almost pick up.

Anti-Backlash Spring

The anti-backlash spring is a thin, blue disc located at the bottom of the bobbin case. The picture below shows the anti-backlash spring with the bobbin in place.



The purpose of the anti-backlash spring is to slow down the spinning of the bobbin as it first begins to sew. This reduces the formation of thread blobs on the back of the quilt. If you hold the bobbin case and gently press on the bobbin, you should notice a small movement in and out. If this movement is not present, it is an indication that the disc is worn and should be replaced.

Bobbin Case Damage

Sometimes a bobbin case can get damaged slightly if it is dropped. If a bobbin does not rotate smoothly within the bobbin case while dispensing thread, it is most likely because the bobbin case has been bent slightly inward, restricting the bobbin's rotation. Place a bobbin in the case and determine where the contact is causing the restriction.

7. Stitching Mechanism

How the Machine Sews

If we understand how the machine actually sews, we can quickly diagnose and correct problems and resume sewing.

The picture below shows a cutaway view of the sewing mechanism (excluding the motor). The orange and yellow colors indicate oil tubes and wicks.



The series of pictures that follow are close ups of the upper arm from the motor to the needle.

The motor turns a belt connected to the crankshaft in the upper arm. Notice how the oil collected in the large, white oil port is distributed to various mechanical components via the orange oil tubing.



The crankshaft spans the length of the upper arm. The electronics for the needle positioner are located at the center of the crankshaft.



The end of the crankshaft is fitted with a lever attached to the needle bar. This lever transforms the circular motion of the crankshaft to the up and down motion of the needle. Notice the two white oil ports and the yellow wick that distribute oil to various mechanical components.



The pictures that follow are close ups of the lower arm from the full cutaway picture shown earlier.

The motor also turns the shaft for the rotary hook assembly, which houses the bobbin case. Notice that the oil tubing continues through the lower arm.



The crankshaft continues to the rotary hook assembly at the end of the lower arm.



Motor and Hand Wheels

If the motor belt is too loose, it can slip, causing the crankshaft to start slowly when turning. A belt that is too tight causes drag on the motor and may cause excessive bearing noise.

The motor can be turned manually by using either of the hand wheels located at the back and front of the machine. When standing at the back of the machine, the motor is turned forward by turning the back hand wheel in the counter clockwise direction. When standing at the front of the machine, the motor is turned forward by turning the front hand wheel in the clockwise direction.

Adjusting the Motor Belt Tension

Proper tension on the motor belt is needed for good stitch quality. If a motor belt is too loose, it will slip on the wheel and cause skipped or incomplete stitches. If the tension is too tight it might cause the motor to overheat. To test for proper tension you should be able to press the belt inward approximately 1/2". If the tension is too loose the motor will need to be raised on its bracket and if the tension is too tight the motor should be lowered.

To raise or lower the motor on the motor bracket:

1. Remove the two screws at the top of the motor that attach the belt guard and remove belt guard.
2. The motor is held in its frame by four screws, two of which face the rear of the machine, and two face forward.
3. For small adjustments, you may need to loosen only the two screws which face the back of the machine.

As you loosen the screws, use a screwdriver or similar tool as a lever to lift the motor.

4. Tighten screws.
5. Check tension on the belt.
6. Replace belt guard.

Motor Brushes

Motor brushes should be cleaned and inspected every 6 months, and replaced when worn. A new motor brush is 9/16" long and should be replaced when it becomes 5/16" long.

Note: If the motor slows down while sewing or will not start at all, this is an indication that the motor brushes need attention.

To check motor brushes:

1. You will need a flat screwdriver.
2. Unscrew the slotted cap on each side of the motor.
3. Measure the motor brushes and replace if necessary.
4. If no replacement is needed, reinstall the brushes in the motor using the same orientation.

CAUTION: Do not use canned air to blow out motor. It can blow dust into the bearings which may ruin the motor.

Motor Jams

On rare occasions the motor will become obstructed and jam, which is indicated by the motor humming when the run/start switch is pressed. Most likely the jam is caused by a tiny piece of thread embedded between the hook race and the rotary hook. The motor hums but does not rotate.

To clear the jam, turn off the stitching, go to the back of the machine and turn the hand wheel clockwise until the jam is released. This might take two hands and a much stronger force than normal to accomplish.

Tip: Strap can openers or oil filter wrenches work well for this operation.

Replacing the Checkspring

The checkspring for the rotary tension device is pulled and released each time a stitch is made. This repetitive movement causes the thin material to fatigue and break over time. It is a good idea to have two spare check springs on hand. Check springs are easy to replace and it is not necessary to disassemble the entire tension device to replace it.

Using a 1/16 allen wrench, loosen the small set screw located in the edge of the black tension ring at approximately the 3:30 position.

Remove the entire tension from the ring and locate the set screw at the backside of the housing that holds the tension shaft in the tension housing. Loosening this set screw allows the removal of the tension shaft and the broken check spring.

Replace the check spring by threading the end of the new check spring through the slot in the housing and forcing the coil portion of the check spring back into the housing. Install the tension shaft back into the center of the coils spring and rotate until a part of check spring fits into the groove in the tension shaft. When this is done, the arm of the check spring will move as the shaft is rocked back and forth. The proper adjustment of spring strength is achieved by rotating the shaft clockwise until the arm of the spring rests against the right side of the slot (or notch), then continue to rotate the shaft clockwise until the spring passes three spokes on the side of the rotary wheel or 1/6th of a revolution which adds the proper strength to the check spring.

Tighten the shaft set screw on the housing and install the housing back into the black ring. Set the radial position of the tension so the bottom of the hoop of the check spring is at 10:30 o'clock (halfway between 9:00 and 1200. Caution: do not push the housing so far into the ring as to cause the check spring's arm to touch the black ring. Tighten the allen set screw. The proper adjustment of regular tension is usually with the thumb nut even with the end of the tension shaft.

Note: Many times after a thread break, the thread will wrap itself around the check spring of the rotary tension. Prior to re-threading the machine after a thread break, check that the thread is not wound around this check spring.

Needle Bar

The needle bar holds the needle and provides the up and down motion during stitching. The needle bar should be stable with no side-to-side motion.

Needle Bar Stability

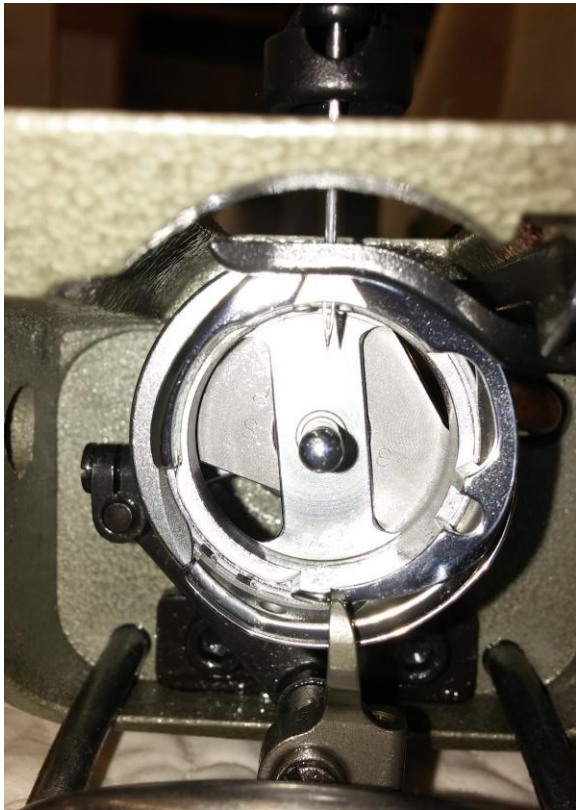
To check needle bar stability, first rotate the hand wheel until the needle bar is in its lowest position. Next, test for excessive side-to-side motion.



If significant motion exists it may indicate badly worn needle bar bushings and require their replacement. This needle bar bushing replacement should be done by a trained technician at a Gammill Dealer

Adjusting the Needle Bar Height

Rotate the hand wheel until the needle bar is in its lowest position. From underneath, looking straight at the sewing hook, the entire needle eye should be visible; however, none of the needle above the needle eye should be visible.



With the needle bar at its lowest position, loosen the set screw visible through the hole and raise or lower the needle bar until the full needle eye is visible. Make sure the needle bar has not pivoted from its original position; tighten the needle bar set screw securely.

Tip: If the needle bar is set too high or too low it can result in skipped stitches or excessive thread breaks.

Rotary Hook Shaft

The rotary hook shaft is located in the lower arm of the sewing head. The motor turns this shaft in a counter clockwise direction, which in turn rotates the rotary hook. The rotation of the rotary hook shaft is synchronized with the needle movement.

Stability of Rotary Hook Shaft

There should be little or no end play (no more than 5/1000 inch of end to end motion) in the shaft that drives the rotary sewing hook.



If excessive end play exists, contact your local Gammill Dealer.

Rotary Hook Assembly

The rotary hook assembly consists of the hook race, bobbin case, and bobbin and it is secured to the rotary hook shaft with two set screws. The bobbin is inserted into the bobbin case that is inserted into the rotary hook assembly. The semi-circular hook race spins at high speeds around the bobbin case.

Some of the problems that can occur with the rotary hook assembly include:

Lint and thread buildup around the hook race can cause the race to jam, which in turns jams the motor.

The deflecting needle hitting the hook race causes burrs (little tiny scratches in the metal) that can cut the thread as it glides over these burrs.

Hook Retainer Bracket (Finger) Adjustment

The hook retainer bracket prevents excessive movement of the bobbin case.

With the throat plate removed, rotate the hand wheel until the needle is low enough to view it and the notch in the bobbin case base.

The proper needle/notch relationship is when the center to the right edge of the notch aligns with the needle.



Hook Retainer Bracket

It is okay if the right edge of the notch aligns with the needle, but never the left edge. To adjust the:

1. Loosen the set screw that holds it (stationary finger) to the underside of the casting.

2. Move the bracket to left or right to set the proper needle/notch alignment.
3. It is also necessary to ascertain that the hook retainer bracket protrudes 1/2 to 2/3 into the depth of the notch.
4. Tighten the hook retainer bracket set screw.

Rocking Finger

The rocking finger is used to slightly tilt the bobbin case base so the top thread passes through the thread escapement without restriction.

An acentric cam located on the shaft behind the rotary sewing hook controls the rocking finger.



The acentric cam should be timed to make the rocking finger tilt the bobbin case base very slightly when the top of the take-up lever is slightly above level on its upward stroke as indicated below.



To time the acentric cam, loosen its two allen set screws and turn the hand wheel forward until the top of the take-up lever is 1/4 - 3/8" from corner of casting on its upward stroke. See diagram above. With the take-up lever in this position, advance or retard the acentric cam until the rocking finger reaches its maximum stroke toward the bobbin case base.

Stability - Before tightening the set screws, stabilize the in and out position of the rocking finger by making sure the acentric cam is near, but not touching, the hook-shaft bushing.

Rocking Finger Control

To adjust the amount of rocking finger control (effect) on the bobbin case base, loosen the clamping screw and, with throat plate off for visibility, adjust the

rocking finger to the right or left until it slightly tilts the bobbin case base, creating equal space on each side of the hook retainer bracket in the thread escapement as you rotate the hand wheel manually.

Tip: Make sure the position bracket does not hit the left side of the thread escapement.

Before tightening the clamping screw, make sure the contact point of the rocking finger is positioned so it will make its contact at the front edge of the shoulder on the bobbin case base. Tighten the clamping screw only slightly, with a small screwdriver.



Caution: Tightening the clamping screw too tight will cause binding of the machine and could break the rocking finger drive mechanism.

Hopping Foot Adjustment

The hopping foot is attached to the end of the presser bar and compresses the fabric layers as the stitches are formed. If the fabric is not compressed enough, the thread loop cannot be formed for the hook to capture it to complete the stitch.

The height of the hopping foot can be adjusted two ways:

1. Adjusting the stroke of the presser bar, or
2. Adjusting the height of the hopping foot.

The stroke of the presser bar is the distance it travels as the stitch is made. Adjusting the stroke of the presser bar moves the hopping foot up or down; finer adjustments are made by adjusting the height of the hopping foot.

To adjust presser bar stroke, press down on the spring loaded black button located on top of the take-up lever box as shown below.



Rotating the hand wheel while holding down the button causes it to drop into a slot. Hold the button in the slot and rotate the hand wheel forward to increase the hopping stroke or rotate

the hand wheel backwards to decrease the stroke.

Note the presser bar height should be readjusted after the stroking action has been set.

Tip: Don't adjust stroke too high or it could hop too high and break your rulers or bend your needle bar.

Height: (all models): Adjusting the space between the foot and the throat plate is accomplished by using a flat screwdriver to loosen the set screw seen through the hole located to the left of the main tension.



The proper foot height is determined when the foot is in the lowest point of its stroke. Perfect spacing is when the foot gently rests on the fabric, holding it still as the needle starts its rise. The amount of space varies with the different thickness of material being sewn. The proper height should be about the thickness of 3 business cards. Be sure to align the center of the foot with the needle before re-tightening the set screw.



Generally it is not necessary to adjust hopping foot height for different thicknesses of batting. If you change from your usual batting to a thicker batting and you are experiencing skipped stitches, you may need to adjust the hopping foot slightly higher for that quilt.

Tip: After adjustment the needle should rise 1/4 – 3/8" before the hopping foot should start its upward motion if this is not the case please contact your Gammill Dealer for assistance.

Needle Plate and Throat Plate

The needle plate is the silver, circular disc attached to the top of the throat plate. The needle plate has a small hole to accommodate the needle moving in and out of the fabric. The hole helps to restrict side-to-side movement of the thread as the stitches are formed. The only time the needle plate should need to be removed is to inspect it for burrs or for cleaning.

As the needle moves at high speeds it is deflected. Most often this deflection does not cause problems, however if the sewing head is moved too quickly

over the quilt or the fabric is too tight, needle deflection does not have sufficient time to recover. The deflected needle can strike the edges of the hole in the needle plate. This can cause thread breaks and/or burrs in the needle plate.

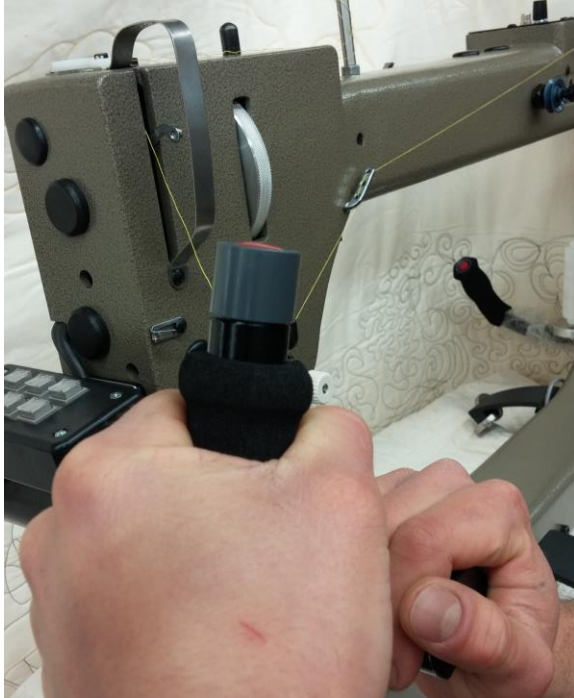
Removing the Throat Plate

The throat plate is the rectangular shaped, black plate affixed to the lower arm of the sewing head. The throat plate is moved out of the way or removed to gain access to the rotary hook assembly. It is not necessary to completely remove the throat plate. Instead, loosen and remove the two upper screws and one of the lower screws. You can now rotate the throat plate out of the way to access the rotary hook assembly.



Replacing Handle Switches

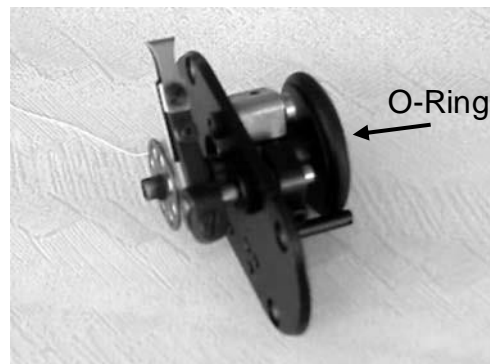
Switches in the handles are easily removed and replaced by simply unplugging them. To replace a switch, grasp the handle with both hands and using your thumbs, roll down the rubber padding as shown below.



Unplug and remove the old switch and replace with the new switch.



Maintenance and Repair of Built On Bobbin Winder



To replace a worn rubber O-Ring, remove the four screws which hold the bobbin winder to the casting. This will allow removal of the entire unit to gain access to the rubber O-Ring.

If the bobbin winder driving disk does not make contact with the O-Ring when the winder is engaged, this may indicate the driving disk needs to be moved closer to the O-Ring. To make this adjustment, locate and remove the rubber plug on top of the upper arm that aligns with the winder.

Using an allen wrench, loosen the two screws on the driving disk and with the bobbin winder lever engaged, slide the disk until it makes gentle contact with the O-Ring and tighten both screws.

Note: Hold the bobbin winder spindle with one hand. Turn the handwheel with the other. If you can hold the spindle, the driving disk needs to be closer.

Tip: If bobbin winds with less thread in the middle of the bobbin, the O-Ring is adjusted too tight to the disc.

8. Troubleshooting Stitch Quality Problems

Now that you are familiar with the mechanical parts of the stitching mechanism we will explore how these parts work together to form a stitch. If you are encountering problems with stitch quality, chances are it is occurring somewhere along the thread path.

How a Stitch is Made

The hopping foot compresses the fabric layers as the needle is lowered. The needle enters the fabric, bringing the top thread under the fabric.

Notice that the eye of the needle, which is slightly flared, is fully visible at this point. The thread travels into the fabric inside the groove at the front of the needle and the flaring of the needle eye helps penetrate the fabric layers to accommodate the thread.

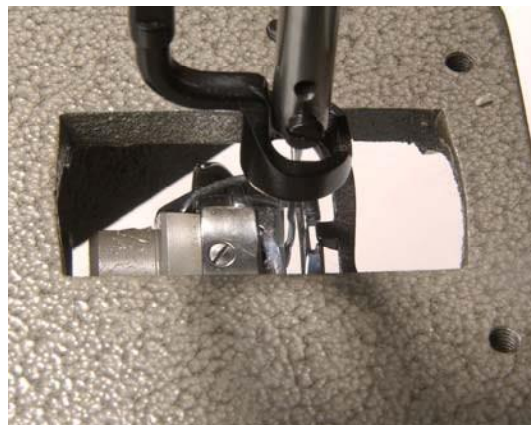
Tip: If you are using a thick thread with a small needle the groove and the needle eye are too small to accommodate the thicker thread and thread breaks can occur.



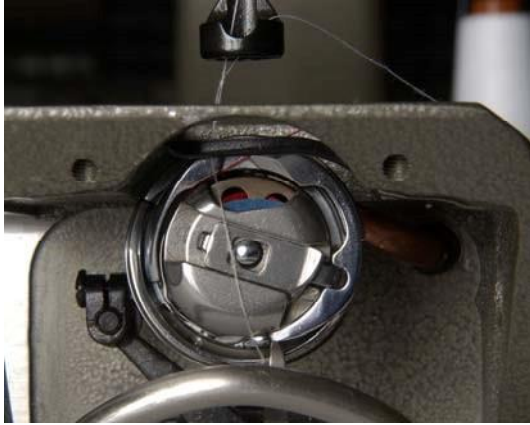
The hopping foot continues to compress the fabric as the needle begins to rise. The friction of the thread against the compressed fabric as the needle rises causes a loop to be formed under the fabric behind the needle.

Note: If the loop is not formed at this point, skipped stitches can occur. Some causes of this are: The hopping foot is not low enough to sufficiently compress the layers, or the fabric is sticking to the needle.

The hook captures the loop as the needle rises out of the fabric. Proper timing of the machine means that the hook reaches the loop at the exact time and location necessary to form the stitch. If the hook misses the loop, the stitch is not formed. If the hook point and needle are not close enough it can result in skipped stitches when the machine is pushed away from you.



The hook continues around the bobbin case, taking the top thread with it and completing the stitch.



Any burrs in the hook, race, or bobbin-case area can slice the thread as it is looped around during this step. Also, if the rocking finger is not set correctly, the thread can be caught as it moves around the bobbin case.

At this point, the loop of top thread has excessive slack. The take-up lever pulls the top thread up to release the slack. Improper tension or feeding of the top thread during this point in stitch formation causes problems with the top stitches, such as tightness in the fabric or loops. When the top thread is pulled up, the stitch is complete and formation of the next stitch begins.

Many factors can lead to poor stitch quality; however there are only two places you need look to find the problems. The first place is the top thread path from the cone to the needle and the second is the bobbin, hook and race assembly.

Checking and Adjusting Stitch Quality

Once the quilt is loaded and you are ready to thread the machine, follow these steps:

Clean and oil the sewing head.

Load the filled bobbin into the bobbin case. Check and adjust the bobbin tension.

Load the bobbin case onto the rotary hook shaft. Be sure to listen for the click that indicates the bobbin case is properly secured to the shaft.

Thread the top thread and pull the bobbin thread up.

Tip: After pulling bobbin thread up, check to see that the bobbin thread still pulls freely.

Test the tension by taking a scrap piece of fabric, folded once with batting, and stitch about 5". Run the machine at a medium speed and move the fabric away from the needle while holding the machine in place. Check the stitch quality on both the top and bottom. You should not see any bobbin threads on the top or any top threads on back. Once the bobbin tension has been checked and the checkspring tension has been set in the assembly, the only adjustment that should be made for the top tension is adjusting the intermittent tension.

Tip: Loosen or tighten intermittent tension 1/2 turn at a time until proper tension is achieved.

If the thread on top is laying flat or you see bobbin thread on the top but the bottom stitching looks good then you have too much top tension. Loosen your intermittent tension ½ turn at a time until stitching looks good.

If your top stitching looks good but the thread on the bottom is laying flat or you see top thread on the bottom then you do not have enough top tension. Tighten your intermittent tension ½ turn at a time until stitching looks good.

Top Thread Frays and Breaks

Probable Cause	Solution
Improper stitch size.	Make stitch size consistent and between 8-12 stitches per inch.
Improperly installed or damaged needle.	Replace needle. See Needles on page 6-4.
Restriction along thread path.	Check for proper threading. See Threading the Machine on page 6-1. Make sure thread cone points directly toward first thread guide. Top thread should pull smoothly without jerking. Do not allow arm or electrical cord to rest against thread cone.
Needle deflected out of alignment with sewing hook.	Use stronger (larger size) needles or do not pull fabric so tightly.
Improper needle bar height.	Check needle bar height. See Adjusting the Needle Bar Height on page 7-4.
Timing off.	Contact your Gammill Dealer for assistance.
Hopping foot too high or stroke out of time.	Adjust hopping foot timing so foot holds fabric still until needle has risen approximately 3/8". See Hopping Foot Adjustment on page 7-7.
Damaged hook point.	Polish back side of point or flange or replace hook.
Damage or burr at needle hole of needle plate or other thread handling part.	Locate damage or burr and polish smooth with crocus cloth or abrasive cord or replace part.
Too small needle for thread being used.	Use larger (thicker) needle.
Rocking finger disengaged, tilting bobbin case base too much, or improperly adjusted.	Adjust rocking finger to eliminate stress on thread. See Rocking Finger on page 7-6.

Loops on Bottom

Probable Cause	Solution
Improper threading or restricted top thread flow.	Refer to threading diagram and threading instructions. See Threading the Machine on page 6-1.
Not enough tension on top thread.	Tighten Intermittent tension. Rotary wheel tension should never be so tight as to stop the tension wheel from turning. See Intermittent Tension on page 8-3.
Checkspring improperly adjusted.	Adjust check spring. See Replacing the Checkspring on page 7-3.
Hopping foot too low.	Adjust presser bar height so Gam Foot is approximately 3 business cards above needle plate when foot is in lowest point of its stroke. See Hopping Foot Adjustment on page 7-7.
Foot stroke out of time with needle.	Needle should rise approximately 3/8" before foot starts rising. See Hopping Foot Adjustment on page 7-7.
Bobbin case finger too deep in notch.	Finger should be approximately halfway to 2/3 into bobbin case base. See Hook retainer bracket (Finger) Adjustment on page 7-6
Rocking finger improperly adjusted.	Adjust rocking finger. See Rocking Finger on page 7-6.

Skipped Stitches

Skipped stitches occur when the rotary hook fails to capture the thread loop at the back of the needle. Top fabric with heavy paint/coloring can cause the fabric to rise up with the needle. If this happens, the loop is not formed behind the needle. Skipped stitches can also occur when the rotary hook is not properly timed with the movement of the needle. The thread loop may be forming but the hook is not present at the moment the loop is formed.

"Eye Lashes" or "Railroad Tracks"

When stitches appear as a straight line with dots along either side, these are called eyelashes or railroad tracks because of the obvious resemblance. Eyelashes occur when the machine is moved too fast around curves or if the thread tension is too tight for one of the threads.

If eyelashes appear in curves, you should slow down the speed of the sewing head while stitching the curve. If the eyelashes continue to persist then adjust the tension as explained below.

If eyelashes appear on the top of the quilt, either the top tension is too tight or the bobbin tension is too loose.

If eyelashes appear on the back of the quilt, either the top tension is too loose or the bobbin tension is too tight.

Pokies

Pokies are little dots of thread showing along the stitch path. They generally occur when the top and bobbin threads are different colors. Even with the tension properly adjusted, pokies can and do happen. The best way to prevent pokies is to use the same color thread in the top as you do in the bobbin. Pokies can be less visible if a busy print fabric is used for the backing.

9. Using the Sewing Head

Cleaning and Oiling

The Gammill sewing head is designed for many years of use with proper maintenance including regular cleaning and oiling. Use only clear machine oil (not yellow oil). Yellow color indicates the presence of varnish that will build up on machine parts, causing friction as the machine sews. This friction reduces the useful life of the machine.

Since every machine is used differently, there are no standard recommendations for the frequency of oiling the machine or the amount of oil used each time. It is important that a small amount of oil is present in the oil ports at all time. However, too much oil may cause excess oil to seep from some part of the machine. Because of this, it is a good idea to park the machine away from the quilt when not in use and to wipe down the table and machine before loading, unloading or quilting the quilt.

Some indications of the need to oil the machine or bobbin are a change in sound as you quilt or a bobbin and/or bobbin case that is hot to the touch. Some general guidelines are listed below. Start with these guidelines and adjust the frequency or amount of oiling as needed to fit your quilting schedule.

Centralized Lubrication System

Oil the machine each day that you use it. If the machine has not been used for a few days it is recommended that you oil it the night before to allow the oil time to work its way through. If excessive oil drips from the bottom of the machine, then decrease the frequency of oiling.

The pictures below show oiling locations for all models. Two of the oil ports are capped with stainless steel spheres. The container of oil included with your machine has a thin brass tube affixed to the mouth. Use this tube to push down on the sphere to direct the oil into the port.

On the bobbin winder side, there are two oiling ports.



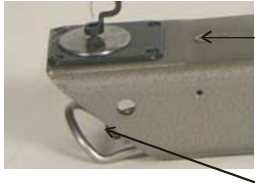
Three oil ports are located on top of the upper arm as shown below.



Add 1-2 drops, every 8 hours.

One oil port is located on the lower arm just behind the throat plate.

The final oil location is in the hook race which houses the bobbin case.



1 drop with every bobbin change. Also when bobbin is hot or rattling is heard.

Draining Excess Oil from the Take-Up Lever Box

Over oiling of the oil wicks located above the needle bar and presser bar causes oil to run down the needle bar or presser bar. To clean out the excess oil, first move the machine off the quilt and place a paper towel or other absorbent material under the drain hole to catch the excess oil.

Remove the small drain plug with the O-ring seal located below the inspection plate on the take-up lever box.

10. Basic Sewing Techniques

Bringing Up the Bobbin Thread

To prevent the bobbin thread from forming “rats nest” each time the stitching starts, you should bring the bobbin thread up to the top and secure it in place. Two ways to bring up the bobbin thread are described here.

At the Start of Stitching

At the beginning of the stitching both threads are loose and this is a quick way to use the top thread to bring up the bobbin thread. At the end of stitching, the threads are attached to the quilt and this method does not work.

While holding the top thread take a single stitch where you want the stitching to start.

Continue to hold the top thread and move machine 2-3 inches away then pull the top thread up which will pull the bobbin thread to the top.

Move the machine back to start position.

Grasp both threads and hold them to the side while making 4 or 5 securing stitches.

Hint: Move the threads slightly when making the securing stitches to ensure you don't stitch in the same location.

At the End of Stitching

When you reach the end of stitching and after the stitching is secured, use this method to bring up the bobbin thread to cut it.

Move the sewing head a few inches away from the stitching.

Grasp and hold the top thread then move the sewing head back to the last stitch. It isn't necessary to go back to the precise location of the last stitch but the closer you get, the smaller the thread tail will be after it is cut.

While still holding the top thread, take a single stitch then move the sewing head a few inches away.

As you pull on the top thread the bobbin thread is pulled up as well. Cut both the top and bobbin threads at the surface of the quilt.

Crossover Threads

As you stitch, especially for custom quilting, you sew a segment in one spot then move over a short distance to stitch another spot. Instead of stopping to cut the threads between these segments and, after you secure your stitches, you can simply move the sewing head to the new location and leave a thread trail connecting them. These connecting threads are called crossover threads.

Note: You will need to secure the stitches before and after crossing to the new location.

As you complete the stitching in an area you can leave the crossover threads to be cut later. Before advancing the quilt, it is a good idea to clip all the crossover threads in the area on the top of the quilt. The crossover threads on the back of the quilt can be clipped later.

When all the quilting is complete, the crossover threads on the top of the quilt will all be cut, leaving the crossover threads on the back. To quickly cut all the back crossover threads, unpin the quilt from the backing roller and go to the back of the machine.

Unroll enough of the quilt to lay on the top of the table. Cut all the crossover threads on the portion of the quilt on the table. After all those threads are cut, unroll more of the quilt and continue cutting crossover threads until the end of the quilt is reached. Unpin the quilt from the pick-up roller.

Securing Stitches

To prevent threads from unraveling, you need to make locking stitches at the beginning and end of each segment of stitching. You can do this by backstitching or by taking tiny stitches. Look for places to hide the locking stitches in places such as the binding seam allowance, busy fabric, or seam lines.

To backstitch at the start of sewing, start approximately ¼" inside the stitching line. Backstitch to the beginning and then proceed with the stitching. With this method, you are taking three or four stitches on top of three or four other stitches to secure the threads. At the end of stitching, simply backstitch for three or four stitches.

To lock the stitches with tiny stitches, simply move the machine a little slower to produce very tiny stitches that are not easily removed. Locking stitches in this way is not possible when using stitch regulation since all the stitches are the same length. You can either turn off the stitch regulation or use the needle up/down or single stitch feature.

Note: It is extremely important that stitching be secured at both the beginning and end of each sewing segment. Monofilament thread requires more securing stitches than cotton or polyester threads. Unsecured stitching will unravel.

Ripping Out Stitches

One of the most frustrating, time consuming things to do in long-arm quilting is to rip out stitches. Stitching that takes only seconds to put in can take hours to rip out. Choose a ripping tool that is small and sharp. You want to be able to lift and cut one stitch at a time while being careful not to rip the fabric.

Start at one end of the quilting stitches to be removed, and clip every third or fourth thread on the top of the quilt. If you are systematic and do this for the entire line of stitches, you will save time in the long run. After you have clipped every third or fourth stitch from the top, reach under the quilt and pull the bobbin thread to release all the stitches.