

**ABM International, Inc.**

Stitch Regulation User Manual

## 1.0: Overview - Standard Stitch Regulation

The Innova is equipped with a machine controller that handles all of the electronic functions of the machine. The controller performs the following tasks:

- stop and start the sewing motor
- maintain and adjust sewing speed
- perform needle positioning - up and down
- display sewing speed
- display electronic error messages in case of failure
- maintain stitches per inch (if equipped)
- deactivation of stitch regulation if idle for more than 20 seconds (if equipped)

When the power switch is turned ON, the machine controller defaults to the main screen (Figure 1.0). From this screen, the user can turn stitch regulation ON or OFF (if equipped), adjust needle stop position UP or DN and adjust the sewing speed when in manual sewing mode.

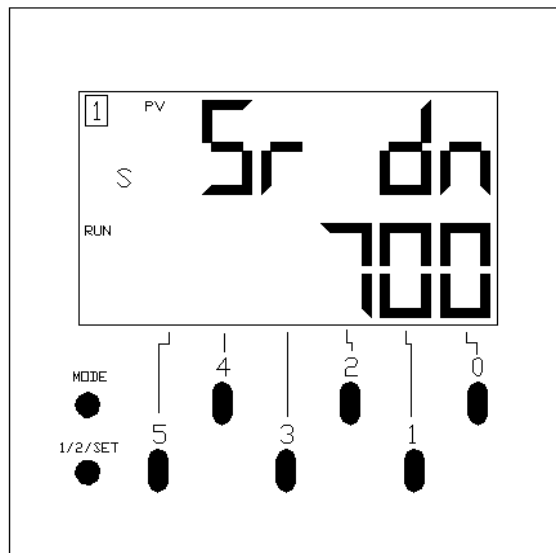


Figure 1.0 – Main Screen

The needle stop position is toggled between up and down by pressing the button marked “4”. The upper right section of the screen displays the current needle stop position “UP” or “dn” (down).

The stitch regulator, if equipped, is turned ON and OFF by pressing the button marked “5”. When stitch regulation is active, “Sr” will appear on the display. When stitch regulation is turned OFF, the “Sr” will not be visible and manual sewing mode is active.

Sewing speed in manual mode (SR off), can also be adjusted on the front of the control panel by using the buttons marked 0,1,2, and 3. Each time the button is pressed, the digit which corresponds to that button will increase by one. The 0 button adjusts speed from 0-9 in single digit increments. The 1 button adjusts speed from 10-90 in increments of 10. The 2 button adjusts speed from 100-900 in increments of 100 and the 3 button adjusts speed from 1000-3000 in increments of 1000. Any value entered that is less than 75 or greater than 3000 will revert to the closest default value, 75 or 3000.

The “mode” button allows the user to navigate through various screens that provided technical assistance as well as stitch regulation adjustment. The “mode” button may also be used to lock out the controller so that no modifications can be made. This may be helpful when allowing inexperienced users to use the machine unattended. Pressing and holding the “mode” button for more than 2 seconds will put the controller into “LOCK” mode. The word “LOCK” will be visible on the screen when enabled. To disable the lock, press and hold the “mode” button for more than 2 seconds. The word “LOCK” will turn off when the mode has been canceled.

Before setting the stitch regulator the user should understand the basics of the system. Stitch regulation is used to maintain stitches per inch during quilting. When in regulated mode the machine will automatically accelerate and decelerate based on the quilting operator’s movements. This occurs when the encoders mounted on the tracks send digital pulses to the controller which in turn increases and decreases the voltage to the motor running the sewhead. The number of stitches per inch is fully adjustable from 5-15 stitches per inch. We recommend that you set your machine between 8 and 12 stitches per inch to achieve the best results. The following steps will walk you through setting the stitches per inch, adjusting minimum stitch speed and turning stitch regulation (SR) on and off.

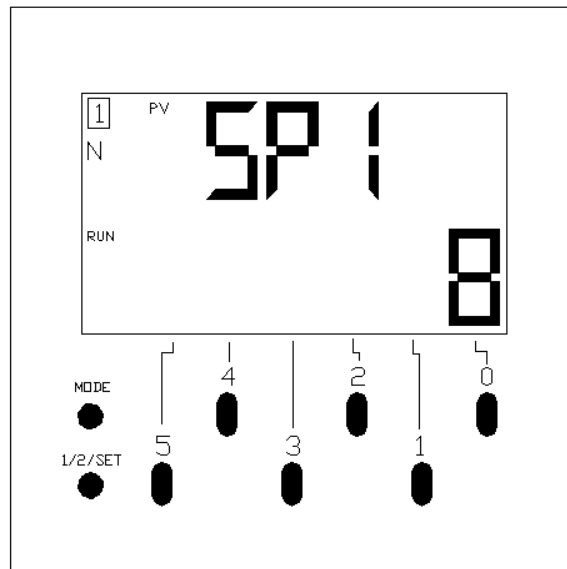


Figure 1.1 – Stitches per inch screen

From the main screen (Figure 1.0), press the “mode” button three times. The stitches per inch screen (Figure 1.1) will now be visible. From this screen, the user can adjust the stitches per inch between 5 and 15. Use buttons 0 and 1 to modify the value. Pressing the 0 button will adjust the SPI value between 0-9 in increments of 1. The 1 button will adjust the value between 0-90 in increments of 10 (NOTE: 15 is the maximum value allowed). When the value is modified, it will begin to flash. To store the modified value in memory, press and hold the “1/2/SET” button until the value stops flashing.

While in the stitches per inch screen (Figure 1.1), the operator may adjust the stitch regulator minimum speed (SrSPD). Quickly press and release the “1/2/SET” button. The stitch regulation minimum speed screen (Figure 1.2) will now be displayed.

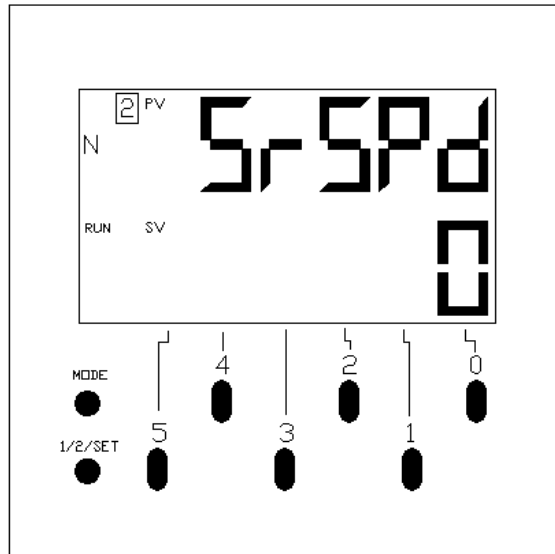


Figure 1.2 – Stitch regulation minimum sew speed screen

The SrSPD value controls the speed at which the quilting machine motor runs when the head is at rest (no movement). A value of zero would mean the head stops sewing when the operator stops moving the machine. A value greater than zero, between 75 and 500, means the sewhead runs at that set speed when the machine is at rest (no movement). ABM prefers to not use an SrSPD setting (factory set to 0). SrSPD has been used in the industry to combat large stitches when accelerating the machine from a stand still or in sharp corners. If the SrSPD is set too high, the user may notice a significant amount of very small stitches in sharp corners and starts and stops. Adjusting the SrSPD to a lower setting may help solve this problem. Again, the 0,1, and 2 buttons are used to set the value between 0 (off) and 75-500. The value will flash when it is being modified. Press and hold the “1/2/SET” button until the value stops flashing. This will lock the new value into memory. Quickly pressing and releasing the “1/2/SET” button will toggle between the SPI menu and SrSPD menu. Pressing the “mode” button once in either screen will bring the user back to the main screen (Figure 1.0).

Once all of the values are adjusted, the user may start stitch regulation. Press and release the green start button on the handle bar. If SrSPD is set to zero, the machine starts to sew only when the head is moved, maintaining the stitches per inch set. If SrSPD is set to some value other than zero, the machine will start to sew at the set speed. Stitching speed will only increase if the machine is moved fast enough to require a speed increase to hold the proper stitches per inch. (NOTE: Setting the SrSPD too high may result in poor stitches per inch consistency).

Press and release the green button again to stop stitch regulation. This will allow the user to move the quilting machine to a new position without sewing. The button marked “5” can be used to turn stitch regulation on and off. If “Sr” is not visible on the main screen, the machine is in manual sewing mode.

## **1.1: Quick Reference**

### **Operating in manual mode –**

Step 1: Quickly pressing and releasing the (Red) left hand button will toggle the machine between needle up and down position.

Step 2: Press and release the (Green) right hand button and the sewhead will start to run

Step 3: Press and hold the (Green) right hand button and the sewhead will increase sewing speed.

Step 4: Press and hold the (Red) left hand button and the sewhead will decrease sewing speed.

Step 5: Press and release the (Green) right hand button again and the sewhead will stop.

### **Operating in stitch regulated mode –**

Step 1: Quickly pressing and releasing the (Red) left hand button will toggle the machine between needle up and down.

Step 2: Press the #5 button on the control panel and stitch regulation (SR) is activated. The main screen of the display will show “Sr” when stitch regulation is activated.

Step 3: Press and release the (Green) right hand button and the sewhead will start to run

Step 4: The faster you move the machine the faster it will run.

Step 5: The slower you move the machine the slower it will run.

Step 6: Press and release the (Green) right hand button again and the sewhead will stop.

Step 7: Press the #5 button on the control panel and stitch regulation mode will turn off.

## 2.0: Overview - Lightning Stitch Controller

The Innova Lightning Stitch kit provides the user with the most advanced stitch regulation system available today. The system consists of two encoders, a controller, an amplifier, a motor and an operator interface. Together these components provide a closed loop stitch regulation system that provides significant improvements in stitch length accuracy.

The encoders, which are identical to the standard stitch regulation assembly, detect physical position and velocity of the Innova quilting machine relative to the frame. As the operator moves the machine to the front, back, left or right, the encoders relay digital information to the controller about the direction, velocity and position of the machine.

The controller processes the incoming information from the encoders and makes informed decisions about how to operate the Innova based on inputs, outputs and the operator interface. Once the controller has determined it is necessary to change the motor speed, digital information is relayed from the controller to the amplifier.

The amplifier provides the controller the muscle needed to drive the motor. This allows the system to achieve extremely high acceleration and deceleration rates and allows the controller to maintain constant speeds. Additionally, the amplifier provides information of the motor position, velocity and state back to the controller thereby closing the loop. The amplifier and control have built in LED arrays to aid in troubleshooting if problems are encountered. However, for the majority of users, the encoders, controller, amplifier and motor are components that will operate behind the scenes with no need for adjustment or in-depth knowledge. The last component of the system is the operator interface (see Figure 2.0).



Figure 2.0 – Main operator screen of a Lightning Stitch

The operator interface provides the Innova user the ability to modify settings of the lightning stitch regulator as well as maintain and troubleshoot problems if needed. When the Innova is turned on, the Lightning Stitch controller and interface will take a few moments to boot – usually 30 seconds to 1 minute. The boot up procedure allows the controller to check that all components of the system are functioning properly. If problems are detected, the controller will notify the user through the operator interface. Though not required, it is recommended that the machine be allowed to boot up completely before attempting to operate the machine. This will ensure that all components function properly. Upon completion of a successful boot up, the main operator screen will be displayed.

The system has been built in such a way that the interface is not imperative to the operation of the system. This means that if the interface were to fail, the lightning stitch assembly would still function and operate based on its last parameter settings for stitches per inch and quilting mode. However, without a working interface, the settings would be unchangeable.

### 3.0: Lightning Stitch Operator Interface

The main operator screen provides all of the needed settings for quilting on a day-to-day basis. The screen also contains buttons that allow access to additional screens where more technical parameters may be adjusted. The version of Lightning Stitch screen software running on the machine can be found in the lower right corner of the screen directly above the SETUP button.

Starting in the upper left corner of the screen below the Lightning Stitch Logo you will see the current speed. The number directly below the text is the actual value of the Innova sewing machine during Regulated, Manual and E-corder mode. To change the speed in manual mode, the operator has two choices. Pressing and holding the green button on the front or rear handle bars of the Innova will increase the speed. Pressing and holding the white button on the front or rear handle bars of the Innova will decrease the speed. Accessing the SETUP screen will also allow the operator to manually enter a numeric value.



Figure 3.0 Main operator screen of a Lightning Stitch

Directly to the right of current speed is Bobbin % remaining. This is a valuable tool that helps to keep the operator informed of the amount of thread left on the bobbin. The value is a countdown percentage based on the calculated sewing distance recorded by the controller. Pressing the RESET button returns the value to 100% and signifies a bobbin change to the controller. The Bobbin % remaining value is adjustable in the setup menu and will be discussed later.

Directly to the right of the Bobbin % remaining value is the Stitch/Inch which stands for stitches per inch. Touching the value below the text brings up the keypad (see Figure 3.1). Any value between 3 and 22 may be entered. Touching the ENTER key will close the keypad and record the setting. Any value outside the range will be disregarded. Setting a value of 5 or less puts the Lightning into AUTO-BASTE mode. This allows the operator to move the machine at a slow speed and the machine will perform a rapid single stitch at the correct stitches per inch.

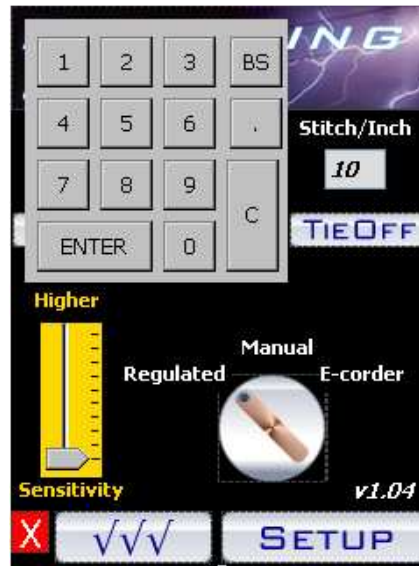


Figure 3.1 Keypad on main operator screen.

Directly below the Stitch/Inch value is the TIEOFF button. Pressing the TIEOFF button will cause the machine to make a pre-determined number of stitches while standing still. The value for the number of stitches is adjustable in the SETUP screen.

To the left of the TIEOFF button is the JOG button. Pressing and holding this button will make the machine jog at a slow constant speed. The speed of the JOG is not adjustable.

To the left of the JOG button is the PICKUP button. Pressing the PICKUP button will cause the machine to make a single stitch in the material so that the bobbin thread can be brought to the top of the quilt.

Directly below the PICKUP button the Sensitivity slider. The adjustment is such that the closer the slider is to the top, the more sensitive the motor will be to speed changes. The correct sensitivity is ultimately the user's choice but ABM recommends the lowest possible setting for everyday quilting. If small intricate work must be accomplished, a higher sensitivity will help to ensure consistent stitches per inch. If higher speed work with long sweeping movements is to be performed, a lower sensitivity will help to smooth out the machine speed adjustments creating a smoother operating machine and more consistent stitch quality and look.

Directly to the left of the Sensitivity slider is the three position sewing mode toggle. The three selectable positions from left to right are Regulated, Manual and E-corder. Touching the toggle switch will advance the switch by one setting. When the toggle is pointing toward Regulated the Innova is set for stitch regulation mode. This mode will vary the speed of the machine based on how fast or slow the machine is moved. In this mode, the controller will maintain the set number of stitches per inch. If the toggle is set to point to Manual, the machine will be set to manual sewing mode. The machine will run at a constant speed determined by the current speed value. Speeds may be adjusted with the green and white buttons or by manually entering a value under manual speed in the SETUP screen as discussed earlier. The final mode of the toggle switch is E-corder. When the toggle points to this label the machine is in E-cording mode. If an E-cording unit is attached to the machine, the unit will enable and lay cord down under the stitch as the machine is moved. The machine is limited to 1200 RPM in E-corder stitch regulated mode. It is important to remember that even though the machine is equipped with a stitch regulator, it is possible to over-speed the machine and cause big stitches. If the 3000 RPM limit in Regulated mode or the 1200 RPM limit in E-corder mode is exceeded, stitches larger than selected will be produced.

Directly below the Sensitivity slider is the red box with an X. This box is the exit button that will allow the operator to exit out of the operator interface software and access the screens operating software. Only access the operating



software if instructed to do so by an ABM technician. If the button is accidentally pressed, cycle the power of the machine OFF and then back ON to re-boot the system.

The button directly to the right of the red X accesses the system status screen (see Figure 3.2). From this screen the user may confirm the correct functioning of the pushbuttons and the X and Y axis encoders. Pressing and holding the button will change the color of the specified lamp. Releasing the button will return the lamp back to its original color. Moving the machine left or right will change the value of the X position. Moving the machine forward or backward will change the value of the Y position.



Figure 3.2 System status screen

Touching the PREV button returns the user to the previous screen – in this case the main operator screen.

On the main operator screen (Figure 3.0), the button located in the lower right corner is the **SETUP** button. Touching this button will access the system setup screen (see Figure 3.3). The system setup screen allows the user to adjust manual mode and stitch regulator mode values. All of the values are adjusted by touching the number below the text and entering the desired numeric value with the keypad and pressing **ENTER**. Values outside the ranges of the individual settings will be disregarded.



Figure 3.3 System Setup screen

The Bobbin Length value is the distance in yards of the thread on the bobbin. Larger thread sizes will allow less thread to be wound on the bobbin and thinner threads will allow more. Adjust the value as needed. In most cases, this will be an experimental value. An initial value of 100 to 120 is a good place to start. Make adjustments as needed.

The Manual Speed value is the constant speed the Innova will operate when turned ON or OFF by the green button. The user may enter any number between 75 and 3000 RPM.

The Start Speed value allows the user to set a minimum sewing speed for stitch regulated modes. Setting the value to 100 will cause the Innova to run no slower than 100 RPM during regulated modes. Even when the machine is standing still, the stitch regulator would maintain the minimum speed. Enter a value of 0 to disable the start speed. When the value is 0, the regulator will come to a stop when the machine comes to a stop.

The Encoder Diameter value allows the user to fine tune the stitch regulators stitches per inch. The standard setting is 1.25. If the user encounters a problem with the stitches per inch value not agreeing with the actual stitch amount, it will be necessary to adjust the encoder diameter value. A smaller value will decrease the actual stitches per inch and a larger value will increase the stitches per inch. Only small adjustments, plus or minus 0.02, should need to be made if any. However, the value can be set for any desired result.

The Tie Offs value allows the user to set how many complete stitches the machine will make when the TIE OFF button is pressed on the main operator screen.

The needle position displays the current setting. The needle out of the material is needle UP and the needle in the material is needle down. The needle UP position may be adjusted by touching the HOME button and accessing the home screen (see Figure 3.4).



Figure 3.4 Home screen

The Lightning Stitch control system operates off of the motors known position. As a result, the user may adjust the needle UP position electronically instead of mechanically as with other stitch regulators. To set the needle UP position, touch the START button on the home screen. Press the JOG FWD button to advance the needle to the desired position and then touch TEACH to set the value.

Touching the PREV button will return you to the main operator screen.

When the green button is pressed to begin sewing, the text “MACHINE RUNNING” will display across the main operator screen (See Figure 3.5) . Pay close attention to the display. Certain stitch regulated modes will make the machine appear as though it is in a “no sew” mode when in fact it is waiting for the machine to be moved. The “MACHINE RUNNING” text will inform the user of the machines enabled condition.



Figure 3.5 Main operator screen while machine is sewing

In addition to the standard screens, Lightning Stitch version 1.04 or higher contains fault screens that will help to inform the user and ABM technicians of problems that the machine might encounter (See Figure 3.6). The fault screen displays a list of descriptions preceded by a fault code number and a white check box. If the machine has a fault, the fault screen will appear and a check box will be marked next to the current problem. Pressing RESET will attempt to clear the problem. If the fault screen disappears and does not return after pressing RESET, the problem has been fixed. If the fault screen reappears, it is necessary to contact ABM directly.

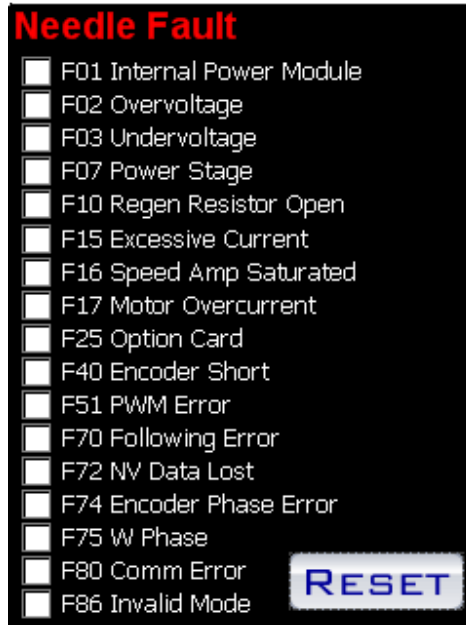


Figure 2.6 Needle Fault screen

### **3.0: Quick Reference**

#### **Operating in manual mode –**

Step 1: Quickly pressing and releasing the (White) left hand button will toggle the machine between the needle up and down position.

Step 2: Press and release the (Green) right hand button and the sewing head will start to run at a constant speed determined by the MANUAL SPEED in the SETUP screen.

Step 3: Press and hold the (Green) right hand button and the sewing head will increase sewing speed.

Step 4: Press and hold the (White) left hand button and the sewing head will decrease sewing speed.

Step 5: Press and release the (Green) right hand button again and the sewing head will stop.

#### **Operating in Regulated mode and E-corder mode –**

Step 1: Quickly pressing and releasing the (White) left hand button will toggle the machine between needle up and down.

Step 2: Press the toggle switch on the main operator screen to select Regulated or E-corder mode.

Step 3: Press and release the (Green) right hand button and the text MACHINE RUNNING will appear on the main operator screen. Depending upon the START SPEED set on the SETUP screen, the needle will either not move if the operator is not moving the machine or the machine will default to the START SPEED if the operator is not moving the machine.

Step 4: The faster you move the machine the faster it will run, up to 3000 stitches per minute.

Step 5: The slower you move the machine the slower it will run. If the START SPEED is set to a value greater than 0, the START SPEED will be the minimum speed the machine will run – the machine will not stop.

Step 6: Press and release the (Green) right hand button again and the sewing head will stop at either the needle UP or the needle DOWN position depending upon the selection in the SETUP screen.