RMS

ROLLER-GRINDER®

AccuGap™

PROUDLY MADE

IN THE USA

Table of Contents

SYMBOLS

✔ -- Accept entered value and exit pop-up editor

✘ -- Exit the pop-up editor without accepting entered values

⬅ -- Backspace – Erase entered character

🟢 -- Roll gaps are currently at their requested positions

🟡 -- Roll gaps are actively adjusting to their requested positions

🔴 -- Roll gaps are not in position and not actively adjusting

Roller Mill Empty ----------------------- Rollermill motor amps below the empty amp (no-load) threshold

Roll Wear Sensor --------------- Grain building up in the machine indicating possible dull rolls

VFD Error --- VFD communication error

Gap Position Error ----------------------------------- Button to clear gap movement timeout and VFD comm error(s)

Error -- Button to clear Individual gap sensor error(s)

Clear Error --- Button to clear equipment motor error

Rolling -- Open Screen (Rolling)

CLOSE --- Close current window

Exit -- Exit out of HMI program

SECTION 1 – ROLL GAP AUTOMATION
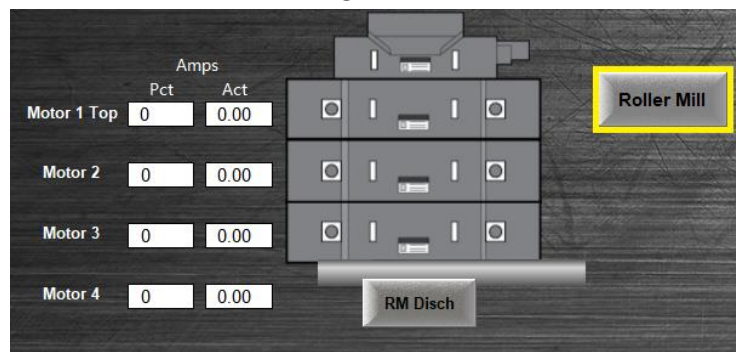
ROLLING SCREEN

Figure 1.1
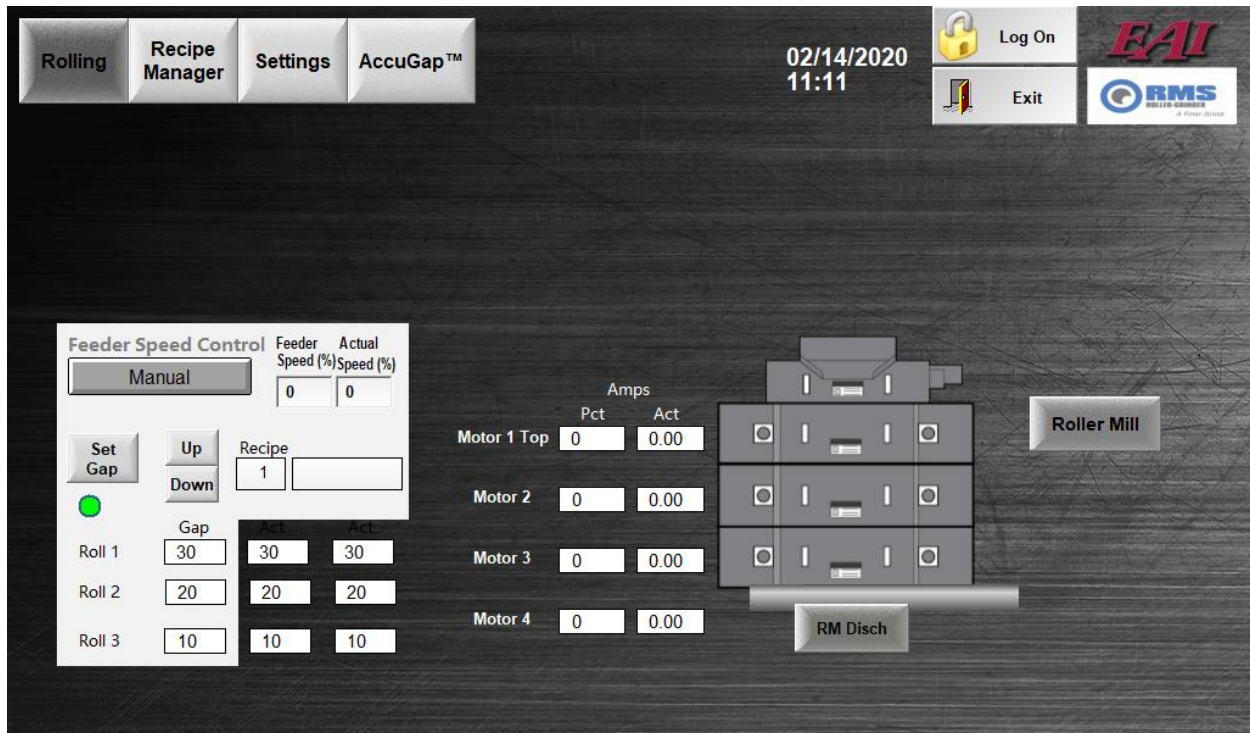
Note: More equipment may be shown in Figure 1.1 than what your purchased mill may include.
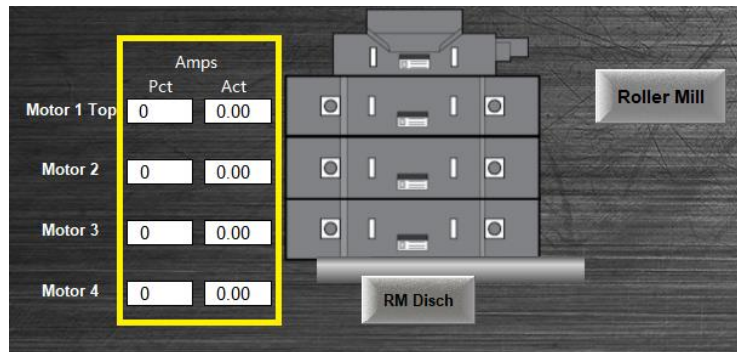
STARTING THE MILL

1. Press the "Roller Mill" button and the machine will start every mill motor in sequence.

Figure 1.2

2. Note the amperage value and percent of maximum motor amps are displayed to the left of the mill.

Figure 1.3

3. Blue color indicates that the individual mill equipment is running. A green colored button indicates that all the rolls are running and therefore the mill is up and running.
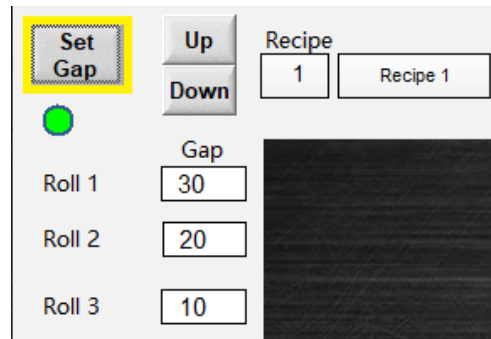
Figure 1.4

ADJUSTING ROLL GAPS TO A REQUESTED RECIPE

Notes:

- Gaps can be adjusted whether the rolls are running or not, however the feedroll <u>must be turned off</u> prior to adjusting.
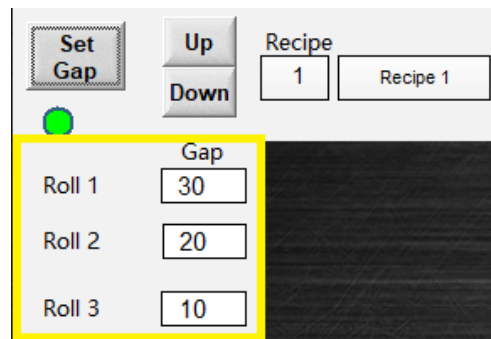- Recipes are managed through the Recipe Manager Screen (Page 7).

1. The gaps are automatically adjusted by tapping the "Set Gap" button on the Rolling Screen.

Figure 1.5

2. Having pressed "Set Gap", the rolls move to their requested positions dictated by the gap recipe targets highlighted in Figure 1.6.

Figure 1.6

3. The indicator beneath the "Set Gap" button is color-coded as follows:

Green: All roll gaps are at their requested gap positions.

Yellow: One or multiple roll gaps are actively adjusting to their requested positions.

Red: Roll gaps are not at their requested positions and not actively adjusting.

SETTING FEEDROLL OPERATING MODE

Note: There are two modes by which the feedroll can be set to operate: Manual mode and Current Following mode. Press the button to toggle between the two. The current mode is displayed on the button itself.

Manual Mode is for manual adjustment and testing. In this mode the feedroll speed is set to a percentage of the feedroll maximum speed range (0-60Hz). In the figure below we are set to Manual Mode with a set speed of 30%. The feedroll speed will ramp up to 30% (18Hz) of full speed when the feedroll is running.

Figure 1.7
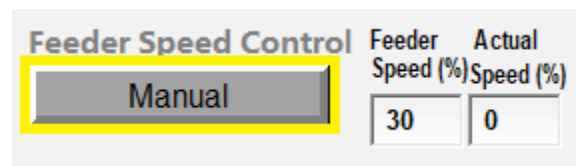
Current Following mode is best for normal operation and allows you to get the most out of the roller mill. In this mode the feedroll speed is automaticaly adjusted to keep the roll motors at a target amperage percentage. For example if you want the roll motors to grind at 80% of their rated amp load, simply set the current following Target Amps(%) to 80 as in Figure 1.8.

Figure 1.8
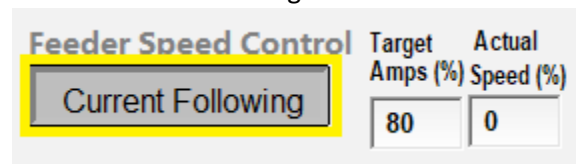
Notes:
- Current Following mode only takes affect when operating in automatic grinding mode (See the section Operating In Automatic Mode on Page 6).
- The Actual Speed(%) box is not a settable parameter but rather a real-time display of the actual percentage speed the feedroll is currently operating at.
- Depending on the grind recipe and/or other settings and limitations in the machine itself, motor amps may not be able to ramp up to some larger Target Amp settings while in Current Following mode.
- The feedroll speed is directly correlated to capacity but not directly proportional. 100% feedroll speed is not 100% capacity of the machine.
- When cracking grain the feedroll will need to be set to manual mode as cracking does not allow the mill to draw enough amps for current following.

OPERATING IN AUTOMATIC MODE

<u>Note:</u> The automatic mode control options in Figure 1.9 are only visible when all the mill roll motors are fully up and running.

Figure 1.9
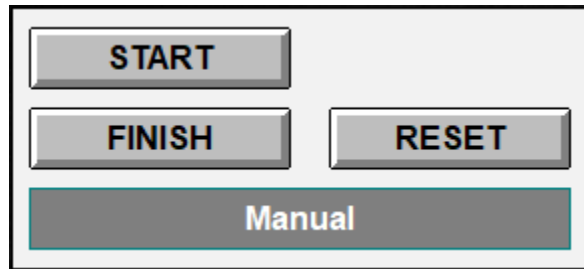
1. Press the "Start" button to start the automatic grinding process. The system will check to make sure the discharge equipment is running, the roll gaps are at their requested positions, and there are no system errors present. Once that is verified, the feedroll starts and operates according the set feedroll mode. If there is a scalper assist present on the machine it will automatically start up with the feedroll and its operating speed will vary with the feedroll speed.

2. Pressing the "Finish" button will begin the cleanout/shutdown process. The equipment will shut down in reverse order of the startup sequence and according to each individual shutdown time (see Shutdown Timers in the Settings Screen section – Page 9).

3. The "Reset" button will immediately exit the automatic process no matter what stage it is in without going through the regular timed shutdown process.

4. To know where you are at in the automatic grinding process keep an eye on the status bar toward the bottom. The grinding stages are, in order: **Starting** (rollermill equipment automatically starts), **Running** (all equipment is up and running), **Cleanout** (system shutting down) and **Manual** (idle state).

Figure 1.10
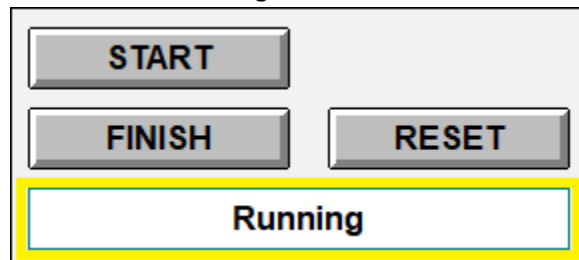
RECIPE MANAGER SCREEN

Figure 2.1
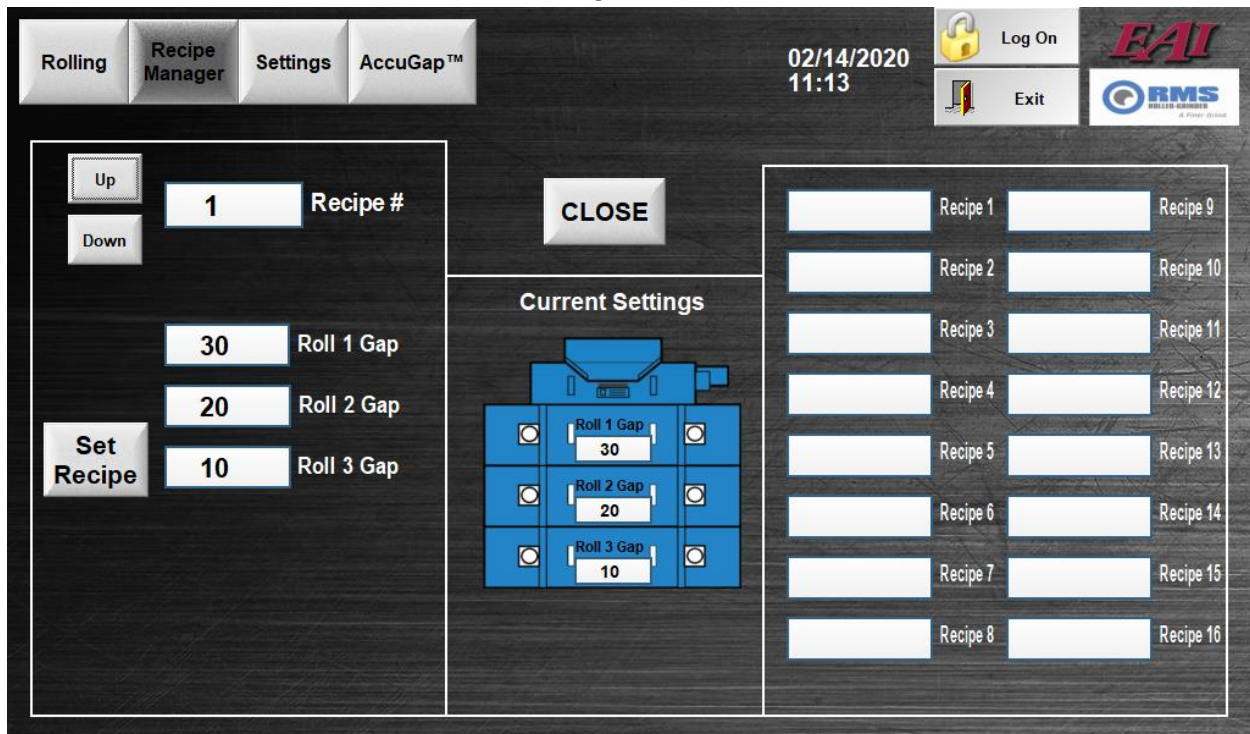
EDITING A RECIPE

1. Select which recipe to edit using the "Up" or "Down" buttons.
2. With the desired recipe selected (#1 in this case) click on each roll gap value entry box, one at a time, to edit each individual roll gap setting.

   Example)

   i.   Click on the box next to the "Roll 1 Gap" text.

   ii.   Use the pop-up keypad to enter in a desired gap value for Roll 1 in thousandths of an inch. We will change from 30 to 25 thousandths in this case.
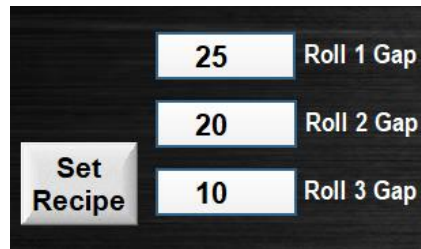
Figure 2.2

Note: Press ✔ to accept. ✖ would be pressed to cancel the change and

pressing ⬅ would erase an entered character.

iii. The green checkmark is pressed to accept value 25 which now shows in the "Roll 1 Gap" box.

Figure 2.3

iv. **Important:** Press the "Set Recipe" button for the recipe changes to take effect.
v. Confirm in the Current Settings section in the middle of the screen that the recipe has in fact changed, indicating a successful edit of the recipe.

Figure 2.4
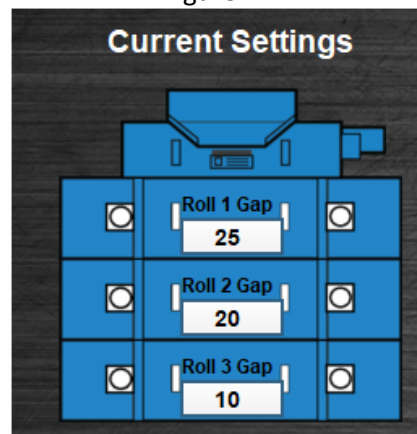
NAMING A RECIPE

    Note: Naming your recipes is not required but can be helpful to the operator.
1. To name Recipe 1, click on the box next to its listing on the righthand side of the screen.
2. Enter whatever name you desire via the pop-up keyboard and press the green checkmark once the name is correctly entered in. "Recipe 1" was entered in this case.

Figure 2.5

SETTINGS SCREEN

Figure 3.1

The Settings Screen contains a variety of settable values across different mill functions

Shutdown Timers

The shutdown settings are referenced when the system enters the shutdown stage i.e. when the "Finish" button is pressed on the Rolling Screen (Page 6) or a condition is encountered that kicks the system out of automatic mode. Taking the settings in Figure 3.1 for example, when the system enters shutdown the feedroll will shut down in 0 seconds, the discharge conveyor 20 seconds after the feedroll turns off (if the conveyor is controlled by EAI), and then the main mill motors 2 minutes after feedroll turns off. These timers are adjustable.

Rollermill Empty Amp Settings

Empty Amps settings are based off the no-load condition of the mill i.e. the amperage each roll motor draws while the feedroll is off and there is no active grinding. The empty amp thresholds will need to be a tad higher – an amp or so for each roll - than what is actually drawn for amps (displayed on the Rolling Screen – Page 3). This is because for the mill to be considered empty all motors need to draw **below** the amounts entered here for their empty amp thresholds.

Feeder Settings

These two settings are tied into the automatic grinding process. The Feeder Idle Speed % comes into play when the mill is empty. If there is no grain flow, it is preferable to keep the feedroll speed fixed at a minimal rate as to not slam the machine with an excess of grain once flow is restored. Therefore, the feedroll will idle at this set speed until the machine starts doing work again at which point it will ramp back up until the Target Amps(%) setting is reached.

The Feeder Max Speed % is the maximum speed the feedroll will run when attempting to reach the target amps that are set in the Feedroll control on the Rolling Screen (Page 5).

Event Log

Keeps a record of specific events or errors that the system has encountered and a date/time recording of when they occurred. This can be useful for looking back on event history or in identifying error trends to be able to tell if a specific part of the machine needs attention.

Figure 3.2

State	Activation T... ▽	Message	
	11/19 14:33	Roll Wear Sensor Hit	
	11/15 13:34	Rolls Were Re Zero'ed	
	11/15 13:33	Rolls Were Re Zero'ed	
	11/15 13:32	Rolls Were Re Zero'ed	
	11/15 13:31	Rolls Were Re Zero'ed	
	11/15 11:15	RM Motor 3 Failed To Start	
	11/15 11:15	RM Motor 2 Failed To Start	
	11/15 11:14	Top Right Sensor Not Found	
	11/15 11:14	Top Left Sensor Not Found	

GAP CALIBRATION SCREEN

Figure 4.1
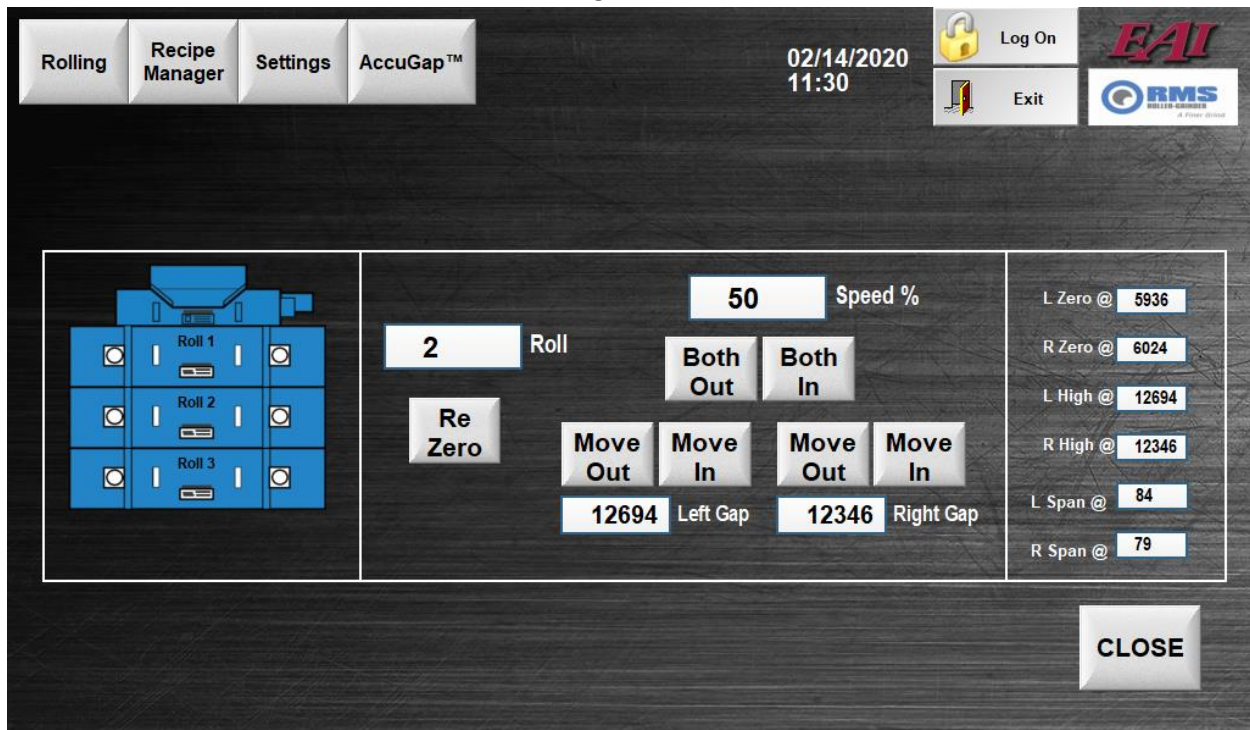
The Gap Calibration Screen can be opened by pressing the "Gap Calibration" button located within the Settings Screen (Page 9).

Figure 4.2

On the Gap Calibration Screen, there are two functions that can be accomplished: Re-zeroing gaps and manually moving the gap motors in and out, individually or in unison. These functions are on a per-roll basis.

RE-ZEROING A ROLL

If a manual re-paralleling of the machine has just taken place and the roll gaps are sitting at their new zero locations, the "Re Zero" button will need to be pressed for each roll that has been paralleled. There are numbers toward the righthand side of the screen to indicate the current gap calibration settings (Figure 3.4). All of these values will automatically adjust accordingly when a re-zero occurs.

Figure 4.3
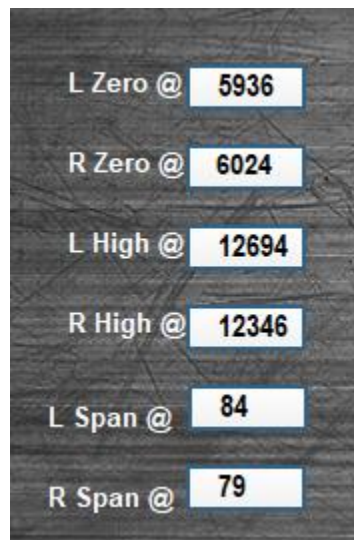
MANUALLY ADJUSTING THE GAP POSITIONS

Figure 4.4
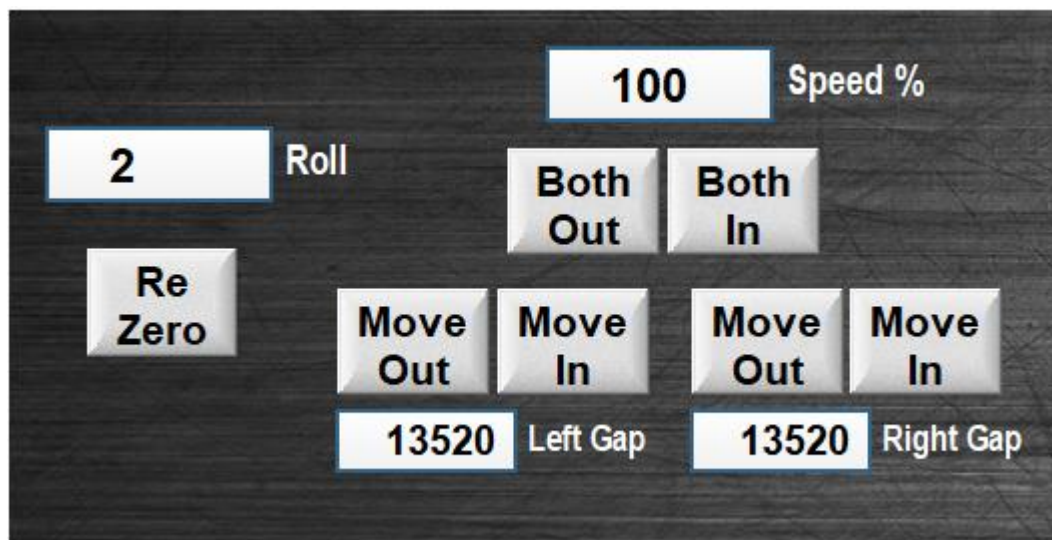
1. Select which individual roll to move. In the case of Figure 3.5 above Roll number 2 has been selected.

2. To then manually adjust the Roll 2 gap either in (making the gap smaller) or out (making the gap larger) a speed percentage (0-100%) must first be entered. Playing with the speed percentage could allow for finer movement control depending on how precisely the roll needs to be positioned.
   Note: Setting the Speed % to any value below 10% may result in no movement due to lack of power to overcome mechanical resistance.

3. Once the desired speed is set, the roll gap can either move in or out in unison via the "Both Out"/"Both In" buttons where both sides left **and** right move simultaneously at the set speed percent or individually by pressing the "Move Out"/"Move In" buttons for each individual side of the roll, left **or** right.

4. The "Left Gap" and "Right Gap" readings toward the bottom are an indication of the roll position. By these readings you can verify that the rolls are moving appropriately. For instance, if you are moving the left gap in then the number will become smaller as it is moved inward. The number becomes larger for outward movement.

COMMON ISSUES AND SOLUTIONS

Table 1

Problem	Cause	Solution
One or all of the Roll motors will not start resulting in a "MOTOR FTS" error condition.	• Power supplied to the mill motors has been inhibited or interrupted. • There is grain above or in between the roll(s).	• Make sure the motor panel has power turned on and there are no tripped overloads/circuit breakers • Open the roll gaps to the plugged recipe, generally between 100-120 thousandths for each roll. Try and start the mill again. If the machine still won't fully start up call RMS Roller Grinder or EAI for further assistance.
The feedroll shuts off and there is a "FEEDER SHUDOWN" error condition.	While grinding, the roll motor(s) draw 110% of their full load amps at which point the system will automatically stop the feedroll/grain flow.	If operating the feedroll in Set Speed Mode, it is possible that the feed rate may be faster than what the machine can handle. Rarely does the feedroll speed get above 50% unless a very coarse grind recipe is set.
The mill motors shut down and there is a "High Amps Shutdown" error condition.	While grinding, the roll motors draw 120% of their full load amps at which point the system will automatically shut down the roll motors after 5 seconds to protect the motors from being damaged.	• Feed is getting built up in the mill which may require slower feedroll speed or sharper rolls. • A motor itself may be failing and drawing more amps than designed for. Get the motor checked out.
While operating in "Current Following" mode, none of the mill motor amps fully ramp up to the Target Amps (%) setting.	The feedroll may be set to ramp up to a Feeder Max Speed setting that is lower than what is required to reach the target amps for the roll motors.	Check the Feeder Max Speed % setting on the Settings Screen (Pg. 9) and evaluate whether the max speed should be bumped up in order to run more product and optimize mill efficiency.

Problem	Cause	Solution
The gaps for one or multiple of the rolls are constantly adjusting and never settling into position and keep adjusting in and out endlessly.	The roll motors encounter more resistance than usual when setting the gap, building spring tension. When the motor tries to home in on the requested gap position the tension in the spring causes the roll to overshoot the requested gap(s) even while the motor is no longer engaged.	The problem roll(s) may require greasing or further attention. Reach out to RMS Roller Grinder for further assistance.
While in "Running" mode the feedroll keeps shutting down and starting back up perpetually.	- Product is flowing too fast and pushing harder against the rolls causing them to move out of the acceptable tolerance. - A feedroll pause condition is repeatedly encountered that is not conducive to normal operation.	- Slow the feed rate down. - Call RMS Roller Grinder or EAI to investigate the root cause.
The feedroll is running very slowly and never ramps up to try and meet the Target Amps (%) setting.	- The feedroll may be running empty i.e. the grain supply above the mill is either empty or inhibited. - The mill motors may not be drawing enough current to surpass their empty amp settings. You can confirm this by viewing the Rolling Screen (Pg. 2) to check for the "Roller Mill Empty" status on the main mill graphic (seen on Figure 1.4).	- Review the current motor amp draws on the Rolling Screen (Pg. 2) for each motor versus their Empty Amps settings on the Settings Screen (Pg. 9). You may have to lower these settings to allow the mill to move past the empty status. - Increase the Feeder Idle Speed slightly on the Settings Screen (Pg. 9) to lower the chance of the motor amps dropping below their empty settings.

SECTION 2 - ACCUGAP™

ACCUGAP™ SCREEN

Figure 5.1
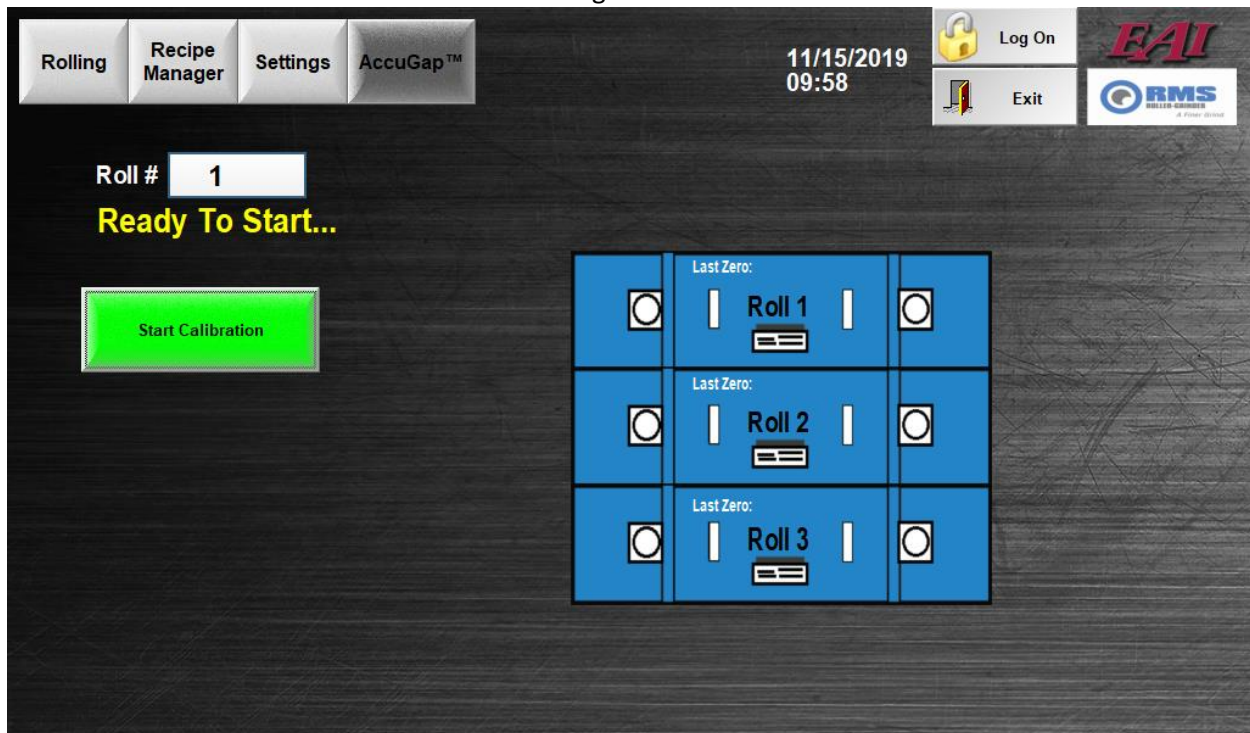
The AccuGap™ process is used to automatically re-zero and re-parallel or in other terms "re-calibrate" the rolls. Only one roll set may be calibrated at a time.

ACCUGAP™ PROCESS

1. Open the screen by pressing the "AccuGap™" button. Enter which roll you want to calibrate in the Roll # entry. If the system is clear for the process to begin there will be a status of "Ready to Start" as in Figure 5.1 indicating that the "Start Calibration" button can be pressed. Once calibration is started for a roll, it will automatically complete in under 10 minutes without the operator needing to do anything else.

Note: Once started, a "Stop Calibration" button will appear as an option to manually stop the process for any reason the operator might deem necessary. Manually stopping calibration effectively cancels AccuGap™ mid-process, immediately returning the roll to its recipe setting and will result in <u>no change</u> to the calibration values.
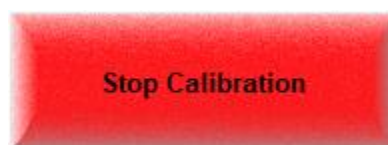
2. During calibration the machine will automatically parallel the rolls first and then find and record new zero reference positions. After first moving the roll to the starting position, the machine will proceed to adjust one side at a time. Active movement is indicated by a yellow status as exemplified by the Roll 1 left side movement in Figure 5.2 below. For AccuGap™ to properly calibrate, it is necessary that it physically touch the front and rear rolls together. Touching is indicated by green such as in Figure 5.3.
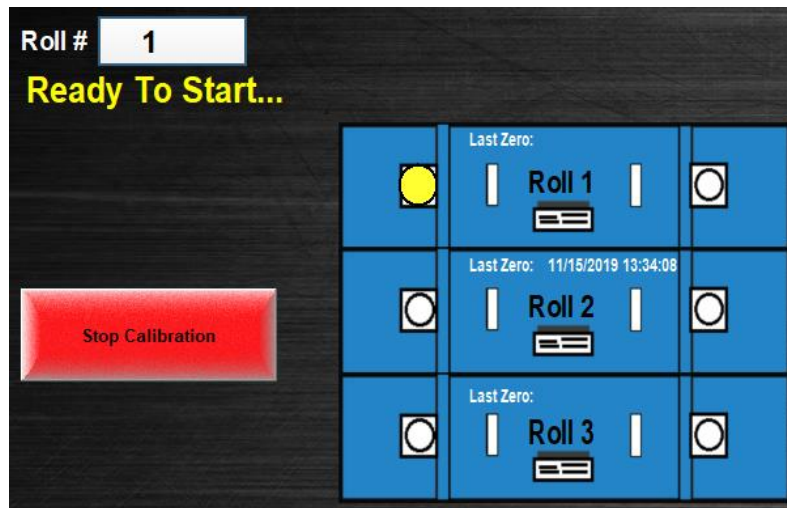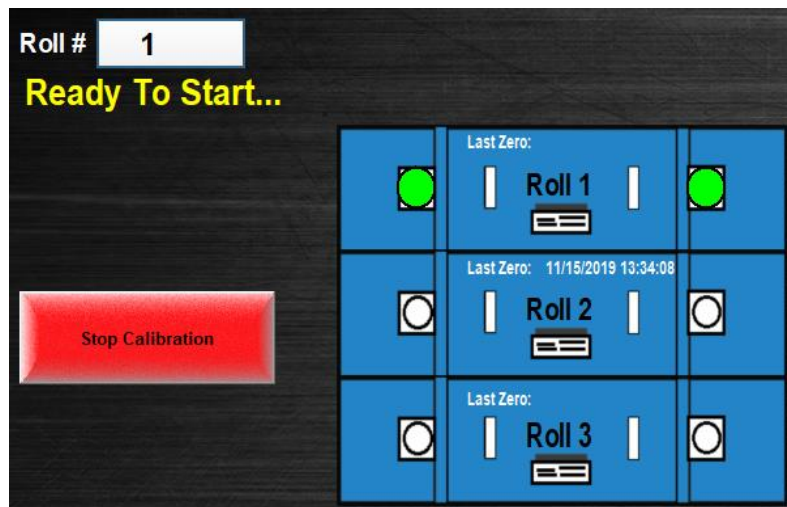
Figure 5.2

Figure 5.3

3. Throughout the calibration process you will see different statuses appear in yellow toward the upper left-hand of the screen. Status messages appear in yellow while errors are in red. See the order and description of each status in the AccuGap™ Statuses section below.

ACCUGAP™ STATUSES

Moving To Position... The rolls have a specific starting position. In the "Moving to Position" stage the rolls will first move to this position before continuing.

Paralleling... (Please Allow 5-6 Min) The "Paralleling" stage is where the automatic parallel takes place. As it parallels, each side takes turns moving into a touching condition and moving back out again to the starting position. The process takes 5-6 minutes to complete and attempts 2-4 touches on each side.

Zeroing... (Please Allow 2-3 Min) In "Zeroing" AccuGap™ has completed the parallel and has moved on to finding new zeroes. The machine will alternate walking the left side and right side in until touching and record new zeroes at that point. The process will take 2-3 minutes to complete.

Calibration Complete... (Returning To Recipe) Calibration has completed and the machine and is returning to the requested gap recipe position.

Ready To Start... Once the roll has returned to its recipe position, the "Ready To Start" status will appear. The system is ready to move on to grinding or calibration of the remaining roll(s).

Calibration Error... Error Reset An error has been encountered mid-process and will cancel and return the roll to its recipe position. No values will be changed since calibration did not complete successfully. If there is an error, the error condition must be addressed and the "Error Reset" button must be pressed before calibration is retried.

COMMON ACCUGAP™ ERRORS AND POSSIBLE CAUSES

Figure 5.4

High Vibration Error
Parallel Roll X Failed
Roll X Travel Limit Exceeded
Excessive Zero Change
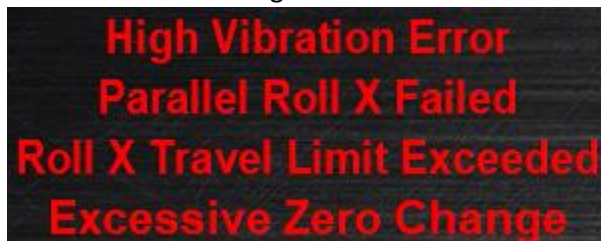
- **High Vibration Error** – Bearing vibration is too high for the AccuGap™ process to run. Bearing(s) might either be grease-deprived or worn out or surrounding equipment is inducing vibration.
- **Parallel Roll X Failed** – AccuGap™ was not able to successfully parallel the roll. This could be due to any number of reasons. Retry the calibration to see if the problem persists.
- **Roll X Travel Limit Exceeded** & **Excessive Zero Change** – There has been an excessive change in the set zeroes since the process was last ran. Running AccuGap™ more frequently could address these errors.

SUPPORT

RMS ROLLER GRINDER

Contact:

605.368.9007

(Toll Free) 888.283.9337

Web: rmsroller-grinder.com

EASY AUTOMATION, INC.

Contact:

507.728.8214

Email: info@easy-automation.com

Web: easy-automation.com