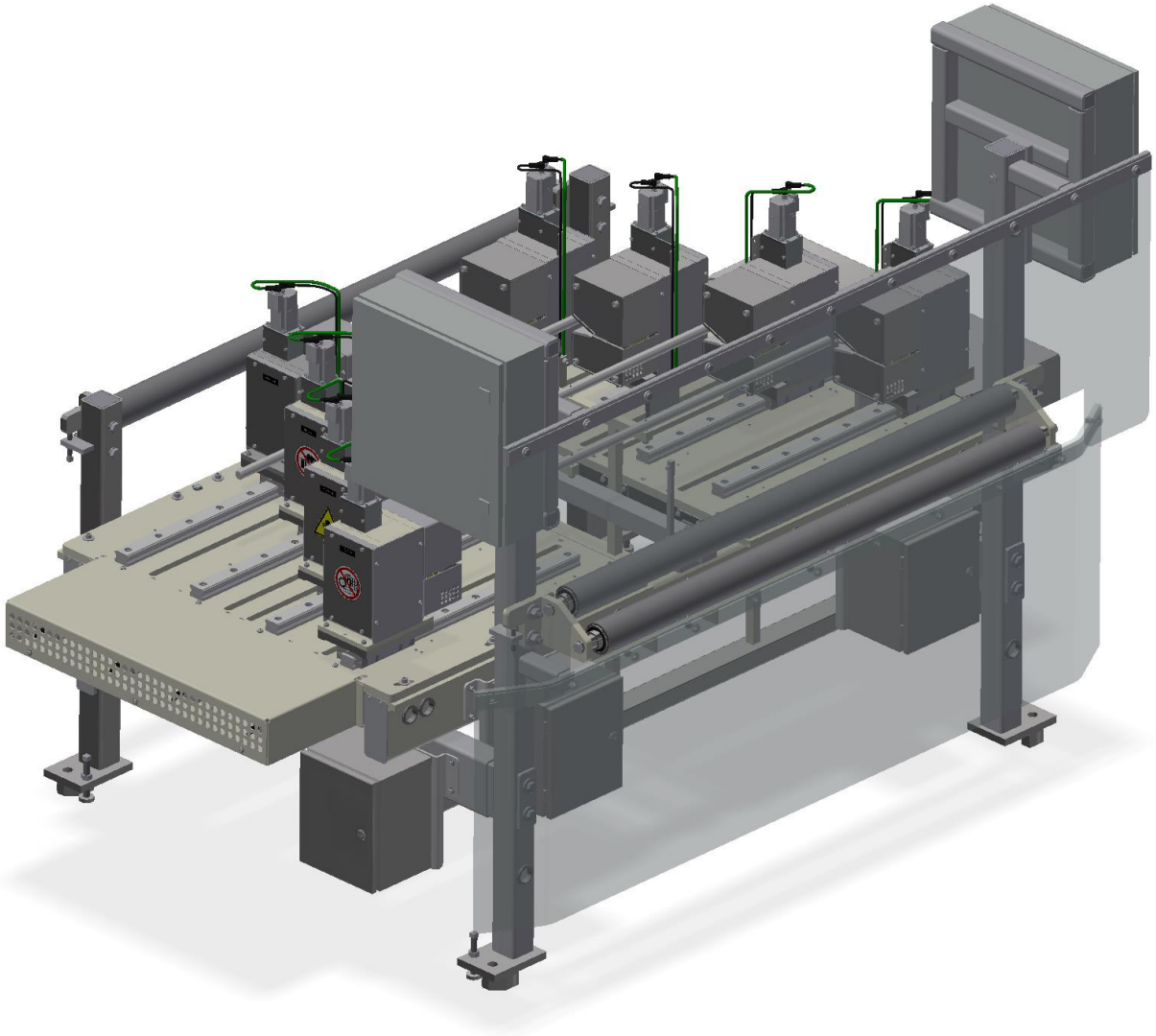
Creaser

Maintenance Manual



Gyptech

Proven Technology Worldwide

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Introduction

This manual contains **Original Instructions** written to assist in the normal operation of the Creaser equipment. This provides an overview only. For more detailed information regarding maintenance, please refer to the maintenance manual specific to the equipment being maintained. Personnel should undergo proper training before attempting to operate any piece of equipment.

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1 Safety Overview

Never put yourself at risk.

Many pieces of equipment have the potential to cause serious injury or even death. Be sure to understand the safety concerns related to a piece of equipment before undertaking or performing any maintenance or clean out procedure. Work with your supervisors to address any safety concerns prior to undertaking work.

This document should be read in conjunction with the Gypsum Technologies Equipment Manuals. This document provides an overview only. Important safety information is contained in the equipment manuals.

1.1 Lockout Procedures

Always lock out any source of motive power (electric, hydraulic, steam, compressed air, etc.) before performing any maintenance or cleaning functions, as equipment may start automatically. Disconnect electrical equipment locally or at the electrical panel (see Disconnects).

Note: Potential energy may also be stored in some equipment such as those held in a raised position by hydraulic or air pressure and that such equipment may move or fall suddenly if pressure is removed.

Depending on the equipment layout, electrical equipment may be locked out at the electrical panel or locally with a safety switch or disconnect. Air pressure is removed and locked out at the manual air dump valve.

SAFETY: You must confirm that any equipment in the system being worked on is not operational after being locked out by using the normal means of starting it (operator control station HMI or manual HOA switch).

1.2 Electrical Disconnect Switches

Electrical Disconnect Switches are a means of physically isolating an area. Each drive panel is equipped with a lockable panel-mounted disconnect switch which isolates all drives in that panel. Some areas may also have a field-mounted disconnect which removes power to a motor or series of motors.

1.3 Start-Up Safety

- Ensure all pneumatic and electrical connections which may have been removed, replaced, or disconnected during an equipment shutdown have been reconnected securely before starting any equipment.
- Return all valves (manual and control system operated) and movable machine members which may have been changed from their normal start-up condition during shutdown back to their normal start-up condition before starting any equipment.
- Ensure that all personnel, product, etc., are clear of machinery prior to starting any equipment.

1.4 During Operation

- Maintain and keep in place all equipment guards.
- Do not wear loose clothing or jewelry which could get caught in moving parts.

1.5 Shutdown Safety

- Shut down and relieve pressure from all pressurized accumulators, actuators, and lines before removing, tearing down, or performing maintenance on any remotely located actuators, hoses, filters, valves, piping, etc.

Before removing or performing maintenance on any pneumatic system components that have an electrical interface (solenoid valve, switches, electric motors, etc.) DISCONNECT ELECTRICAL POWER.

2 Creaser Overview

Creasing is the act of running the bottom paper through creasing wheels, which create continuous parallel indentations along the length of the paper that will easily fold into the final edges.

Creasing is a precise operation which will determine both the quality and thickness of the gypsum board edge. Previous systems required manual adjustment of each creasing head, and extensive manual measurements to ensure proper creaser head positioning. The automatic creaser table gives the operator automatic adjustment of both the left and right edge creases, which determines edge thickness, and the relative left to right inside creaser distance which aids in maintaining the overall width.

In total there are eight creasing heads, with four on the left and four on the right. The heads can all be independently controlled and set to any desired position via stepper motors which give a theoretical accuracy of 0.001 inches. Creaser heads not in use are disengaged from creasing the paper based on the recipes entered in the HMI.

During normal operation, top and bottom paper sheets are threaded from the paper handling area down to the mixer forming area, where gypsum slurry is sandwiched between the two sheets creating a continuous stream of gypsum board. The bottom paper, which becomes the face of the board, requires creasing so it can be folded into a square edge as it passes through the forming plate where the top paper, which will be the back, is pressed upon it, with a bead of glue holding the two sheets together.

The Individual Head Auto Creaser was engineered to improve edge angle control, ease of product changeovers, and the ability to position the creasing heads based on board recipe and operator input. The creaser provides an alternative to scoring to produce an edge for board formation. The creaser blades are not powered, but rather they roll over the paper that is pulled through them.

Benefits of the Creaser:

- Quick set-up times
- Quick product change times
- No score wheel dressing required
- More consistent edge formation
- Reduced risk associated with operating and sharpening of score wheel
- No dust emissions from paper grinding.

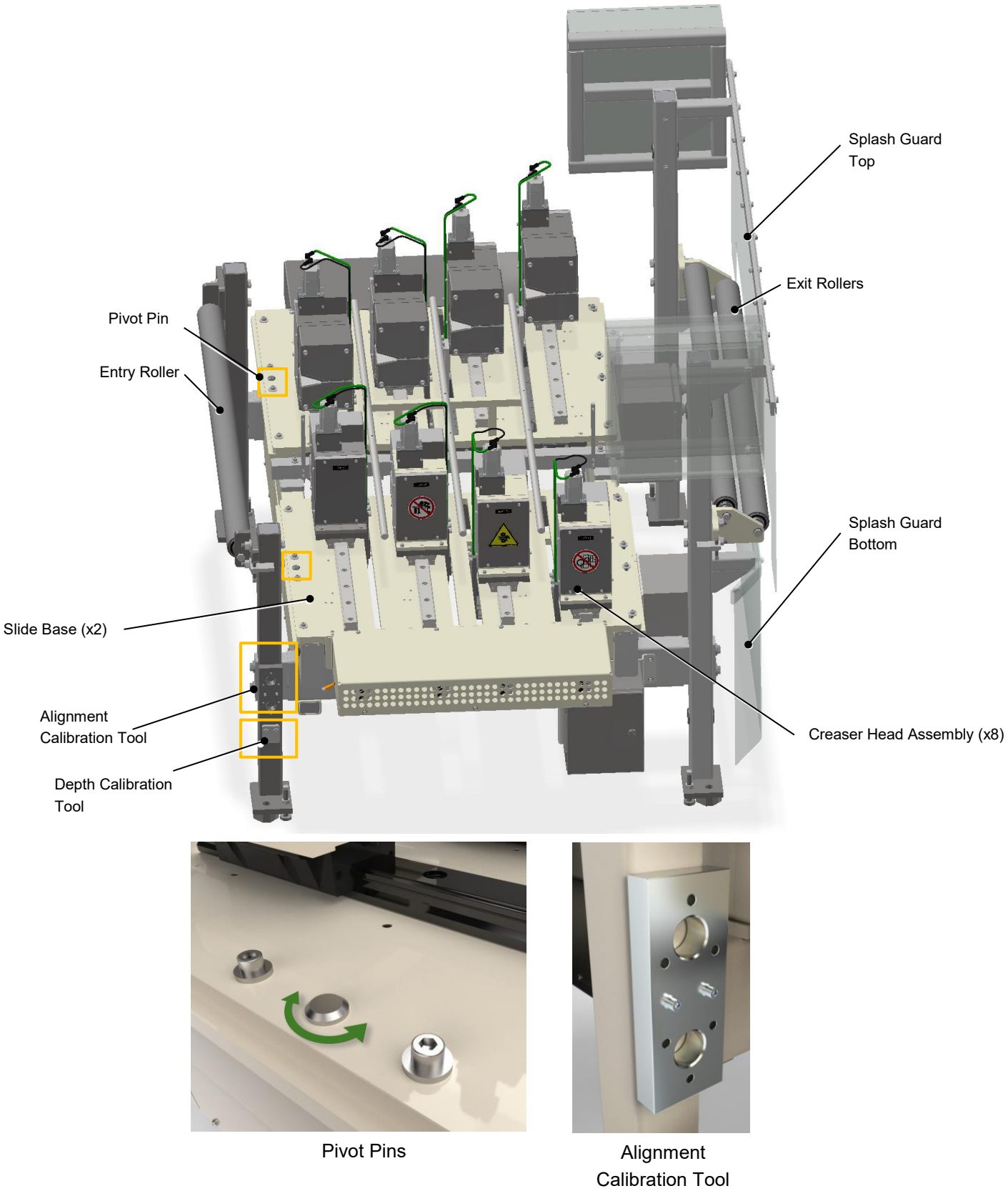


Figure 1: Creaser Overview

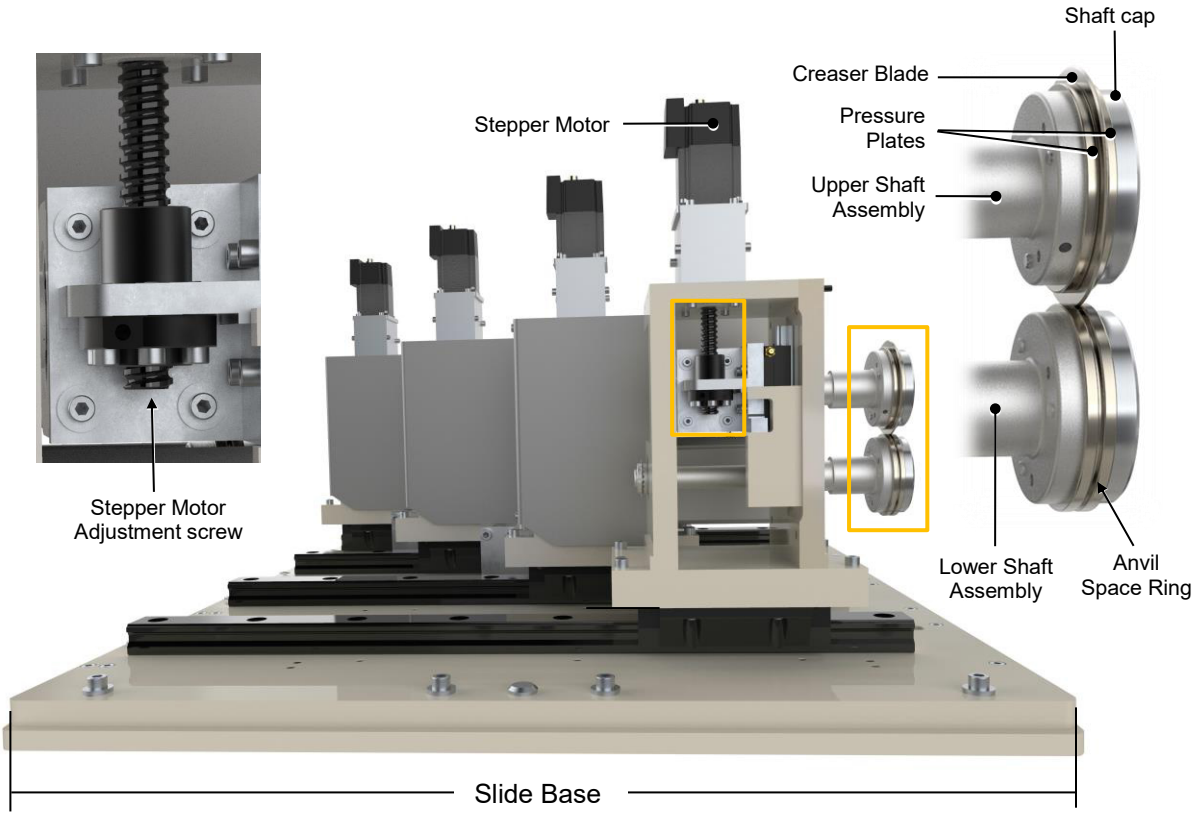


Figure 2: Creaser Head Assembly cutout view

The creaser is nominally designed for 24” to 54” (600mm-1350mm) board, the board centerline being common.

The creaser base is comprised of 2 independent slide bases, one on each side of the paper. Each slide base can be pivoted independently to lightly “toe-in” or “toe-out” the creaser head assemblies. This is to prevent buckling or tearing of the paper between the creaser assemblies.

An individual head assembly includes a creaser wheel and anvil which creates one crease line per side. The creaser slide base will accommodate up to four creaser assemblies per side (eight in total):

- To make two creases on one side of the paper, two head assemblies are utilized.
- To make three creases on one side of the paper, three heads are employed.
- To make four creases on one side of the paper, four heads are employed.

Each crease line is individually controlled by the HMI/Recipe, independent of all other crease lines. If only two creases per side are required, it is recommended that the first head assembly (as counted from the entry) be set for the inner crease (nominal board width) and the other two

assemblies set for different board thicknesses. Stepper motor raises the upper rotating element of the head assembly (the lower rotating element is at fixed elevation).

Each creaser head assembly is attached to a width adjustment assembly. A motor attached to a precision ball screw positions the creaser head assemblies based on inputs on the HMI.

Please note: This manual was written to provide information on the four-head creaser as engineered. Outside factors may influence the operation and performance of the equipment.

2.1 Entry Roller (Paper Guide)

The Entry Roller guides paper into the creaser at the required elevation for the crease heads.

2.2 Board Width Adjustment System

The Board Width Adjustment System is a width adjustment motor which drives a precision ball screw for each of the eight heads. Coarse and fine position movements are done from the HMI.

2.3 Slide Base

The Slide Base has four head assemblies and the width adjustment systems mounted onto it. The bases can be pivoted independently to lightly “toe-in” or “toe-out” the creaser head assemblies. The centering marks for the pivot are located on the ends facing the entry and exit. A Pivot Pin can be found on each of the slide bases located on the entry side of the creaser. Loosening the bolts that hold the Slide Bases tight to the main frame allows for rotation around the pin. This adjustment allows for correction of buckling or tearing of the paper between the left and right creaser assemblies, moving all four heads on the slide base together so they will all have the same toe.

2.4 Head Assembly

An individual Head Assembly provides one crease line on one side of the paper. To make two creases on one side of the paper, two creaser Head Assemblies need to be engaged. The assembly consists of a creaser blade rotating element, an anvil rotating element, and depth adjustment ball screw with stepper motor

2.5 Creaser Upper Shaft Assembly

The Creaser Upper Shaft Assembly is a movable shaft assembly which can be raised off or lowered onto the paper as required by a stepper motor. The shaft consists of an adjustment mechanism, two pressure plates, blade or anvil, and shaft cap. This is the shaft assembly that is adjusted for creaser depth during set-up.

2.6 Creaser Lower Shaft Assembly

The Creaser Lower Shaft Assembly is at a fixed elevation. This shaft assembly contains the anvil for crease creation, consisting of two pressure plates, an anvil, and a shaft cap.

2.7 Pressure Plates

A set of two Pressure Plates on each shaft assembly hold the blade or anvil tightly in place. Because the same plates are used for both the upper and lower shafts, in the case of uneven wear, they can be rotated.

2.8 Creaser Blade

There is one Creaser Blade per head assembly which works in conjunction with an anvil mounted on the other rotating element of the head assembly. The angle on the creaser blade works best for short fiber recycled paper. Contact Gypsum Technologies for specialty product blades.

2.9 Anvil (Spacer Ring)

There is one Anvil (Spacer Ring) per Head Assembly made of hardened steel which works in conjunction with a blade mounted on the other rotating element of the Head Assembly.

2.10 Creaser Shaft Cap

The Creaser Shaft Cap is part of the Shaft Assemblies that holds the Pressure Plates with the Anvil and blade tightly against the shaft.

2.11 Calibration Tools

A removeable Calibration Tool located on the entry roller frame can be used for shaft alignment of the creaser upper and lower shaft assemblies. To use this tool, first remove the cover plates, anvils, blades, and spacers from each shaft and install the calibration tool using the six existing bolts from the top and bottom shaft assemblies as shown:

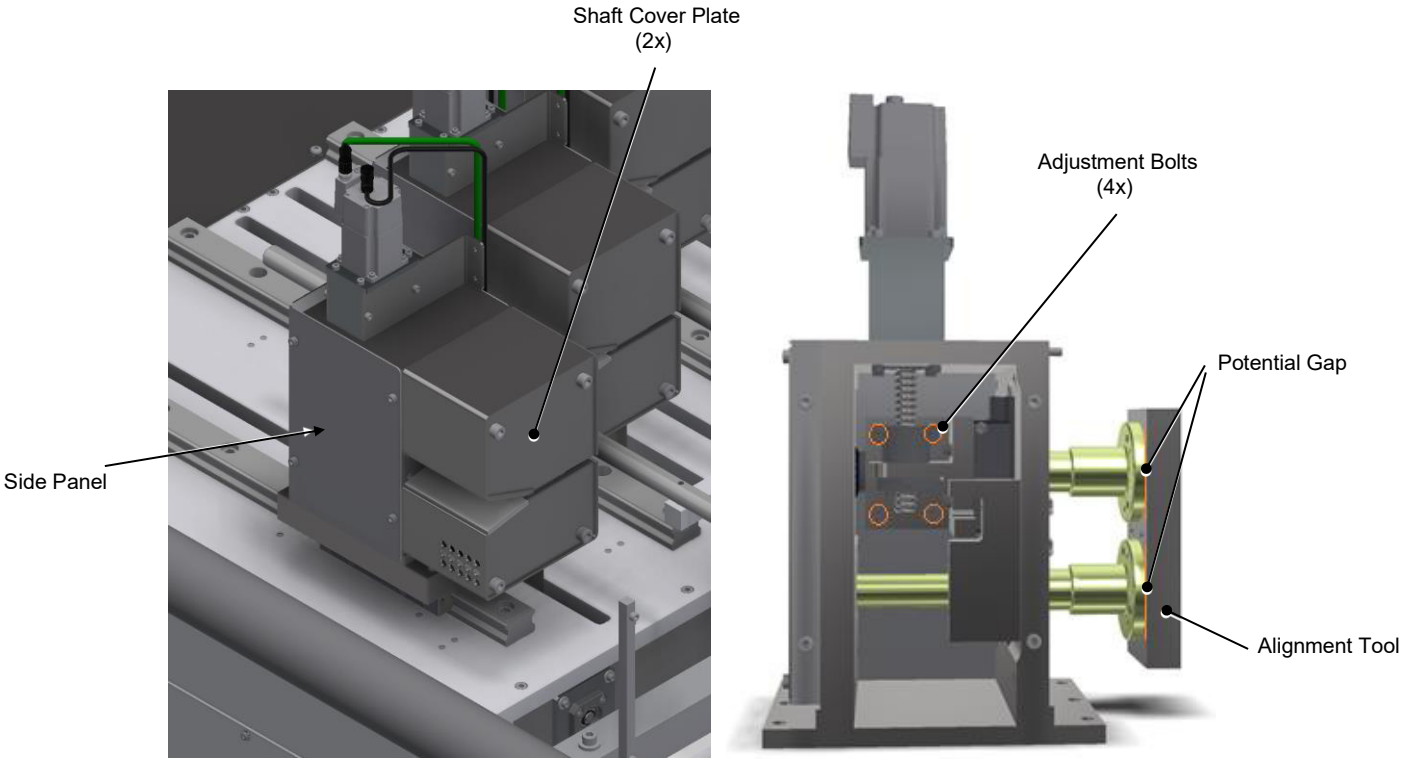


Figure 3: Creaser Head Calibration

If there is a gap between alignment tool and either shaft face this means the shafts are out of alignment and will not be in constant contact with the block. To fix this issue, loosen the 4 bolts located under the removeable side panel and move the top shaft assembly axially to close the gap. Now you can re-tighten the bolts, remove the tool, and reassemble the anvils, blades, and spacers. Replace cover plates, side panels, and ensure adjustment tool is re-mounted to machine frame for future use.

2.12 Exit Rollers (Paper Guide)

The Exit Rollers are a set of rollers that guide paper out of the creaser.

2.13 Splash Guard

The Splash Guard located at the exit end of the creaser protects creaser mechanisms from splash back from the mixer and roller coater.

3 Operation

3.1 Threading Paper

Prior to re-threading paper following a paper break etc., the creaser blades should be disengaged to provide access to pull paper through them without tearing.

1. Pass the paper under the exit roller of the web guide and over the entry roller of the creaser.
2. To thread paper, disengage the heads.
3. The paper should then be routed between the top and bottom head guards (and consequently the heads themselves) on all 4 head assemblies.
4. Ensure that the paper is lying flat on top of the paper support bar.
5. The paper should continue under the first roller and over the last roller of the exit paper guide.
6. The paper can now be passed under the mixer, along the forming table as per normal practice.

3.2 Alignment of Blades (Toe-in, Toe-out)

The creaser base consists of two independent slide bases, one on each side of the paper. Each slide base can be pivoted independently to lightly “toe-in” or “toe-out” the creaser head assemblies. This is to prevent buckling or tearing of the paper between the creaser assemblies. The table is factory set with the slide bases installed with a 1/16” toe-out over the length of the slide plate and this is referenced with permanent alignment marks.

To adjust the blade alignment:

1. Loosen the clamping bolts on the slide bases
2. Shift the slide base as required on the pivot pin.
3. Retighten the locking bolts.
4. Perform the same adjustment on both sides but swivel in the opposite direction.

3.3 Width Adjustment

All horizontal adjustments are done with inputs into the local HMI. The width of the board is determined by the two inner creases. It is suggested the entry set of creaser head assemblies (marked Head 1) be used for the inside crease and Heads 2, 3 and 4 should be used for the outer crease lines.

Note: that the actual distance between the creases will be slightly less than the width of the desired board. Expansion of the board must be considered. Exact settings must be based off of samples taken at the wet transfer and/or takeoff area.

3.4 Thickness Adjustment

The thickness of the board is determined by the second crease. The distance between the first crease (Head 1) and the second crease (Head 2, 3 or 4) is the thickness. Head 2, 3 and 4 should be set to correspond to different board thicknesses and/or positions of tapers.

3.5 Crease Depth Adjustment

Adjust desired depth of crease using the HMI screens located on the machine. The adjusting screw is powered by a stepper which determines the elevation of the upper rotating element. The lower rotating element is fixed in place.

The depth of the crease cannot be set by measuring as with the board width. It is set by operator feel and experience. Depth varies between paper weights and can even vary between different lots of the same paper.

A test crease will determine whether a crease depth needs to be increased or decreased. See section on “Trouble-Shooting” below for characteristics of different crease depths to help set the proper depth. One complete revolution of the motor raises or lowers the element approximately 0.20” (5mm).

3.5.1 Ideal Crease Lines

Ideal Crease Lines are:

- Even in depth
- Deep enough to avoid excessive round edges of the finished board
- Not too deep as to cause cuts or excessive impressions through to other side of paper

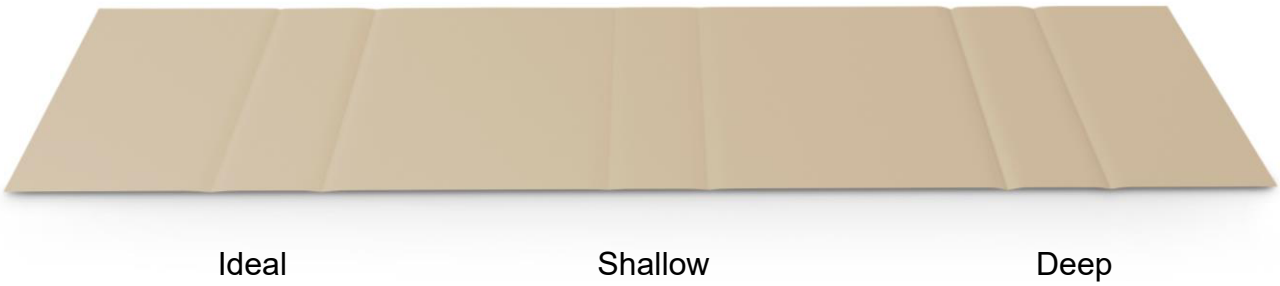


Figure 4: Ideal crease line depth

3.5.2 Ideal Edge Angle

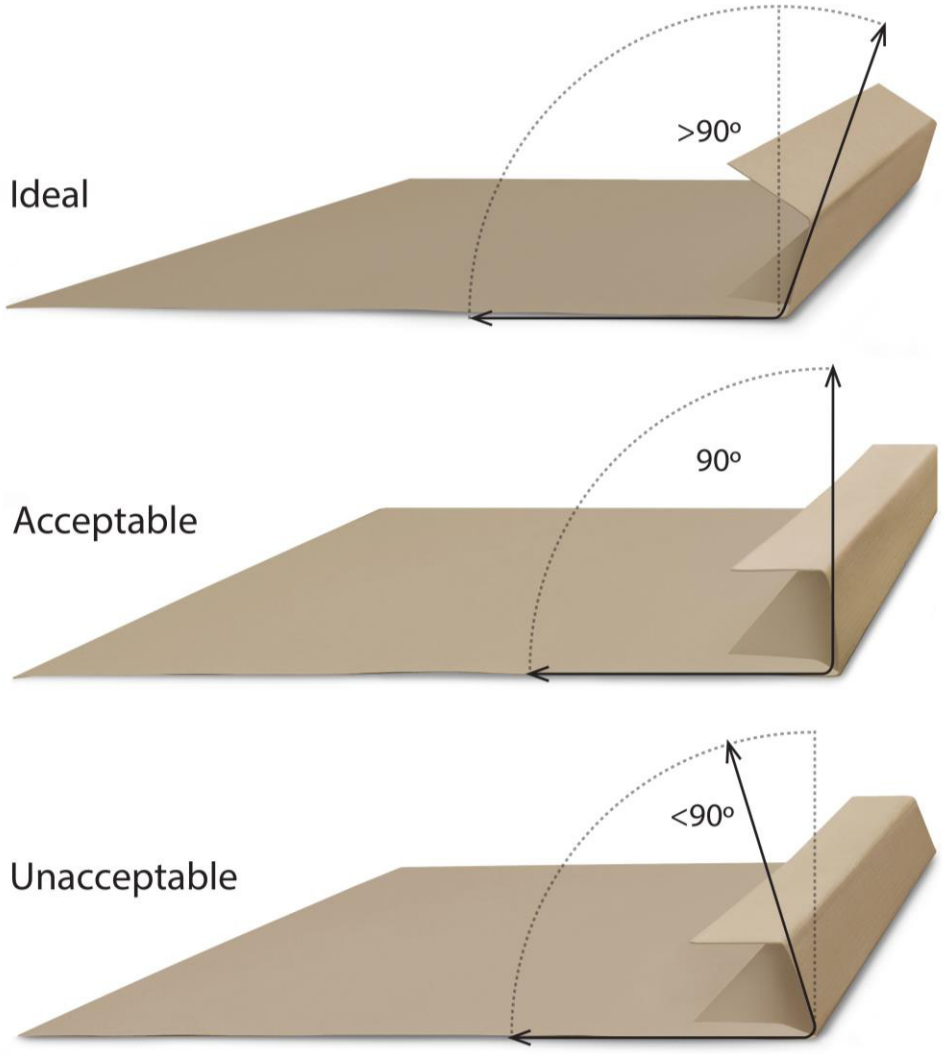


Figure 5: Ideal edge angle

3.6 HMI Screens

3.6.1 HMI Main Screen

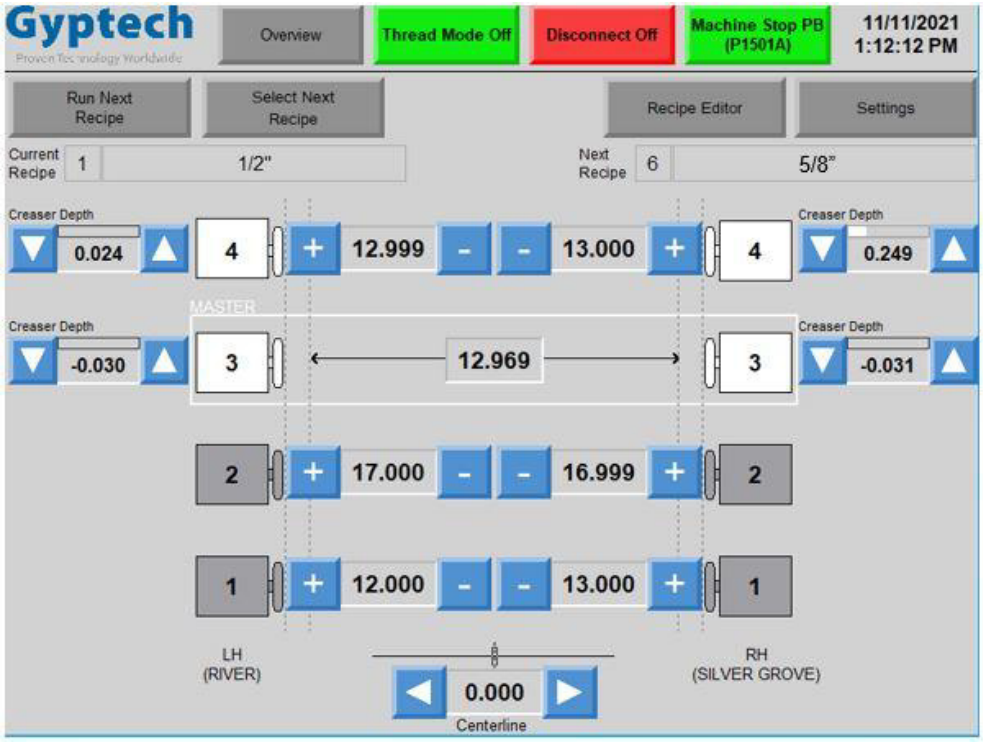


Figure 6: HMI Main Screen

Note: All HMI screens shown are not finalized to final design.

The main screen will appear at start up. This screen shows all the motor information including what recipe is running and the description of the recipe. It also has options for editing/loading recipes and settings for adjusting the motors.

Motors will light up in different colors depending on the mode.

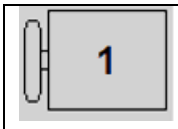
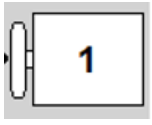
	**Dark Grey:** Drives ready to run, however not enabled
	**White:** Drives running in Auto, enabled

Figure 7: HMI Motor Indicators

3.6.2 HMI Creaser Pair Overview

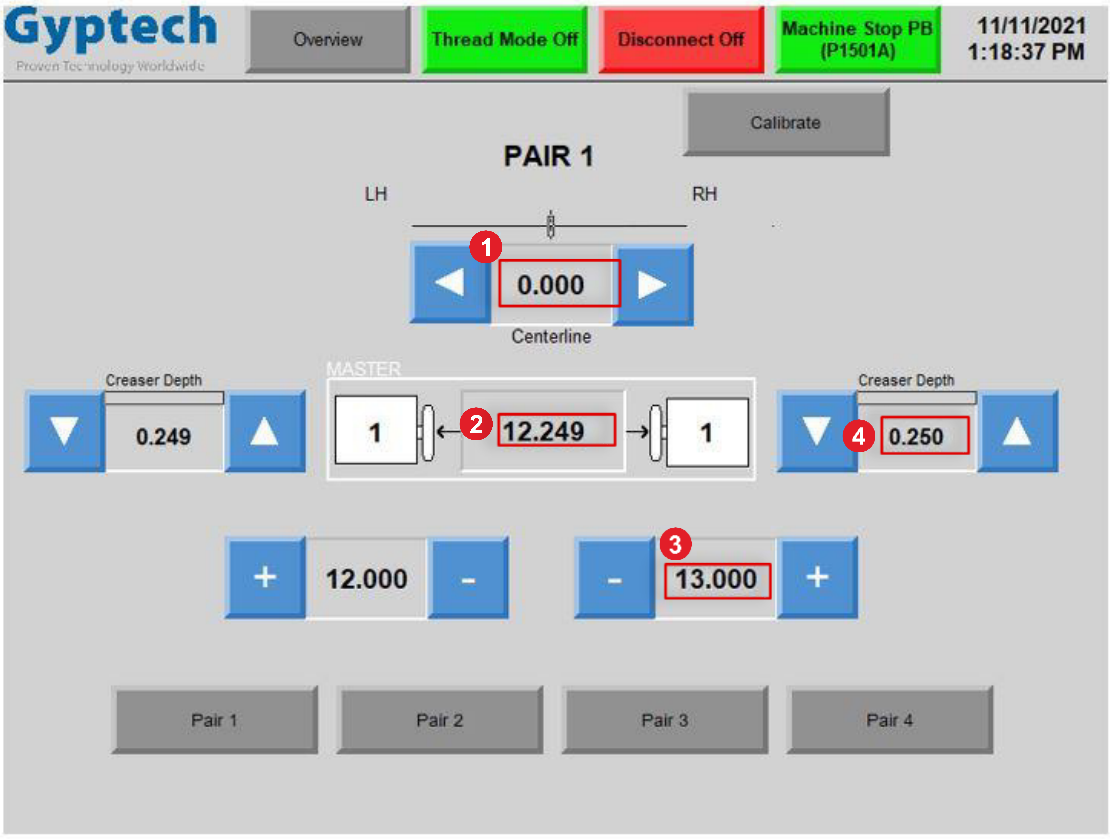


Figure 8: Creaser Pair Information

Values:

1. **Offset:** shows how far off center the motors are (can be shifted left or right).
2. **Gap:** shows how far the motor pairs are from each other.
3. **Recipe Width offset:** This shows how far off the individual motor is from the recipe position. (relative to the center) (can also be shift left and right).
4. **Depth Position:** This shows how thick the crease is.

3.6.3 HMI Recipe Screen

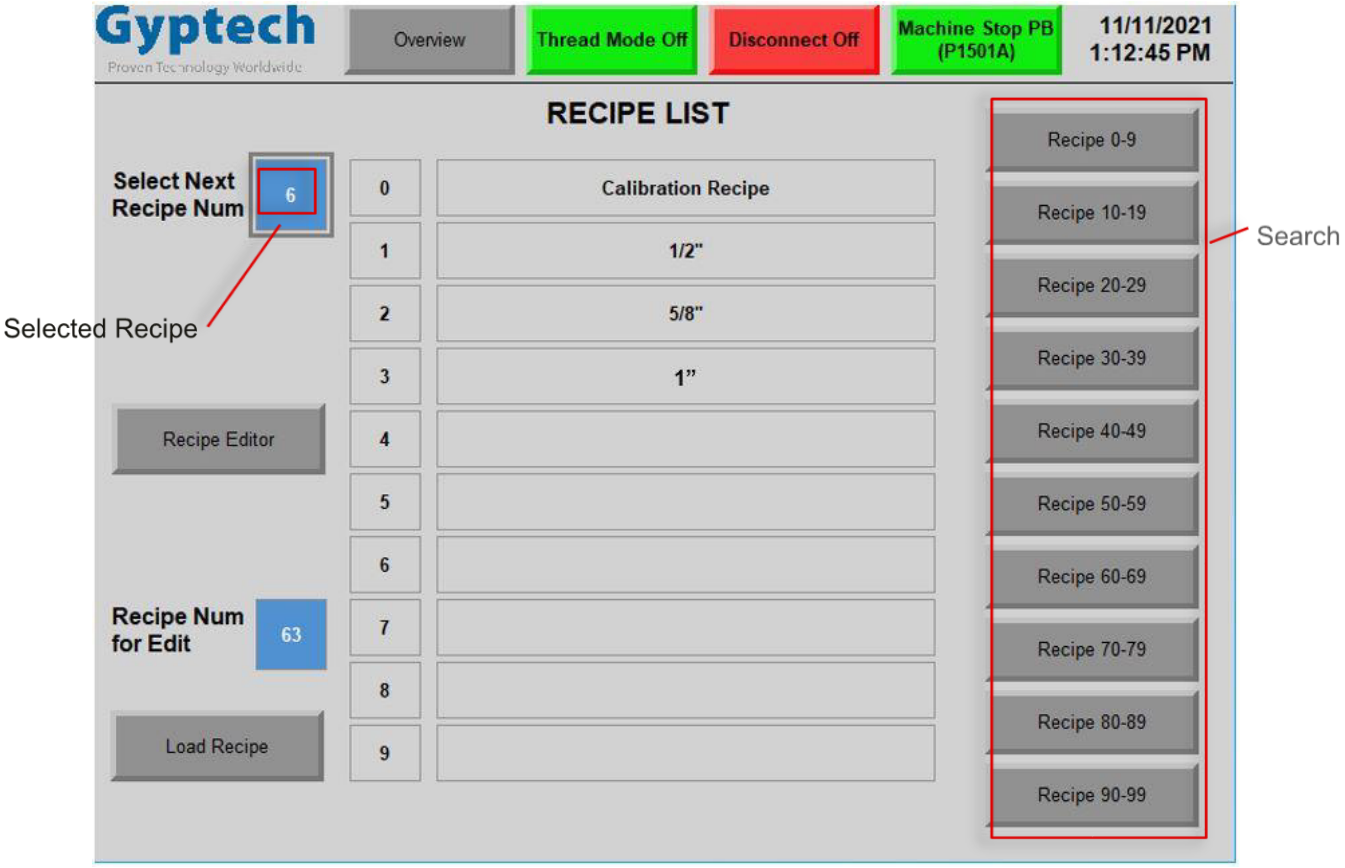


Figure 9: HMI Recipe Screen

This screen allows you to choose the next recipe. You’re able to confirm a recipe by pressing the “Select Next Recipe Num” highlighted in blue. After pressing, the user can manually input any value provided in the recipe list to select next recipe. If you need to change the next recipe selection, press the ‘Select next recipe’ before clicking ‘Run next recipe’ and it will bring you back to the recipe menu.

3.6.4 HMI Recipe Editor

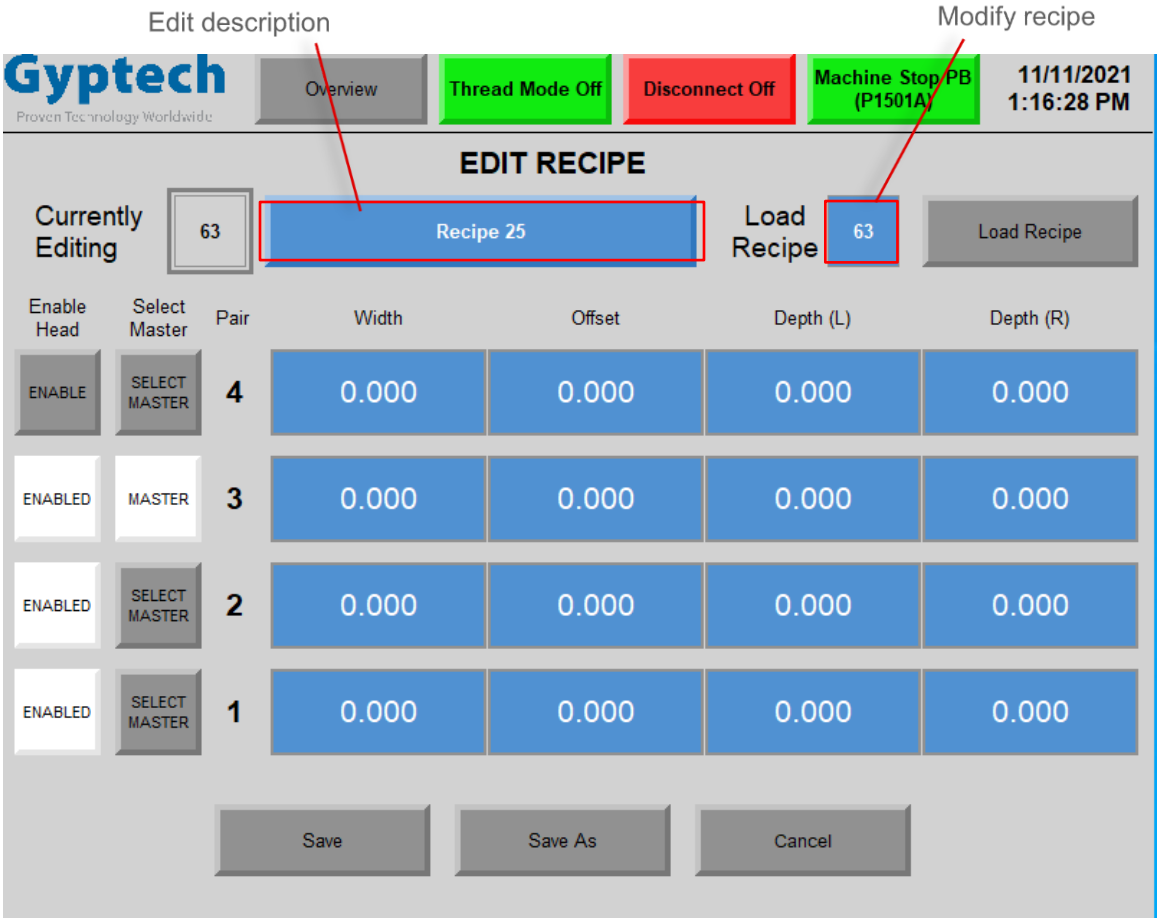


Figure 10: HMI Recipe Editor

This screen allows you to modify a specific recipe. You can choose which recipe you want to modify by selecting the top right Load Recipe number selection. The user will have to click “Load Recipe” button to load the recipe number into the currently editing box. The number displayed next to “Currently Editing” is the recipe number being updated. You can also edit the description by clicking the ‘edit description’ box and confirming the text. Each field highlighted in blue with a number value is clickable and allows you to edit the values. Once you have the right settings, you can either ‘save’ or ‘save as’.

If you ‘save’ it will overwrite the current file, if you ‘save as’ you will get the following popup:

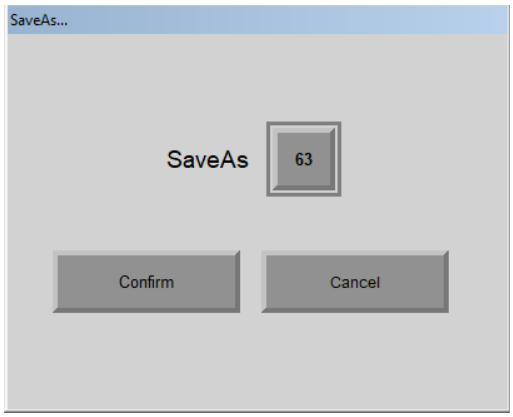


Figure 11: HMI Recipe Editor Save As Pop-up

This gives you the option of overwriting another file or saving it to a new recipe. You can enter any number and the current setup will be saved as the new number selected by the user. User can click on the box next to “SaveAs” to enter a recipe number and then click on “Confirm” to finalize the save or click “cancel” to return to the overview screen.

3.6.5 HMI Settings Screen

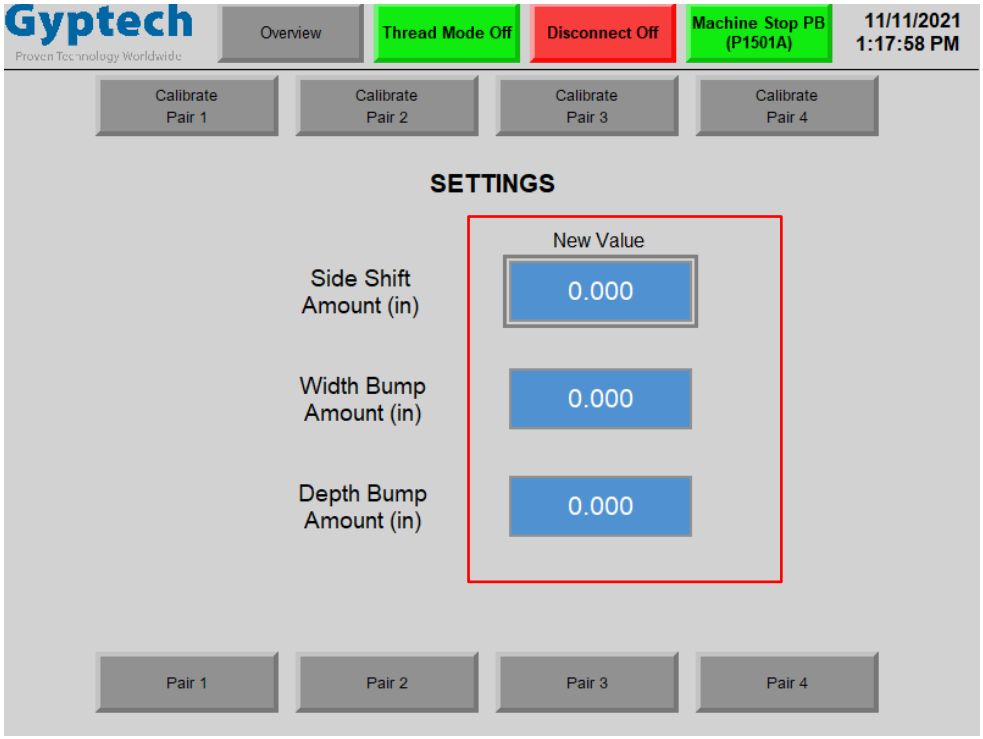


Figure 12: HMI Settings Screen

The values of the ‘bump’ amounts can be changed on the settings screen.

Side Shift Amount: this changes the offset amount, so how much all the motors shifts left and right.

Width Bump Amount: this changes the width amount, so equivalent to every time you click the ‘+’ or ‘-‘ on the overview screen

Depth Bump Amount: this changes the depth amount, so how much the motors go up and down with every touch of the up/down buttons.

4 Creaser Head Setup and Calibration

The 8 creaser heads move relative to the centerline of the machine, whereby for example if a 48” board width set-point is entered, the crease head will move to a position 24” from the centerline. If the machine is not installed exactly on the board travel centerline, this center reference line can be given an offset so the basis of the move will be from the center of board travel, not necessarily that of the creaser table. This offset is hard-coded in the PLC as it should only need to be set once during initial commissioning.

4.1 Creaser Calibration Procedure

The Gyptech creaser with position control for width adjustment and depth of crease features stepper motors with absolute encoders. There is no need to routinely home/zero these steppers to a home switch since the absolute position of each stepper motor is stored in the PLC relative to a physical position on the machine.

It is necessary to calibrate the position when certain mechanical changes occur:

- When a stepper motor is removed.
- When a coupling from the stepper motor is serviced.
- When an upper or lower shaft is replaced.
- When bearings for the upper or lower shaft are replaced.
- When the crease head location ball screw or ball nut is removed or serviced.
- When the crease depth ball screw or ball nut is removed or serviced.
- The vertical/depth adjust axis can be calibrated more frequently due to wear of the blade and anvil.

Note: the following 3 procedures are completed when the surrounding equipment/line is shut down from production.

4.1.1 Creaser Pair Width Calibration

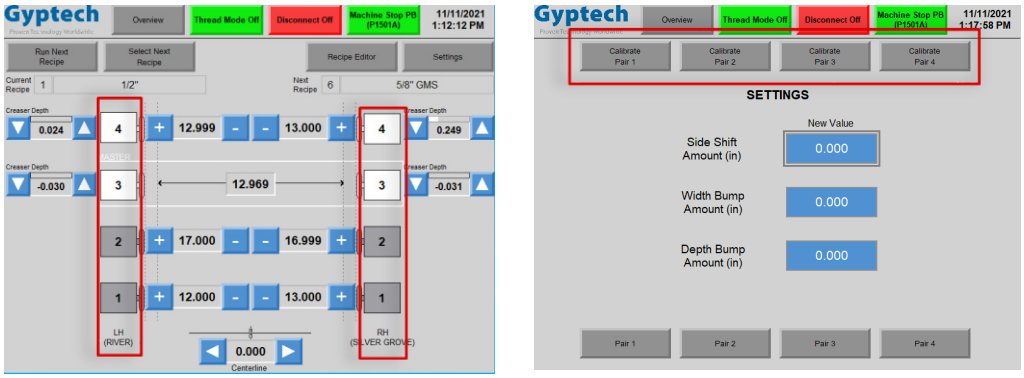


Figure 13: HMI Screen Calibrate Buttons

1. Identify the creaser heads that need calibration. Heads 1, 2, 3, or 4 positions correspond to locations shown on the HMI screen.

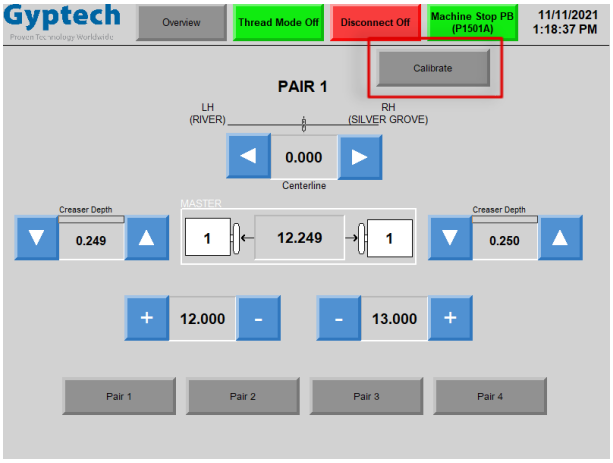


Figure 14: HMI screen Calibrate Button

2. Go to the Settings then Calibrate Pair X screen of the HMI and engage the calibration function on the heads you wish to calibrate. Or the user can click the background of any head on the overview screen to enlarge the setup screen for that specific head and click “Calibrate” to open the calibration screen. The heads will now move in and stop at the physical hard stop.
3. Isolate the motor stepper power by locking out the disconnect on the creaser panel, note this will leave the PLC and HMI power on.

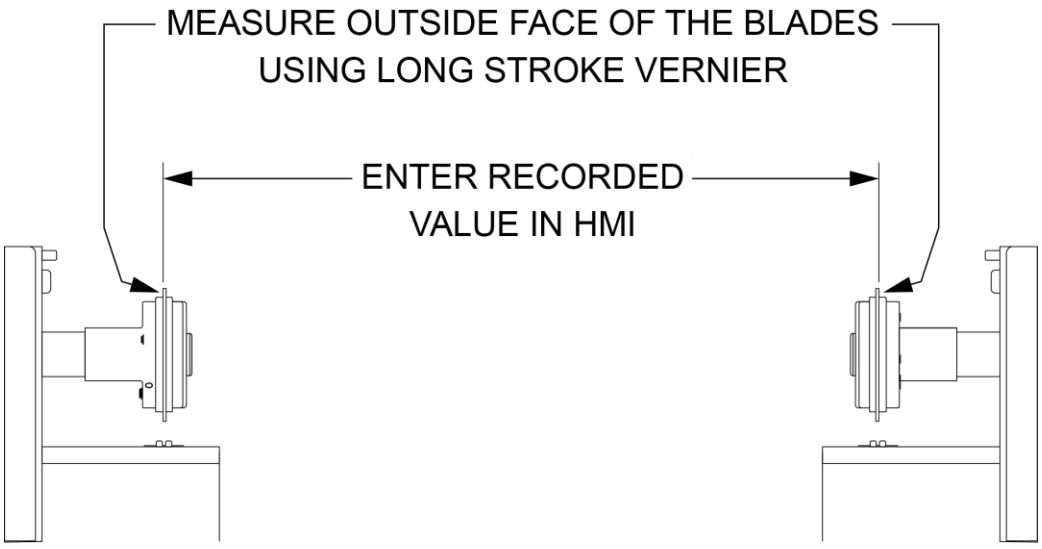


Figure 15: Creaser Pair Calibration Dimension

4. Remove the upper guards on the pair of creaser heads you are calibrating. Take a measurement between the blades using a Vernier caliper.

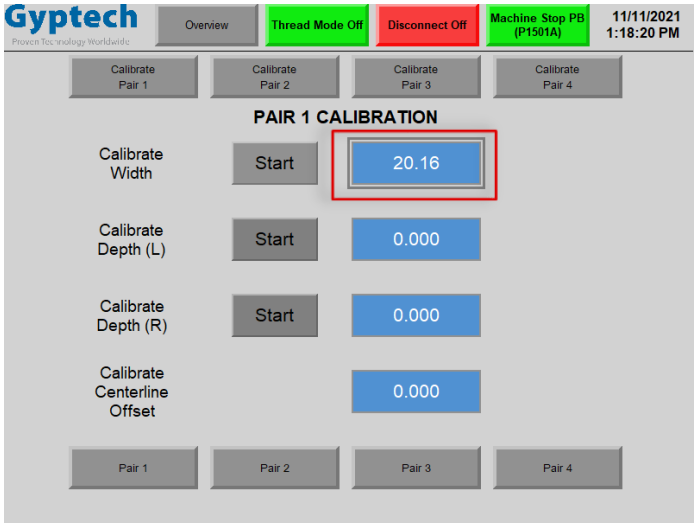


Figure 16: HMI Calibration Screen

5. Enter (or compare, if the value is there already it shouldn't change since the hard stop isn't moving) the recorded value into the text box shown in the calibration screen. The program will automatically factor in the thickness of the blade and calculate an accurate center distance at the hard stops.
6. Re-install the upper guards on the crease heads being calibrated.
7. Turn on the disconnect to provide power back to the stepper motors.
8. The Center Offset for the pair of heads now needs to be calibrated, proceed to that procedure for steps on how to accomplish this.

4.1.2 Creaser Pair Center Offset Calibration

1. The Center Offset for the pair of heads now needs to be calibrated. Move the heads to an even value apart from each other.
2. Feed paper through the creaser and through to the boardline under the first walker wheel. Run the boardline with the walker wheels down at a slow speed in order to pull the paper through the creaser under tension. Ensure the web guides bring the paper to the guide point.
3. Engage the creaser blades on the creaser heads being calibrated as the paper is passing through the creaser, this will crease lines per the distance apart set in Step 8, but the lines will not be centered on the paper.
4. Using a graduated ruler, measure from the edge of the paper to the crease lines on each side of the paper. Left and right is defined by looking down the boardline from upstream of the creaser and the Left and Right is defined in the following orientation.

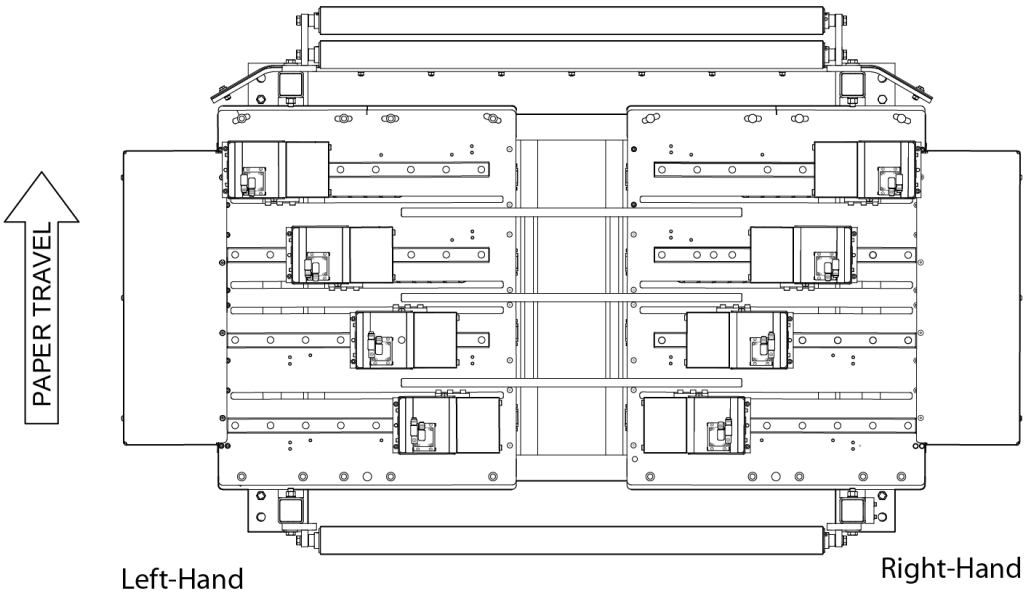


Figure 17: Creaser LH and RH definitions

5. Record the ***Left Distance Measure*** and ***Right Distance Measure*** respectively
6. From the recorded values, we will need to calculate an offset factor as shown below, be mindful if the gap is larger on the left-hand side or right-hand side as the equation changes:

Larger Distance on Left Side:

$$Centerline\ Offset = \left(\frac{(LeftDistanceMeasure - RightDistanceMeasure)}{2}\right) * (-1)$$

Larger Distance on Right Side:

$$Centerline\ Offset = \left(\frac{(RightDistanceMeasure - LeftDistanceMeasure)}{2}\right)$$

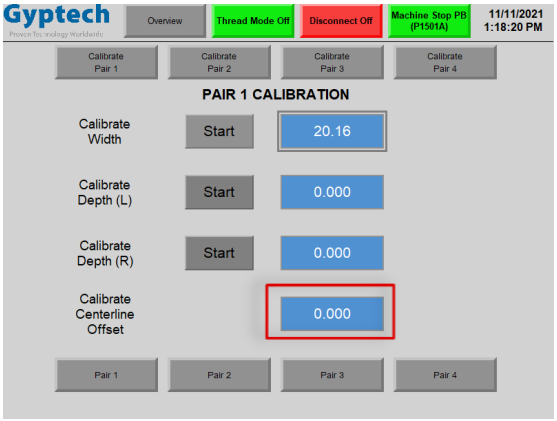


Figure 18: HMI Calibration Screen

7. Enter in the calculated value on the HMI screen and press enter to write the value to the program. The heads will now adjust to compensate for the offset.
8. Turn on the boardline again to pull more paper through, reconfirm that the ***Left Distance Measure*** and ***Right Distance Measure*** should be equal now.
9. Complete the setup mode by pressing enter and exiting back to the main screen.

4.1.3 Depth Adjust Calibration

Depth calibration is accomplished with the included calibration block that is located on the right-hand entry leg of the creaser.

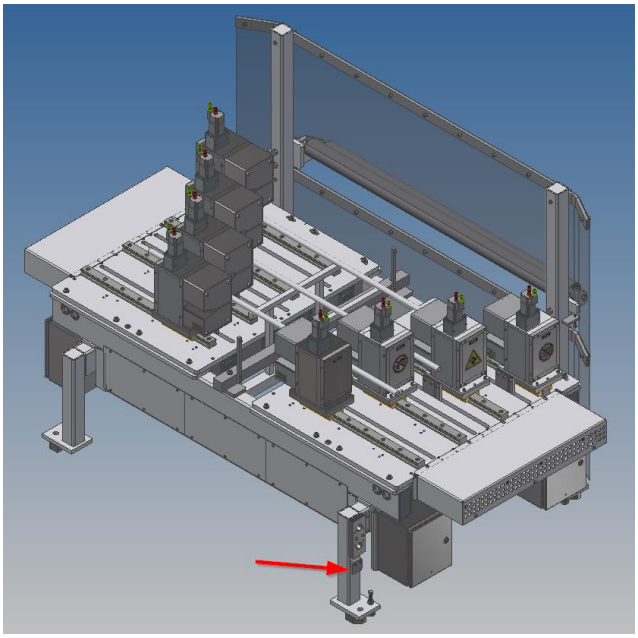


Figure 19: Depth Calibration Tool

1. Identify the creaser head that requires depth calibration (LH-1, RH-1, LH-2, RH-2, LH-3, RH-3, LH-4, RH-4). Positions correspond to locations shown on the HMI screen.

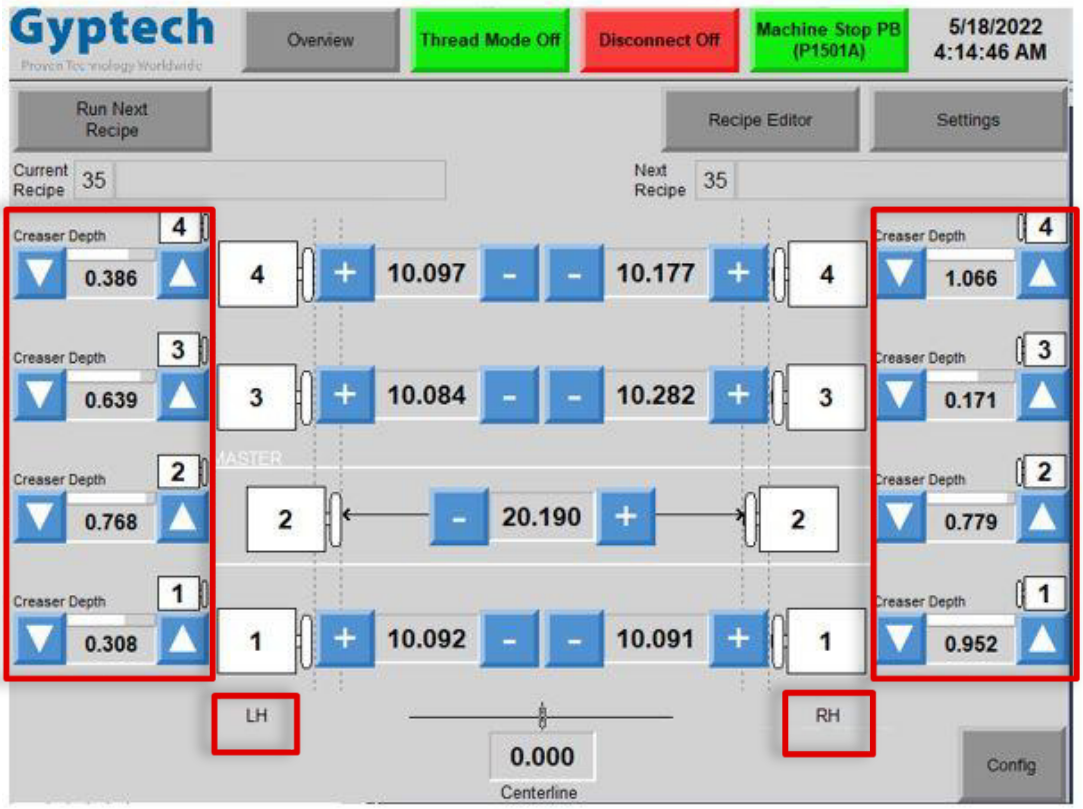


Figure 20: Creaser Head Identification

2. Jog the creaser head out so that it is more easily accessible from the outside of the machine and jog the head up to make space for the calibration block.

3. Go to the Settings screen of the HMI and engage the Depth Adjust Calibration function on the head you wish to calibrate.

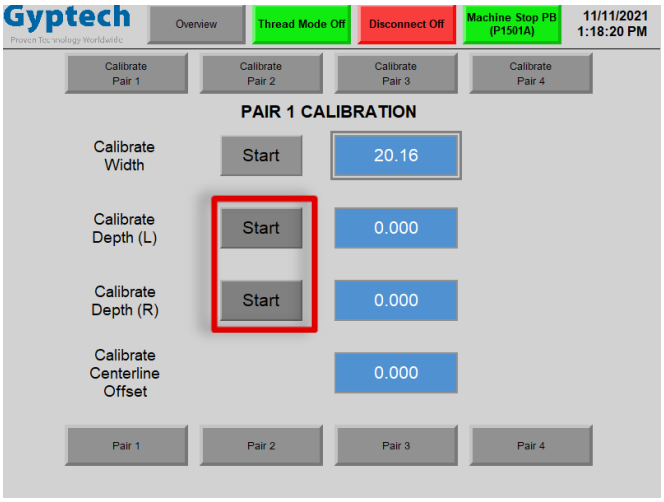


Figure 21: Creaser Head Depth Calibration

4. Remove the guarding from the head to be calibrated.

5. Attach the calibration block, as shown in the photo below.

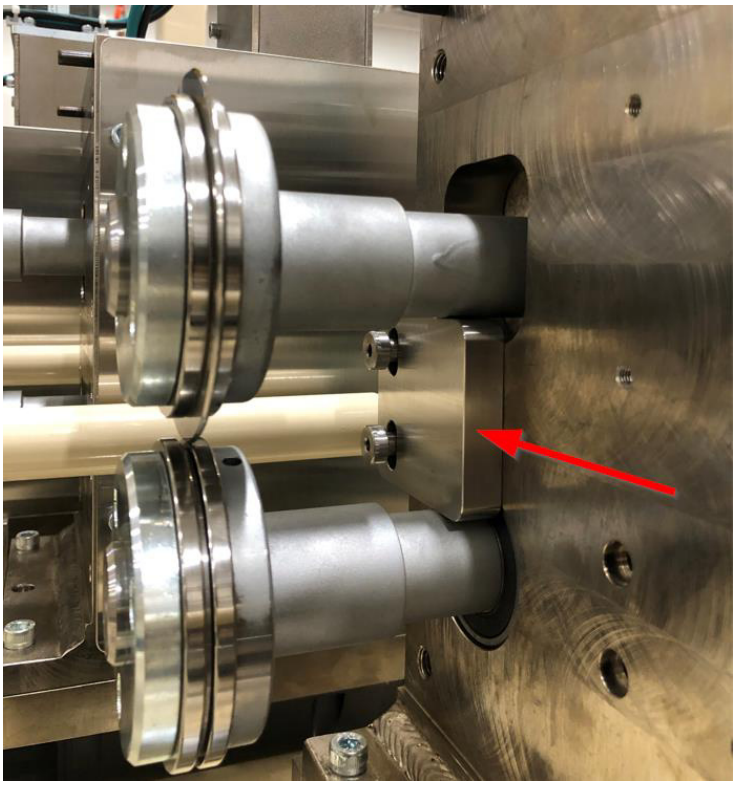


Figure 22: Calibration Block Installation

6. Push the corresponding start button on the HMI. The creaser head will slowly move down at a reduced torque level until it contacts the calibration block and stops.
7. Once the creaser head stops, the “Accept Calibration” button will become visible.
8. Push the “Accept Calibration” button.
9. Jog the creaser head up to allow for removal of the calibration block.
10. Remove the calibration block and re-install it on the side of the leg to avoid losing it.
11. Re-install the top and bottom guards.

5 Maintenance Procedures

To prevent premature failure of the equipment, the preventative maintenance procedures in this section are recommended.

5.1 Lubrication

No lubrication is required for the creaser heads. The creaser head shaft assembly ball bearings are pre-lubricated and sealed for life. The bearings should be replaced in sets per shaft. The width adjustment screws and the linear bearings supporting the creaser heads should be inspected every 3 to 6 months and greased only when required.

5.2 Replacing Creaser Blade

Creaser blades need periodic replacement when the edge wears down from the ideal angle. When creases widen and become rounded instead of sharp, it is an indication that the blades need replacing. To replace blades:

1. Detach creaser head guard by removing the two screws holding the guard in place.

2. Remove the three screws holding the assembly together.

Figure 23: Creaser Blade Disassembly

3. Pull off the creaser shaft cap from the shaft.

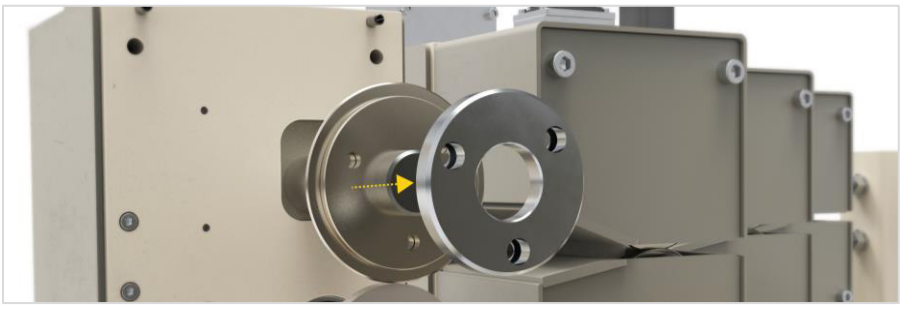


Figure 24: Creaser Blade Disassembly

4. Remove the outer pressure plate.

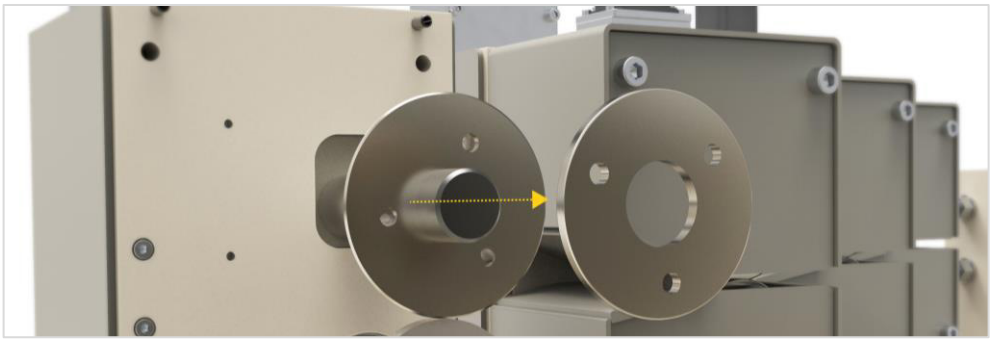


Figure 25: Creaser Blade Disassembly

5. Remove the old creaser blade and replace with a new blade. Make sure that the surfaces of the blade and pressure plates are clean before re-assembly. Apply a light film of oil (WD-40) on the surface of the new blade. Never attempt to regrind the blade.

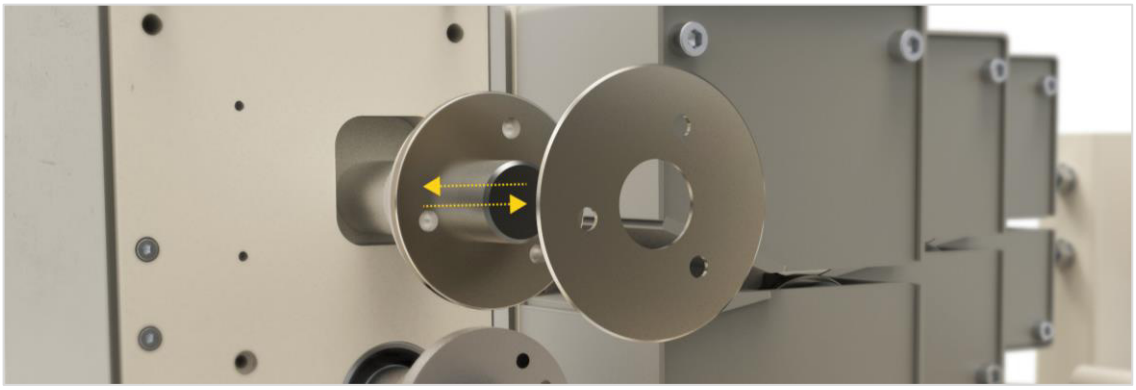


Figure 26: Creaser Blade Replacement

6. Replace the pressure plate and shaft cap, lining up the three screw holes.

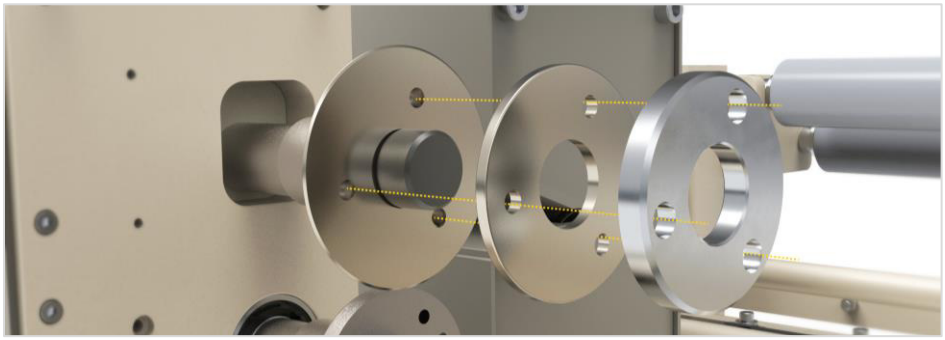


Figure 27: Creaser Blade Re-assembly

7. Replace the screws and tighten.

Figure 28: Creaser Blade Re-assembly

5.3 Replacing Creaser Anvil

The creaser anvil is removed and replaced in the same manner as a creaser blade.

5.4 Rotation / Replacement of Worn Pressure Plates

Pressure plates can become worn at the inner edges from use. The wear occurs from the passing of the paper between the blade and anvil. One plate can wear more than the other if the blade is slightly off center. Flip the pressure plate to expose the other edge. When both sides of the anvil pressure plates are worn, they can be exchanged with the pressure plates holding the blade. Again, flip the pressure plates when one side gets worn down. If the pressure plates have been through all possible rotations or the plates are too worn to rotate, replace them using the same method as the blade or anvil.

Please note: The pressure plates have a slight chamfer when new.

6 Maintenance Schedule

The following is a general recommended guide for maintenance on the creaser.

6.1 Monthly Tasks

Task	Notes
Inspect creaser blade / anvil / Pressure plates	Check condition and that they rotate freely
Inspect guards	Check their condition.

6.2 3 Months

Task	Notes
Inspect paper guide rollers	Check condition and that they rotate freely

6.3 6 Months

Task	Notes
Clean entire machine	
Paint and rust coat	
Replace blades	
Inspect width adjustment screws	Check condition and grease only if required
Inspect linear bearings	Check condition and grease only if required

7 Troubleshooting

Due to the intricate nature of the equipment, this section will outline only basic mechanical approaches to problem solving. Should the maintenance steps outlined below fail to fix the issues, we recommend contacting a Gyptech representative.

7.1 Crease Lines

Problem	Possible Cause(s)	Possible Solutions
No crease	• Creaser head not engaged • Creaser head not contacting paper	• Engaging creaser head • Increasing overall depth
Crease lines too shallow	• Creaser head not engaged • Creaser head not contacting paper	• Increase overall depth • Disengage creaser head and clean underneath
Creasers are cutting paper	Creaser depth too deep	Reduce overall depth
Crease lines becoming rounder and shallower	Creaser blade dulling	Replace creaser blade

7.2 Product Quality

Problem	Possible Cause(s)	Possible Solutions
Scuffing or tearing of paper	Excessive paper tension Creaser elements not turning on paper	Check tension of paper and adjust Try rotating element by hand, bearings may need replacing
Buckling or tearing of paper	Creaser heads need toe-in or toe-out	Pivot slide bases accordingly

7.3 Edge Formation

Problem	Possible Cause(s)	Possible Solutions
Very round edges on formed board	Creaser depth too shallow	Increase overall depth

END OF DOCUMENT

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