CATBRIDGE

Model 324MC-32 Laminator
PL71145
Operator Manual

Prepared for Adhesives Research, Inc

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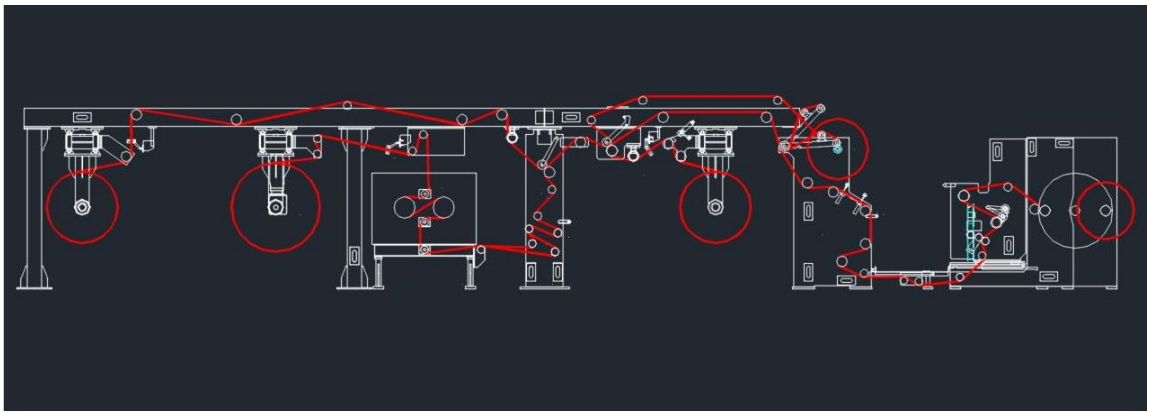

Dry Laminating System

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Section
1

INTRODUCTION

Scope of this manual

Who should use this?

- All operators of the Model 324MC-32 Laminator
- Any person who will supervise an operator
- All maintenance personnel assigned to the equipment

What's in this manual?

- Information regarding the day-to-day operation of the equipment
- Troubleshooting common problems
- Suggested maintenance of the equipment

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Section
2

OVERVIEW OF EQUIPMENT

What and why?

This system was designed for laminating and rewinding materials up to 67" in width. It comes equipped with many features that make day-to-day operation safe, efficient, and effective. The system consists of a shaftless, non-driven & driven unwind, corona treater section, lamination section, an infeed section with an auxiliary liner winder, and a winder section containing a tape applicator, moving carriage with a duplex turret, unload table, and upender. The primary purpose of this equipment is to unwind an adhesive product and foam, laminate the adhesive product to foam, wind the release liner, tab, and rewind finished rolls. In particular, this machine is made to process and rewind open adhesive products of varying thickness.

The theory behind the equipment is as follows: the web from unwind #2 (foam) passes through the corona treater in preparation for lamination. As the web continues through the machine, the transfer liner and foam are laminated as they pass through laminator #1. After that, they go through laminator #2, where they are laminated to the backer (unwind #1). As soon as the web leaves laminator #2, the transfer liner is peeled off and wound on the liner winder. The rest of the web is rewound, taped (if applicable), cut, and turreted to the outboard position, where it can be pushed off to the non-powered conveyor for stacking on the pallet. The process is designed to limit operator involvement to just loading blank cores and unloading finished rolls for downstream packaging/processing.

Type MC Machines are designed for high-speed production. These machines are turreting Rewinders that normally contain either a tabber or gluing system. When the material is rewinding on the inboard shaft and the gate is down, the operator can unload finished rolls and reload cores in preparation for another turreting action. The cutoff assembly is also optimized with a mobile carriage (MC) for a cutoff sequence. In some cases, these machines are equipped with automated loading and unloading for fast and uninterrupted production.

The machine contains the following features:

Unwind Section

- Three [3] Model 690 Shaftless Unwind
- Two [2] Braked Unwinds
- One [1] Driven Bidirectional Unwind
- Two [2] 2 x 6" base torque chuck adapters
- One [1] 2 x 6” pneumatic-mechanical chuck adapters
- Four [4] Unwind Light Curtains
- Seven [7] static bars
- Three [3] Evo 150 Edge guide with [2] deep depth heads and +/- 6” of web correction
- Two [2] Driven Laminator Rolls
- Two [2] Dancer Assemblies (Unwind # 2 & Corona Treater)
- One [1] Driven Corona Treater with Four [4] Feedback only Guards
- Three [3] Tail Clamps (one for each Unwind)
- Two [2] Laminator Nip Rolls with adjustable stops
- Two [2] Polyband Expander Roll

Infeed Section

- One [1] Unwind/Infeed Light Curtain
- Auxiliary Liner Winder with Touch Roll
- 3" Lift-Out non-inflating lightweight shaft
- Laminator 2 Dancer assembly
- Walkway
- Splice Table with flaps and vacuum
- Overhead Hoist
- Three [3] static bars
- One [1] Tail Clamp
- One [1] Safety Gate
- Jog Footswitch

Rewind Section

- Model 324MC-32 Rewind
- Automatic Tabber
- Duplex Style Turret Rewind
- Mobile Carriage with integrated Cutoff Assembly
- Two [2] 3" lock-core rewind shafts
- One [1] Holding Brakes
- Rewind Area Safety Laser
- Rewind Safety Guard
- Two [2] Integrated Static Bars
- Main Operator Station
- Jog Footswitch
- Camera System
- Unload Table with none-powered Conveyor
- Roll Upender for skid

Section
3

SAFETY FEATURES

Emergency Stop

The Model 324MC Rewinding system is equipped with oversized, mechanically latched Emergency Stop (E-Stop) Pushbuttons located in critical areas all around the machine. Emergency stops are positioned at the lowest level of all operator stations for easy access during hazardous situations. The E-Stops should be utilized whenever a dangerous situation arises or appears imminent.

The infeed section of the machine is protected by a Fortress Safety Gate. This prevents an operator from entering this section of the machine while running. The gate must be locked in order for the machine to run, and will not unlock unless the machine is running below safe speed.

The unwinds are protected by one Laser Safety Fence If the Safety Zone is breached while the machine speed exceeds 50 FPM, the machine will initiate an E-Stop.

Activating an E-STOP will halt all web motion and/or carriage motion within 5 seconds and command the rewind motor to enter STO (Safe Torque Off) mode. It is important to note that during an E-Stop, the web is not guaranteed to be salvageable, and a re-web may be necessary. The E-STOP Reset Illuminated Pushbutton indicates a clear E-STOP circuit.

The equipment has **ONE** E-Stop Reset Pushbutton located on the operator station. Using only one reset button will eliminate the possibility of an inadvertent E-Stop circuit reset.

Guarding

All guarding has been provided to minimize the possibility of accidents. In general, if a location does not require regular access, the guard in that area will require tools to gain access and will **not** be equipped with an electrical interlock.

Never wear loose fitting clothing when working around the equipment.

Never wear gloves when operating in or around the equipment.

Lock Out/Tag Out

A Lock Out/Tag Out is required when performing maintenance on the machine. These are useful for preventing personnel from operating machinery while maintenance is being performed. Multiple locks may be put in the Lock Out hasp to indicate several personnel are servicing the equipment.

There are two main Lock Out/Tag Out locations. One Lock Out/Tag Out is on the main air supply valve, located behind the Main Electrical Enclosure on the same side as the Main Operator Station. Rotating the **blue** hinge on the manual locking valve will cut off all air supplied to the machine, revealing a Lock Out point. The other Lock Out/Tag Out is located on the Main Electrical Enclosure's electrical disconnect. Pushing in on the lever will reveal a cutout, allowing one to lock out the main electrical supply to the machine.

Follow the guidelines set by your company on Lock Out/Tag Out Procedures.

Catbridge Model 324MC Safety Component Descriptions

Main Control Station Stack Lights/Horn

Two multi-colored Stack Lights are located above the Main Control Panel. These lights are visible from all around the machine and give useful information about the machine status at a moment's glance. The different statuses are indicated by an **Amber**, **Red**, and **Green** Light that will be either SOLID, FLASHING, or OFF.

1) The **Amber** Light indicates the Line Speed Reference and Drive Status:
    a. SOLID: Drives are enabled, but no Line Speed Reference is given. In Slack Take-Up, NOT Jogging.
    b. FLASHING: Core Hopper Level is LOW or the Safety circuit has been disabled.
    c. OFF: Drives are disabled.
2) The **Red** Light indicates the Safety Status:
    a. SOLID: An Emergency Stop has been triggered.
    b. FLASHING: There is an Active Alarm or the Safety circuit has been disabled.
    c. OFF: All Safety Statuses are nominal.
3) The **Green** Light indicates the Line Run Status:
    a. SOLID: The Line is running (Drives Enabled, Speed Reference Enabled, Speed Reference greater than 0, NOT JOGGING).
    b. FLASHING: The Rewind shaft is maintaining tension at zero speed (Slack Take-Up) or the Safety circuit has been disabled.
    c. OFF: The line is not running (Drives disabled and Speed Reference disabled) – Zero Tension.

Red	Amber	Green	Meaning
Off	Off	Off	The line is not running, Safety OK, No Alarms, Drives disabled
Off	Off	On	The line is running (Drives Enabled, Speed Reference Enabled, and Speed Reference greater than 0, NOT JOGGING).
Off	Off	Flashing	The Rewind shaft is maintaining tension at zero speed (Slack Take-Up) or the Safety circuit has been disabled.
On	Off	Off	An Emergency Stop has been triggered.
Flashing	Off	Off	There is an Active Alarm or the Safety circuit has been disabled.
Off	On	Off	Drives are enabled, but no Line Speed Reference is given (Drives On – Not Running, or Jogging).
Off	Flashing	Off	Core Hopper Level Low or the Safety circuit has been disabled.
Flashing	Flashing	Flashing	The Safety Circuit has been disabled. Contact your Controls Engineer.

Note: The desired stack light sequence will depend on the current operating conditions. Ideally, the **Red** Light should be OFF while the machine is running.

A **Stack Horn** is located just above the Main Operator Control Panel. The horn can be heard from within the vicinity around the machine and will sound if there is any action being performed during operation or start up. The volume of the horn can be adjusted using the slider at the bottom of the horn module. The conditions for the horn sounding are:

1) The line is starting up.
2) The Laser Scanner Warning Bank is blocked (mode enabled on **Machine Safety Screen**).
3) The machine is holding at Safe Speed (< 50 FPM).
4) Jogging has been initiated.
5) The Carriage is being jogged manually.
6) The Cutoff Sequence has been reset (**Short Beep**).
7) Winder guard is opening or closing

The Main Control Panel Stack Lights/Horn contains:

1) Allen-Bradley Stack Base
2) Allen-Bradley Stack Tube
3) Allen-Bradley Stack Horn
4) Allen-Bradley **Red** Stack Light
5) Allen-Bradley **Amber** Stack Light
6) Allen-Bradley **Green** Stack Light

Edge Guide Disabled

If the machine is E-Stopped for any reason (pushbutton, light curtain, access door, etc.) and remains in the E-Stopped state, the Edge Guide is disabled to prevent any non-intentional shifting of the web. In addition, any time the machine line speed is equal to zero, the Edge Guide will be disabled. If applicable, in some cases, when the Unwind Zone is not clear, the Edge Guide is disabled to prevent any unintentional shifting of the web.

Where applicable, the Zone Reset Pushbutton (**blue**) is SOLID when the safety zone is clear and equipment is enabled, OFF when the safety zone is not clear and reset is not allowed, and FLASHING when the safety zone is clear but a reset must be done.

In some cases where a Zone Reset Pushbutton is not applicable, an indication of the Unwind Light Curtain status can be found on the **Machine Safety HMI Screen** (refer to **Section 5 – *Description of Controls*** of this manual) or the flashing indicator of the Unwind Safety Zone Reset Pushbutton pilot light. The light will flash to show that the Unwind Light Curtain needs to be reset.

In certain machine configurations, the Unwind light curtain (or laser scanner) may also control the operation of a Carriage, Tabber, Cutoff, and Turret. When the light curtain (or laser scanner) is tripped, the motion to any of these devices becomes inhibited. The operator must reset the light curtain (or laser scanner) using the above method to continue the sequence or operation of the device.

Safety Gates/Guard Door Locking Devices

When applicable, safety gates are installed in the safety fence to create additional safety zones. On this machine, there is one safety gate. This gate allows access to areas such as walkways/rewind motor houses, tabber, splicing sections, and, in general, areas that should not be accessible while the machine is running. The machine will be allowed to jog. Additionally, the machine is equipped with a sliding safety guard at the rewind section. The theory behind the winder guard is that the machine will be able to run at speeds greater than or equal to 100 FPM when the guard is down. This allows for continuous output of the machine while the operator(s) are able to load and unload finished rolls and new cores onto the outboard mandrels. When the guard is in the raised position, the machine is programmatically limited to 100 FPM, and the safety zone located at the rewind is extended beyond the outboard rewind shafts.

There are four feedback-only guards for the corona treater. When the corona treater guards are closed, the treater gate safety resets automatically. When the corona treater is enabled, the machine will not be allowed to start if these guards are open. If, for some reason, one of the guards opens or loses the feedback signal while the machine is running, the machine will be E-Stopped.

The right side of the infeed section is equipped with a safety gate that is intended to lock the section unless a request to enter is granted. These gates and doors must and will remain CLOSED and LOCKED at all times when the machine is running at speeds greater than 50 FPM. To gain entrance to this section, an operator must press the 'Gate Lock' pushbutton (**white**, located on the fence next to the safety gate). If the line speed is 50 FPM or below, entrance will be granted. The 'Gate Lock' pushbutton will begin to flash, indicating it is safe to enter. Once the work inside the Safety Zone is complete, the operator must exit through the door they entered, close the door, press the 'Gate Lock' pushbutton, and then press the 'Zone Reset' pushbutton (**blue**).

If the safety switch on the access door or gate is not made (door open/not locked), the safety zone is placed into a “Not Safe to Run” state. In this case, two situations are possible:

1) If the access door or gate became unlatched while line speed was greater than 50 FPM the Safety Zone will be tripped and the machine will trigger an E-Stop condition. This will put all drives into a Safe Torque Off (STO) state, open all safety power contactors, and disable the Edge Guide. To reset this condition, the operator must clear the area and perform the following steps:
    a. Press the “E-Stop Reset” Pushbutton on the Main Operator Station
    b. Close the access door or gate (will require maintenance if it does not close)
    c. Press the “Gate Lock” (**white**) Pushbutton
    d. Press the “Zone Reset” (**blue**) Pushbutton (for respective section)
2) If the line speed was less than 50 FPM when the Safety Zone was tripped, all line drives are placed into Safe Speed Limit monitoring. The line will continue to run as long as the speed does not exceed 50 FPM. If, somehow, the machine achieved a line speed over 50 FPM, the machine will E-Stop, even if the line speed set point is below 50 FPM. To reset this condition, the operator must follow the directions laid out in point 1.

In certain machine configurations, the Safety Gates may also control the operation of a Carriage, tabber, etc. When the Safety Gates are not reset, the motion to any of these devices becomes inhibited. The operator must reset the safety gate using the above method to continue the sequence or operation of the device.

Infeed/Unwind Light Curtain

There are total of five light curtains on this machine. Four of them are positioned on the unwind section of the machine and one is positioned on the infeed/unwind section to prevent unwanted entry to the infeed, tabber, unwind, etc. section during machine operation. The curtains are intended to prevent unknowing personnel and/or others from entering the protected sections while the machine is running above Safe Speed (> 50FPM).

If the light curtain is tripped, the Safety Zones associated with the light curtain are placed into a 'Not Safe to Run' state. In this case, two situations are possible:

1) If the line speed is greater than 50 FPM when the light curtain is tripped, the machine will execute an E-Stop condition. This will place all the line drives into Safe Torque Off (STO), open all safety power contactors, and disable the Edge/Line Guide. To reset this condition, the operator must clear the area and perform the following steps:
    a. Press the “E-Stop Reset” Pushbutton (located at the Main Operating Stations)
    b. Press the appropriate “Safety Zone Reset” (**blue**) pushbutton (mounted closest to the light curtain)
2) If the line speed was less than or equal to 50 FPM when the light curtain was tripped, all line drives are placed into Safe Speed Limit monitoring. The line may continue to run as long as it does not exceed 50 FPM. If, somehow, the machine achieved a line speed over 50 FPM, the machine will E-Stop, even if the line speed set point is below 50 FPM. To reset this condition, the operator must follow the directions laid out in point 1.

Where applicable, the Zone Reset Pushbutton (**blue**) is SOLID when the safety zone is clear and equipment is enabled, OFF when the safety zone is not clear and reset is not allowed, and FLASHING when the safety zone is clear but a reset must be done.

In some cases where a Zone Reset Pushbutton is not applicable, an indication of the Light Curtain status can be found on the **Machine Safety HMI Screen** (refer to Section 5 – **Description of Controls of this manual**) or the flashing indicator of the Safety Zone Reset Pushbutton pilot light. The light will flash to show that the Light Curtain needs to be reset.

In certain machine configurations, the light curtain may also control the operation of a Carriage, tabber, etc. When the light curtain is tripped, the motion of carriage becomes inhibited. The operator must reset the light curtain using the above method to continue the sequence or operation of the device.

Rewind Safety Laser Scanner

There is one safety laser scanner located on the machine frame protecting the rewind area. The scanner is intended to prevent unknowing personnel and/or others from entering the Rewind section while the machine is running and/or the Winder Guard is in the raised position and cutoff & turret sequence is running.

If the laser scanner is tripped, the Rewind Safety Zone is placed into a “Not Safe to Run” state. In this case, two situations are possible:

1) If the line speed is greater than 50 FPM when the laser scanner is tripped, the machine will execute an E-Stop condition. This will place all the line drives into Safe Torque Off (STO), open all safety power contactors, and disable the Edge/Line Guide. To reset this condition, the operator must clear the area and perform the following steps:
    a. Press the “E-Stop Reset” Pushbutton (located at the Main Operating Station)
    b. Press the “Zone Reset” (**blue**) Pushbutton (for respective section)

2) If the line speed was less than or equal to 50 FPM when the laser scanner is tripped, all line drives are placed into Safe Speed Limit monitoring. The line may continue to run as long as it does not exceed 50 FPM. If, somehow, the machine achieved a line speed over 50 FPM, the machine will E-Stop, even if the line speed set point is below 50 FPM. To reset this condition, the operator must follow the directions laid out in point 1.

Where applicable, the Zone Reset Pushbutton (**blue**) is SOLID when the safety zone is clear and equipment is enabled, OFF when the safety zone is not clear and reset is not allowed, and FLASHING when the safety zone is clear but a reset must be done.

In some cases where a Zone Reset Pushbutton is not applicable, an indication of the Rewind Safety Laser status can be found on the **Machine Safety HMI Screen** (refer to **Section 5 – *Description of Controls*** of this manual) or the flashing indicator of the Rewind Safety Zone Reset Pushbutton pilot light. The light will flash to show that the Rewind Safety Laser needs to be reset.

In certain machine configurations, the Rewind laser scanner may also control the operation of a Carriage, Turret, Nip Roll, Cutoff, etc. When the laser scanner is tripped, the motion to any of these devices becomes inhibited. The operator must reset the laser scanner using the above method to continue the sequence or operation of the device.

The Rewind Laser Scanner contain:

1) Keyence Laser Scanner SZ-04M

Unwind Roll, Unwind Drive Rewind Shaft

The shaftless unwind will hold and retain the unwind roll using 3”-6” torque chucks (laminate unwinds) and pneumatic chucks (middle carrier) that expand into the unwind roll core.

The braked unwind immediately inflates the pneumatic brakes to maximum pressure, and the driven unwind will be placed into Safe Torque Off (STO) when the Emergency circuit is tripped to stop all material motion in the shortest time possible. For driven unwinds with holding brakes, motor brakes will engage when a standstill status is achieved (when the motor velocity reaches zero).

The Rewind Shafts are cantilevered and attached to the drive components on the left side. These are held in place with pneumatic shaft lock mandrels on the right side. The system is designed so that the operator must press a button to release the safety locks; the locks will only automatically release and engage during Cutoff & Turret Sequence.

Caution: Operators should be cautious during the Cutoff, Turret, and Transfer Sequences. Though safeguards are in place to prevent injury, pinch points still exist in certain areas.

On Turret Style machines, the outboard rewind shafts will spin freely as the clutch becomes disengaged. Additionally, the shaft differential elements will be deflated. The elements will inflate again when the Operator presses the “Cores Loaded” pushbutton just outside the Rewind or during an Automatic Core Loading Sequence, where applicable.

> **Note:** An E-Stop condition can make threading the machine difficult, so the E-Stop circuit should be reset and the Unwind brake turned off prior to attempting to thread the machine.

Safety Device Control

This section provides an overview of the functions controlled by each Safety Device. Emergency Stops control all machine functions and immediately stop movement. Other Safety Devices, such as Light Curtains, Laser Scanners, Gates, etc., will only control the specific Zone they are designated to protect, depending on the current state.

Unwind Light Curtain

- Emergency Stopping
  - Greater than 50 FPM Line Speed will Emergency Stop machine
- Safe Speed
  - Machine will not achieve speed greater than 50 FPM
- Nip Roll Safety
  - Prevent actuation of Laminator Nip Rolls
    - Movement can cause pinch points

Infeed/Unwind Light Curtain

- Emergency Stopping
  - Greater than 50 FPM Line Speed will Emergency Stop machine
- Safe Speed

- Machine will not achieve speed greater than 50 FPM

- Nip Roll Safety
  - Prevent actuation of Laminator & Winder Nip Rolls
    - Movement can cause pinch points
- Cutoff Sequence Safety
  - Disables/ Pauses Cutoff & Transfer Sequence and all manual controls
    - Carriage access if light curtain is tripped
- Liner Winder Safety
  - Disables Scrap Winder Run Mode
- Tabber Safety
  - Disables/ Pauses Tabber Sequence and all manual controls except tail clamp.
    - Tabber access if light curtain is tripped

Infeed Safety Gate

- Emergency Stopping
  - Greater than 50 FPM Line Speed will Emergency Stop machine. Gate access not allowed over 50 FPM line speed
- Safe Speed
  - Machine will not achieve speed greater than 50 FPM
- Nip Roll Safety
  - Prevent actuation of Laminator & Winder Nip Rolls
    - Movement can cause pinch points
- Cutoff Sequence Safety
  - Disables/ Pauses Cutoff & Transfer Sequence and all manual controls
    - Carriage access if gate is opened
- Liner Winder Safety
  - Disables Scrap Winder Run Mode
- Tabber Safety
  - Disables/ Pauses Tabber Sequence and all manual controls except tail clamp
    - Tabber access if gate is opened

Winder Safety Guard

- Emergency Stopping
  - Greater than 50 FPM Line Speed will Emergency Stop machine when guard is raised & rewind laser scanner is tripped
- Guard Open Speed
  - Machine will not achieve speed greater than 100 FPM when guard is open

- Cutoff Sequence Safety
    - Disables/ Pauses Cutoff & Transfer Sequence and all manual controls if rewind laser scanner is also blocked
        - Cutoff Carriage access if guard opened
- Nip Roll Safety
    - Prevent actuation of Winder Nip Roll if rewind laser scanner is also blocked
        - Movement can cause pinch points
- Pneumatic Safety
    - Disables certain Rewind pneumatic devices if rewind laser scanner is also blocked
        - Movement can cause pinch points

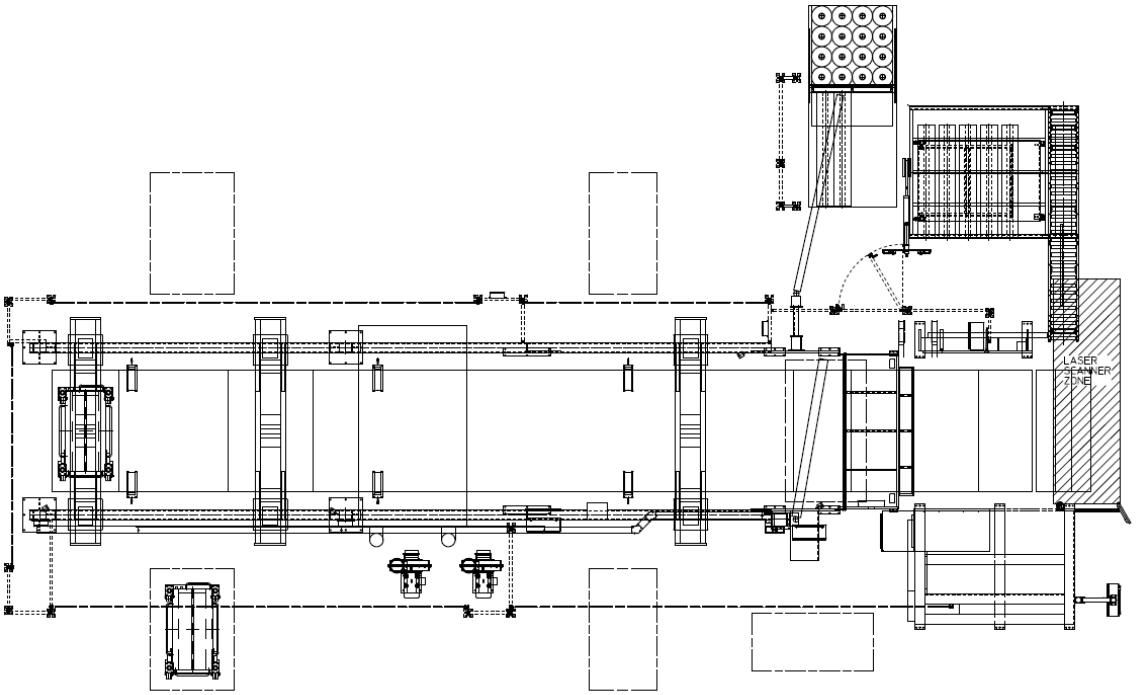
Winder Safety Laser Scanner

- Emergency Stopping
    - Greater than 50 FPM Line Speed will Emergency Stop machine
- Safe Speed
    - Rewind line drive will be in STO
- Cutoff & Turret Sequence Safety
    - Disables/Pauses Cutoff & Turret Sequence and all manual controls if rewind guard is open
        - Cutoff Carriage access if laser scanner tripped
- Pneumatic Safety
    - Disables certain Rewind pneumatic devices if rewind guard is open
        - Movement can cause pinch points
- Nip Roll Safety
    - Prevent actuation of Winder Nip Roll if rewind guard is open
    - Movement can cause pinch points

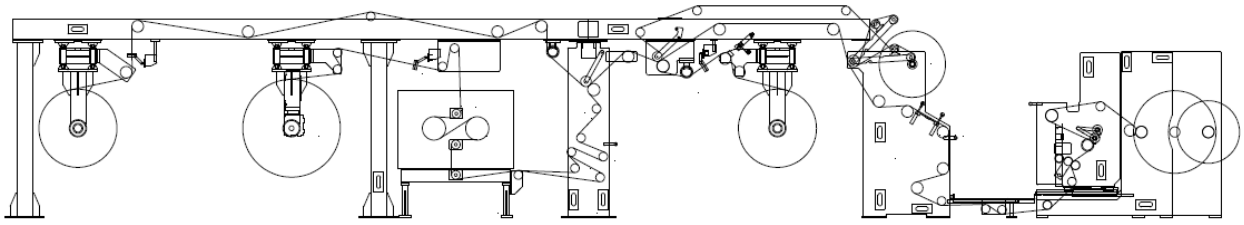
Section
4

SYSTEM CONCEPTS

Floor Plan

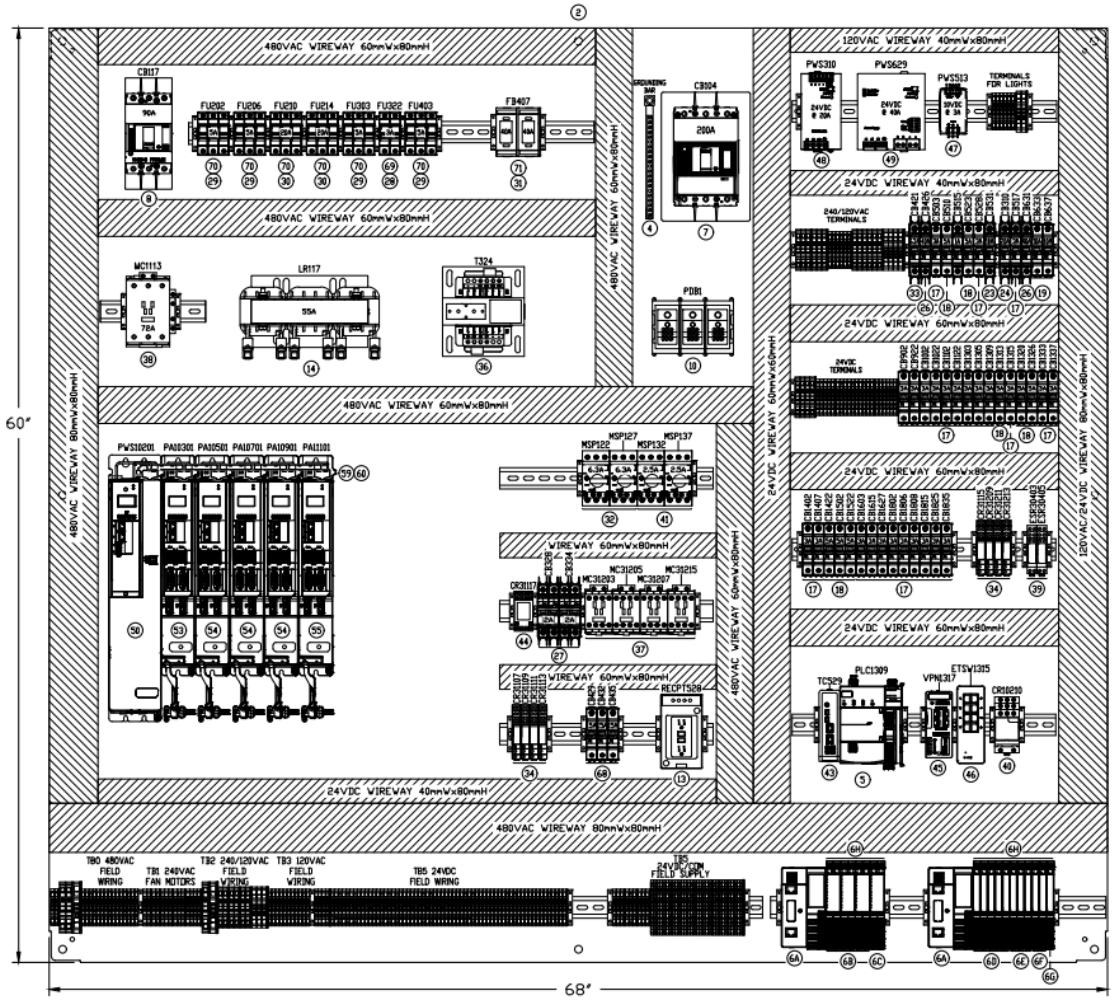


Web Flow



Main Electrical Cabinet

The main electrical cabinet is where power is distributed; all protection, circuit breakers, and starters are located. Auxiliary electrical equipment is also located here. Depending on the machine model, different types of enclosures can be used. Power is provided from the main circuit breaker down to the distribution block. Refer to the Electrical Schematics for this machine for details on wiring.



The main cabinet is equipped with cabinet lights, useful during commissioning and maintenance. It is user's responsibility to keep the to clean or change the filters on a regular basis.

Unwinding

690 Unwind: A shaftless unwind is designed to be loaded by carts. The shaftless first and second laminate unwind sections accept rolls that are 67" wide and up to 40" in diameter, weighing up to 5000 lbs. The middle carrier unwind section accepts rolls that are 67" wide and up to 50" in diameter, weighing up to 5000 lbs. Using the carts, the roll to be unwound is placed in the center of the shaftless unwind, between the chucks. The chucks are manipulated via unwind control.

For the first and second laminate unwinds, tension is controlled using a pneumatically actuated brake. The unwind brake increases or decreases brake pressure to maintain linear tension. Brake pressure can be manually adjusted to control the unwind tension. A set of 3" base torque chucks with 6" adapters is provided for running master rolls with either core size.

For the middle carrier unwind, tension is controlled by adjusting the speed of the unwind motor. The unwind motor speed is adjusted to keep the dancer at the reference position, ensuring linear tension. A set of 3" base pneumatic-mechanical chucks with 6" adapters is provided for running master rolls with either core size.

Unwind chucking control is provided by the operating station mounted on the left/right side of the unwind arms.

The unwind is mounted on linear bearings and is driven by an AccuWeb WideArray edge guide with +/- 6" of motion. Two deep-head edge guide sensors are mounted on a Bosch rail section, located on the left and right frames of each unwind section. Web adjustability is provided by moving the web offset between the heads on the unwind HMI. The default web control is to center the web equally between the heads.

Operators will need to verify that the diameter is manually entered on the first and second laminate **Unwind Screens (Unwind 1 & 3)** when switching to a new roll, this value is not automatically captured. The diameter is automatically captured for middle carrier unwind **(Unwind 2)** using a Time-of-Flight sensor. On line start the previous value is entered into the diameter calculations and roll diameter is derived from pulses in the diameter proximity sensor and for the unwind with dancer from the displacement.

Operators will need to verify that the diameter is manually entered on the first and second laminate **Unwind Screens (Unwind 1 & 3)** when switching to a new roll. This value is not automatically captured. The diameter is automatically captured for the middle carrier unwind **(Unwind 2)** using a Time-of-Flight sensor. At line start, the previous value is entered into the diameter calculations, and the roll diameter is derived from pulses in the diameter proximity sensor. For the unwind with dancer, it is derived from the displacement.

> **Note:** The Unwind diameter is updated only when the machine is running (material is moving). This value is calculated by the PLC while in motion.

Rewinder

This **rewinder** has been designed for winding up to a 36" diameter roll with the guard open and a 32" diameter roll with the guard down.

Diameter estimation is a crucial part to any type of rewinding action. The Rewind has two methods of calculating diameter: **Length-Gauge** and **Displacement**.

For **Length-Gauge** calculation, the machine estimates the diameter based upon the accumulated length, operator's input gauge (thickness), and core diameter (Outer Diameter, OD). This method is only as accurate as the input parameters. Generally, operators can give a rough initial estimate if unsure then measure the final diameter and footage of the roll and, using the calculators on the **HMI Calculators Screen** (refer to **Section 5 – *Description of Controls*** of this manual), obtain a close approximation of the thickness.

For **Displacement** calculation, the machine uses a pulse counter to measure the "displacement" footage between pulses of the Rewind Shaft. Measuring the displacement between pulses gives an estimate of the circumference of the winding rolls. Using that estimate, the diameter can be found with some mathematics. This method has the limitation of only working in Lock Core mode. In Lock Core mode, the shaft rotates at the same rate that the winding rolls do; however, in differential winding the rolls slip on the shaft. This slipping effect does not portray each rolls' circumference accurately and so the Displacement method cannot be used in Differential winding mode.

> **Note:** The Rewind diameter is updated only when the machine is running (material is moving). This value is calculated by the PLC while in motion.

The Rewind has been configured for **Differential Shaft Winding** with **Touch Mode** and/ or **Gap Mode** Touch Roll control.

The **Rewind Tension** settings affect the torque transmitted to the Rewind Shafts directly in Locked Core Mode. **Locked Core** winding is a method of winding where the core of the winding material is "locked" to the Rewind shaft (i.e., for every 1 revolution of the shaft, the roll(s) also rotate once). This is produced by applying full pressure to the differential shaft elements. Locked Core winding is done utilizing motor torque or via a clutch to apply a variable torque. **Note:** locked core torque is developed by the motor servo only; the clutch method is described for posterity. For the motor torque method, the motor's speed reference is fixed at slightly higher than line speed (overspeed) while the torque applied varies. By varying the torque, different tension set points can be obtained. For the clutch method (not used on this machine), the clutch connects the Rewind transmission to the Rewind shaft. The Rewind transmission side of the clutch is given a speed reference slightly higher than line speed. The clutch is then allowed to slip on the shaft side. This slipping force (torque) is directly related to the tension. Varying the torque that the clutch exerts between the Rewind Transmission side and the shaft side creates different tension set points. The torque applied by the clutch or motor is proportional to the diameter of the winding roll and the tension required when winding in Locked Core. The value for the required torque is continuously calculated using the estimated diameter of the roll and taper percentage. In some cases, feedback from a load cell can be used to trim the torque applied to maintain the tension set point exactly. Locked Core winding provides an even amount of tension across the web; however, does not account for slight imperfections in the web. If more than one roll is winding, some rolls might accumulate in diameter quicker than others due to inconsistent thickness across the web. This has a direct consequence on the tension of the winding roll as the largest diameter will bear all the load of the tension while the small diameters will begin to go slack.

In **Differential** winding, the motor is not torque limited (meaning the motor may use all of the available torque, not changing). The differential elements of the Rewind shaft are inflated but the level of inflation varies. This allows the outer, cam-lock rings of the shaft, which are engaged with the core, to slide against the inner shaft elements. The frictional force (torque) between the cam-lock rings and the differential elements creates the tension required. Similar to the Lock Core method, the required torque is continuously calculated and sometimes trimmed using load cells. Differential winding provides individual tension control for each roll and solves the imperfection issue that lock core contains; however, differential winding comes with its own issues. The friction between the cam-lock rings and the inner shaft may vary depending on residue between the two surfaces, which will directly affect the tension to rolls in the afflicted location. In addition, the cam-lock rings may slip axially, which would consequentially cause the core to slide axially along the shaft. This axial slide may cause the core to degrade if the core is not rugged enough, but can be resolved by using the provided core locator bearings or strips. The major drawback of differential winding comes from allowing the cores to maintain tension for themselves, which lead to inconsistent tension in the rolls.

A third method of tension control is a hybrid between the both called **Mixed Mode**. Mixed Mode winding is primarily locked core winding while also adjusting the force that the differential elements exert. The motor maintains the tension across the web while the differential elements' torque applied is just above the tension set point by some small multiplier (usually 1.2-1.8). By doing this, as the diameter of one roll accumulates larger than others on the same shaft, that the cam-lock rings engaged with the core can begin to slip until it reaches the same tension that the other rolls are generating (i.e., a larger diameter roll will require more torque to maintain the same tension set point and so it begins to slip until it reaches the same tension across the web). This method works well for most materials.

To summarize Lock Core and Differential Winding:

The **Locked Core** setting controls Motor Torque or air pressure applied to the Rewind Clutches to control tension. Bladders on the inside of the shaft expand, pushing out the elements that grab and lock

the core. In this mode, air pressure is applied to the differential Rewind Shafts to lock the cores to the shafts. Tension is controlled by the motor, or clutch, as the air pressure is fixed inside the Rewind Shaft. Unlike Lock Core, **Differential Winding** regulates air pressure by automatically adjusting it to provide the desired torque at the Rewind Shafts. This system allows the cores to slip on the Rewind Shaft individually.

The **Differential Pressure** setting controls the pressure applied to the differential shafts. Differential Mode winding is usually used where gauge banding and material thickness inconsistencies may exist.

In **Touch Mode** Touch Roll winding, the Touch Rolls always maintain contact with the surface of the winding material. The **Touch Force** setting controls the amount of force applied by the Touch Rolls against the surface of the material on the Rewind Shafts. The purpose of the Surface Wind Mode is to exert pressure against the surface of the roll reducing the amount of air trapped between the layers of the winding material, resulting in a harder roll with reduced telescoping.

In Type MC Machines, as the Touch Rolls compresses, a string potentiometer (pot) measures the amount of compression. As the rolls build in diameter and compresses the Touch Roll, the Carriage will back out to maintain a set compression value. This will ensure that the rolls will always be in correct contact with the Touch Rolls.

In **Gap Mode** Touch Roll winding, the **Gap Distance** setting controls the distance the Touch Rolls will maintain from the winding material. With materials that are thick, Gap winding is a good solution, however it can impact winding speed and may cause telescoping if the tension is set too high.

In Type MC Machines, as the rolls begin to build in diameter, the Carriage will back out the same amount that the rolls' radius has built up by. It is important that the diameter is accurate during accumulation as the carriage will maintain the distance based upon the diameter estimation. If the diameter is not accurate, the Gap Distance will not be correct.

Mobile Carriage (MC)

The basis behind Type MC Machines is their ability to quickly and efficiently slit and transfer finished material while allowing operators to load cores for the next run. The use of a **Mobile Carriage (MC)** helps to achieve this by positioning the cutoff assembly directly on the Carriage. The Carriage will move backward and forward during the Cutoff & Transfer Sequence to position the required components for their particular action. Once the Cutoff has completed, the Carriage will remain in the next spot ready for the next run. This, coupled with fast speeds, make for rapid turnaround times and minimal error due to operators.

The Carriage also serves another purpose as it designates the position of the Touch Rolls relative to the winding material. In Touch Mode, the Carriage will move back slowly to account for the buildup of material on the Rewind Mandrels. The Touch Rolls contain string potentiometers (string pots) that measure the compression of the Touch Rolls in length. That compression is then converted to a linear movement backward. This ensures that the rolls will always be in contact with the Touch Rolls.

In Gap Mode, the machine will estimate the diameter of the operator's input values. From this, the Carriage will maintain a theoretical model of the Gap distance between the Touch Roll and the winding roll.

With the Carriage moving backward and forward, the machine will require either a slack take-up roll, accumulator, or a dancer to collect the material that is moving behind Carriage. Without any of these, the material will fall slack and begin the lose tension. This will have a negative effect on roll quality.

The carriage uses the servo encoder for positioning feedback; as such, the Carriage will not need to be rehomed on power up as it retains its location. Only in events of data loss or interruption, such as program corruption or a program update/download, will the carriage require rehoming. Rehoming is

performed on the Carriage Maintenance Screen located in the maintenance menu. The homing sequence steps are listed below, in addition to the list present on the Carriage Maintenance Menu. Once the Carriage is properly homed, the system can properly and effectively move the Carriage to the required locations with high accuracy and precision.

Caution: The Carriage is large moving mass. DO NOT OPERATE THE CARRIAGE OR COMPONENTS WITH PERSONNEL NEARBY. Failure to observe this precaution can result in serious injury or death.

To Home the Carriage

If the Carriage comes out of calibration or the carriage loses home for any reason, a rehome may be necessary. The Carriage rehome requires only pressing one button and ensuring that a proximity sensor is set to the proper position.

To Home the Carriage:

1) Power the machine down properly. For more information on powering down the machine, refer to ***Section 7 – Typical System Operation*** **– Shutting Down** of this manual.
2) Verify that the rear Carriage proximity sensor (the rear overtravel proximity sensor) is set to the proper position.
3) Clear the Cutoff Carriage Safety area of personnel.
4) Power the machine up properly. For more information on powering up the machine, refer to ***Section 7 – Typical System Operation*** **– Power Up** of this manual.
5) Reset any Safety Zones and/or Gates associated with the Cutoff Carriage.
6) Navigate to the **Turret and Carriage Screen** on the HMI. Optionally, users can also use the **Rewind Carriage Maintenance Screen**.
7) If the Carriage needs to be homed, homed status on the left of the screen will appear Red
8) Press the *Press to Home Carriage* button displayed in **blue** in the bottom of the screen. This will begin the Carriage homing sequence.
9) Once the sequence has completed, the Carriage can now be used for operation.

Tabber

A tabber assembly is integrated into the machine and provides quick, automatic feeding of adhesive tab strips for web-to-core adhesion. The tape length and position are fully adjustable via the Tabber screen on the HMI. The tabber will place a strip of adhesive tab on a nonstick, plasma-coated vacuum roll in preparation for application. At the end of a run, the web will slow to a predetermined speed, and the vacuum roll will retract, nipping the web between the vacuum roll and an idler. This nipping action and web movement cause the vacuum roll to rotate, transferring the tab directly to the moving web, where it is brought up to the cutoff assembly and positioned for cutoff.

When in automatic mode, the tabber will place a strip of tape immediately upon activation. This strip will be applied to the web currently in sequence. Once the tab is transferred to the web and the cutoff sequence commences, the tabber will promptly initiate the sequence to replenish the tab on the vacuum roll.

Note: When testing the tabber or running the sequence after changing the tape, remove any tape from the vacuum roll before re-enabling the auto apply sequence. Failure to remove the tape before returning the tabber sequence to automatic mode will cause the tabber to reapply the tape over the existing one.

Caution: The tabber assembly and idler are large moving parts. Ensure no personnel are inside the infeed area zone before operating the tabber sequence to avoid serious injury or death.

Caution: The Tabber contains a sharp razor knife and several pinch points. Wear protective cut-resistant gloves before engaging with the Tabber or changing the Tabber cutoff blade. Failure to do so can result in serious injury or death.

To Replace a Roll / Thread the Tabber

When the Roll Diameter becomes too low, the roll must be swapped out. This can be achieved by following these steps:

1) Cut the Tape out of the Applicator.
2) Rotate the thumbscrews to loosen the side plate.

   Note: It is not necessary to fully remove the thumbscrews. A few turns are enough to loosen the side plate from the thumbscrews.

3) Slightly rotate the side plate, aligning the holes with the thumbscrew cutouts.
4) Pull the side plate off and set aside.
5) Remove the roll by pulling it from the core.
6) Push a new roll onto the center of the assembly, ensuring a firm push to the core.
7) Align the side plate thumbscrew holes and push the side plate back on.
8) Rotate the side plate to lock it into place.
9) Rotate the thumbscrews until they are pressing tightly against the side plate.
10) If using tape with a liner, tear the liner near the nip roll and thread it to the liner winder. Attach the liner to the Liner Winder.
11) If tape requires lot of force to peel, turn the tensioner knob counterclockwise to reduce tension.
    a. This will ensure gripper is able to pull the tape

How To Setup the Automatic Tabber Sequence

The operator needs to follow the steps below to begin the Automatic Tabber Sequence:

1) Navigate to the **Main Operating Screen** on the HMI.
2) Enter a valid Run Length or Diameter in the set point field.
3) Enter a valid speed set point under the Speed Gauge. Generally, the speed set point should be equal to or greater than the feed forward speed.

   Note: Any speed less than the feed forward speed will cause the feed forward to run at the line speed set point and will affect where the tape lands on the cutoff assembly.

4) Navigate to the **Tabber Screen** on the HMI.
5) Select "Auto Tape Sequence".
6) Set the "Right Web Edge" (how far from the frame the Tabber will begin applying tape to the web).
7) Set the "Tab Width" (how much of the web width the tape will cover).
8) Acknowledge any alarms on the **Tabber Screen**.
9) If required, use "Tape to Cutoff" to adjust how far forward or backward the tape will be when the *Cutoff & Transfer Sequence* is running (Tabber Maintenance Screen)

   Note: Any speed less than the feed forward speed will cause the feed forward to run at the line speed set point and will affect where the tape lands on the cutoff assembly. "Tape to Cutoff" distance is affected by the rewind tension and feed forward speed.

10) Ensure the roll orient arm is under the vacuum roll positioning cam.

How the Automatic Film Tabber Sequence Works

To appropriately use the Automatic Tabber feature, the operator needs to set up the Automatic Tabber Sequence as described above. The Sequence will begin shortly before the line reaches the desired Length or Diameter set point. Here are the steps involved:

1) While the line is running, machine will continuously calculate the distance to stop to apply the tape.
2) The line will decelerate to tape apply speed.
3) The vacuum roll will retract, nipping the material between vacuum roll and the idler.
4) Once the predefined distance has passed, the vacuum roll will extend.
5) The web will run forward at the feed forward speed to bring the tape to the cutoff.

Unloading

The machine is equipped with a non-powered conveyor to assist in pushing the roll onto the unload table. The unloading process is done manually. While the rewind guard is closed, the operator will be able to unload the rolls from the outboard shaft while the line is running. However, when the guard is open, the line must be stopped in order to enter the rewind zone and unload the roll from the outboard shaft, without triggering an emergency stop (E-Stop) of the machine.

An **Unload Table** is an apparatus that holds the finished rolls unloaded from the Rewind. The Unload Table consists of a non-powered conveyor, a table, and a hydraulic circuit used to move the table up and down.

Since the controls for the unload tables are independent of the machine, the operator can move the unload table from the Unload Table Operator Station located on the right-side frame of the winder.

Caution: Moving any of the unload table components while personnel are near or under the equipment may cause serious injury or death.

A hydraulically operated Upender accepts a pallet and a cardboard box on its platen. During the loading process, the pallet is upright with the box against it, and the box opening is horizontal. The operator will unload rolls individually from the rear of the unload table using a lightweight ¼ ton jib crane. The hoist is equipped with a manipulator that the operator inserts into the core end. Using the hoist, the operator lifts the finished roll off the table in a horizontal orientation and guides it into the cardboard box. The operator then withdraws the manipulator and uses it to pick the next roll off the table and load it into the box. This process continues until the box is filled, at which point the operator actuates the upender to lower the pallet to floor level with the rolls now oriented vertically. This allows the pallet to be in a position to be picked up by a pallet jack.

Caution: Moving any of the upender components while personnel are near or under the equipment may cause serious injury or death.

Unload Sequence

1. Set up the upender so the pallet is upright with the box against it and the box opening is horizontal

Caution: Moving any of the upender components while personnel are near or under the equipment may cause serious injury or death.

2. Adjust the height of the conveyor for the diameter of the rolls

Caution: Moving any of the unload table components while personnel are near or under the equipment may cause serious injury or death.

3. Push the rolls of the outboard rewind shaft onto the none-powered conveyor.
4. Unload rolls individually from the rear of the unload table using a lightweight ¼ ton jib crane.
5. Maneuver the manipulator shaft and insert it into the core end.
6. Use the hoist to lift the finished roll off the table in a horizontal orientation and guide it into the carboard box.

Caution: Roll manipulator shaft must be all the way into the core before lifting roll up. Improper use may cause serious injury or death.

7. The process continues until the box is filled at which point the operator actuates the upender to lower pallet to floor level with the rolls now oriented vertically.

Caution Moving any of the upender components while personnel are near or under the equipment may cause serious injury or death.

Basic Machine Operation

Understanding & Setting Diameters

The diameter of a roll is a fundamental concept the converting industry. The diameter represents the maximum distance from one end of the roll, through the center (the focus), to the other end. In a building roll, the diameter will be changing as the machine runs and material is built up. The amount of buildup is determined by the thickness (or gauge) of the material. It is important to ensure that the roll diameter measurement is as accurate as possible since the diameter directly relates to the turning force required to maintain tension (torque). The larger the diameter, the larger the amount of torque required to maintain the same tension set point. For information on tension control methods, see **Rewinder**. Diameter calculation can be done in multiple ways such as the Length-Gauge method, Velocity method, Displacement method, and Sensor method. For most methods of calculation, the machine requires an initial diameter estimate to begin calculation. This can be either input by an operator or captured using a sensor.

Length-Gauge is a method of Diameter calculation that uses the operators input thickness and the total length accrued on the roll to estimate diameter. This method is only as accurate as the input thickness by the operator and the homogenous thickness across the web. Some materials tend to have imperfections called “Gauge Bands” which cause inconsistent thickness across the web. This results in rolls that do not wind with even diameter. Length-Gauge works as a general estimate of diameter.

The Velocity method uses feedback from an encoder to measure the instantaneous velocity (the velocity at that moment in time) and the current line speed to estimate the diameter of a roll. This method requires an initial diameter estimate in order to work; however, over time, the diameter will eventually close in on the actual diameter assuming the machine runs at constant speed for a while. This is because of a filtering method called “Rate Limiting” which takes inputs and adjusts the increment and decrement rates to find a value where the rate of change is essentially zero. This method is accurate when the machine is running at speed for long periods of time (steady state). In cases where the machine is accelerating then immediately decelerating, the method will not work well. This method also requires an encoder to be mounted to the shaft that is rotating which can be costly.

Similar to the Velocity method, the Displacement method uses an encoder like sensor to measure the circumference of a roll while using the footage between pulses to estimate the diameter. Circumference is measured by a pulse counter that will send a signal to the machine every time the roll makes one revolution. Knowing the difference in accrued length between pulses, the circumference is found. Diameter and circumference are related by an irrational number known as “pi” [π, 3.14159…]. The ratio of the circumference of a circle to its diameter is always equal to pi (Circumference divided by Diameter equals pi [$C/d = \pi$]). Using this method, the diameter can be found by dividing the circumference by pi (Circumference divided by pi equals Diameter [$C/\pi = d$]). This formulation can be sent through a “Rate Limiter” filter to prevent diameter from changing rapidly. Again, similar to the velocity method, this method works well while the machine is running for long periods of time (steady state). If the machine is accelerating then decelerating, this method will not work. Though this method is similar to the velocity method, it is significantly less costly and just as accurate.

In special cases, a direct measurement of diameter may be needed. High speed applications may tend to inhibit pulse counters from working properly. Not only this, but in cases where machines are always accelerating then decelerating, diameter can be difficult to accurately portray. Using a sensor will obtain the estimated diameter to the degree of calibration. The sensor outputs an estimate of the diameter to the machine while the machine takes the sensors value and runs it through a “Rate Limiter” to prevent the diameter from changing rapidly. Sensors can be prone to give sharp spikes or dips in signal depending on the type of sensor used and the medium of detection, so the Rate Limiter filter must be used to smooth the diameter estimation. Ultrasonic sensors do not work well with porous or materials

that absorb sound waves. Infrared sensors do not work well with highly reflective materials or extremely dark materials. Depending on the circumstance, a sensor may or may not be the best method to obtain diameter.

Diameter controls can be found on the respective screen for components that contain rolls (**Rewind Screen**, **Unwind Screen**, **Liner Screen**, etc.). Operator may enter initial diameter estimates using the **blue** set point fields label as "Diameter." Operators can also press the "Diameter Reset" button, if available, the input value in the "Diameter" set point field will become the active diameter. In cases where a sensor is used, the diameter will update when the "Line Start" pushbutton or the "Diameter Reset" button is pressed while the Diameter mode is set to "Sensor" (refer to **Section 5 – *Description of Controls*** for more information).

Understanding & Setting Tension

Tension is an important concept in web handling. It is the internal pulling force inside the web, or the tightness of the web. Under certain applications, such as slitting, perforating, coating, etc. tension can drastically affect the outcome of a process. All materials react differently to applied tension, which can be variable. For some materials, by pulling too hard the web may begin to yield (or permanently stretch). For others, light tension is required, such as a liner application, where if the tension is too high the web may begin to relax and compress the applied liner. Higher tension applications may be needed under wide web load or particular papers.

Tension is, generally, measured in two ways: force (pounds [lbs.], Kilograms [kgs]) or linear force (pounds per linear inch [PLI], kilograms per linear centimeter [KgsLCm]). Force measurement is not commonly used as it does not account for the width of the web. Under slitting conditions, it is important to use the force across the web as a measurement as the tension that the web will endure after the material has been cut becomes more intuitive. The linear force method addresses the individual cuts' tension.

As an example, take a 50" web width and divide the web into 50 even cuts of 1" width each. Setting the tension, in force measurement, to 100 pounds gives the tension across the entire web, not the individual cuts. To achieve the individual cuts' tension, divide the tension (100 pounds) by the web width (50 inches). This results in a tension of 2 pounds per 1" cut. In this case, instead of setting the tension in pounds, the operator can simply set the tension in pounds per linear inch as 2.0 PLI.

Another, more complex, example would be to take that same 50" web width and divide it into 5" cut sizes. Setting the tension, in force measurement, to 100 pounds again, gives the tension across the entire web, not the cuts' individual tension. To achieve the cuts' individual tension, divide the tension (100 pounds) by the web width (50 inches) to get 2 pounds per 1" segment. However, since the cut size is 5 inches, the result must be multiplied by 5 inches. The final tension of the individual cuts results in a tension of 10 pounds per 5" cut. Setting the Tension to 2.0 PLI will result in 10 pounds per cut because 2.0 PLI multiplied by the cut width (5 inches) is 10 pounds.

To summarize:

$$Tension\ per\ cut = \frac{Tension}{Entire\ Web\ Width} * Width\ of\ Individual\ Cuts$$

OR

$$Tension\ per\ cut = Tension\ in\ Linear\ Force * Width\ of\ Individual\ Cuts$$

Taper is another concept in web handling that describes the tension change as the diameter of a roll builds on the Rewind. Taper is almost never used for sections other than a rewinding roll. For short rolls,

taper does not play an important role. Large rolls may need to be tapered to prevent rolls from winding too tight and causing deformations such as "starring." Catbridge uses a method of taper known as "Maximum Diameter Taper Percentage". As machines are designed with the maximum diameter in mind, using this method allows consistent taper to be used across a range of products on a single machine. The tension will change with proportion to the ratio of the machine's maximum diameter to the current diameter. Taper is input as a percentage which means that if 10% taper is input, the machine will read the value as 0.1 [1/10] (or 10 divided by 100). A 0% taper would mean that the taper feature is disabled.

As an example, take a roll that begins winding with a 4-inch diameter (core diameter) and a machine maximum diameter of 20 inches. The operator sets the tension to 2.0 PLI and the taper to 10%. This means that at a 20" diameter, the tension will taper off by 10%, or finish at 1.8PLI. As the roll begins to wind, the 2.0 PLI tension will begin to drop to 1.95 PLI, 1.9 PLI, etc. until the machine is stopped. Say the finished roll diameter is 12 inches (half way to maximum diameter, one-half), instead of winding to maximum diameter. Since the taper percentage is set to 10%, but the accrual of diameter is one-half maximum diameter, the effective taper percentage is 5% (since 10% multiplied by one-half (1/2) results in 5%). This now means that the finished tension will be 1.9 PLI, rather than 1.8 PLI.

To summarize:

$$Final\ Tension = Start\ Tension * (1 - (\frac{Final\ Diameter - Core\ Diameter}{Max\ Diameter - \ Core\ Diameter} * \frac{Taper\ \%}{100}))$$

Tension and/ or Taper must be set for any controllable section, such as a Rewind, Unwind, Infeed, etc. The operator can input the tension in pounds or PLI (depending on customer request) from their respective screen on the HMI (**Unwind Screen**, **Rewind Screen**, etc.) using the **blue** set point fields label as "Tension" and "Taper." The machine will then maintain that tension set point until it is updated.

Understanding & Setting Run Length/Finish Diameter and Low Diameter Modes

The sole purpose of this machinery is for operators to decide how long finished rolls will be. This can be done by setting a length for the machine to run to or a diameter to stop at. The machine will automatically calculate when to begin decelerating to stop at the input set point. Not all machines contain the function to run to diameter. This feature is enabled per request. If an unwinding roll is too small to reach the final length or diameter required for the operator, the machine will do one of three operations depending on the mode chosen: Ignore the low diameter, Slow Down to an auxiliary set speed, or stop the machine. The diameter value at which the machine will trigger these functions can be set by the operator.

In Ignore mode, the machine will continue to run until the Core Diameter threshold is met. At this point, the machine will stop regardless of the ignore state. This prevents operators from running the material off the core and needed to re-web the machine. Essentially, this feature acts as a safeguard for unsuspecting or curious operators.

If the Low diameter mode is set to Slow down to a set speed, the machine will automatically calculate when to decelerate the line to reach the given speed at the diameter value. This feature is useful for utilizing more material than a simple stop. Operators can monitor the Unwind as the roll decreases in diameter, stopping the line before the material runs off the core. Similar to the Ignore mode, the machine will stop when the Core diameter threshold is met. The Core Diameter threshold is only as accurate as the diameter calculation method. It is important not to abuse the feature as if the diameter calculation is not correct, the material may run off the core, drastically reducing turnaround time.

As indicated, the diameter Stop mode will stop the machine at the given diameter. This is the most common method as it ensures that the Unwind will stop before the core is reached. Operators can view the estimated length remaining to the Stop diameter and the Core Diameter using the values on the screen.

Run Length/Finish Diameter modes as well as the corresponding length or diameter can be set from the HMI. The operator may change the mode, where applicable, from the **Main Operating Screen** just to the right of the Speed Indicator Gauge. Pressing the [Length Set point/Run to Diameter SP] button toggles between the two modes. Operators can then set the length or diameter using the **blue** set point fields label as [Length SP] and/or [Diameter SP]. The machine will then run to the request set point.

Understanding & Setting Run Speed

Line Speed determines the steady state running speed that the machine will attempt to run at. During run time, the machine will first accelerate to the speed set point. Upon reaching the set speed, the machine will continue to run until the line is stopped for any reason or the current length or diameter begin to approach the set points, at which point the line will start to decelerate.

Line Speed plays an important role in production. Logically, the faster the machine speed, the more material will be produced in a given time. Some machines are limited in maximum line speed based upon mechanical limits. In some cases, line speed is limited to maintain that the rotational speed (RPM) of the roll does not exceed a certain value as components have limits to the speed they can run. This RPM limiting is called "Speed Clamping." Speed Clamping is an internally set value that will automatically adjust the speed of the line as Rewind, Unwind, Liner, etc. diameters change. For an Unwind, as the diameter decreases, the speed at which the roll is rotating increases. Once the rotational speed reaches the threshold RPM, the line speed will begin to decrease. The opposite can be said for a rewinding roll. The Rewind starts at a small diameter, then builds up. As the diameter builds, the rotational speed of the roll decreases and so if the line speed is currently speed clamping, the line speed will grow with proportion to the Rewind diameter until the RPM threshold is met with respect to the input line speed.

Line speed can also be limited based upon the status of certain safety devices. When a light curtain, laser scanner, safety gate, etc. is tripped, the machine receives a Safe Speed Limit request that limits the line speed to 49 Feet per minute (14.9 Meters per Minute) until all safety devices are reset. Safety devices and their statuses can be found on the **Machine Safety Screen** on the HMI. Safe Speed Limiting is a function required by OSHA to allow machinery to continue running under what is deemed as a "safe speed." Catbridge conforms to OSHA regulations and will not change safe speed above 49 Feet per minute. If a customer requests to lower the Safe Speed threshold, Catbridge will do so. For more information, refer to OSHA regulations for machinery.

Line speed is a universal set point and can only be set from the HMI. The operator can input the Line Speed in Feet per minute (FPM) or Meters per Minute (MPM) (depending on customer request) from the **Main Operating Screen** using the **blue** set point field labeled as "Run Speed." The rates at which the line speed will accelerate and decelerate are determined by set points on the **Line Run Setup Screen** which are unavailable to operators.

Starting the Machine for Operation

Once operators are ready for run time, some items should be checked before beginning:

1) Verify the Web is Threaded Through the Machine Properly
2) Verify Safety Status of Devices
3) Use any required Personal Protective Equipment (PPE)
4) Verify All Modes are Set Correctly
5) Enable any Slit Knives, Perforators, Coaters, Trim Systems, Corona Treaters, Blowers, etc.
6) Verify the Correct Parameters are Input
7) Do a Final Scan of the Area for Personnel Inside or Around the Machine.

After these final checks, the machine can then be run. The process for starting the machine can be found below.

The path that the web follows MUST be the proper one when threading the machine. Some machines may have multiple web paths depending on the functions available and/ or direction the web is winding. Machine web path changes depending on machine function, though every machine depicts the proper web path on the HMI and in this manual. Failure to use the correct web path may result in poorly wound rolls and/or defective material. Refer to ***Web Flow*** or the **Web Flow Screen** on the HMI for diagrams depicting the proper web flow.

Verify Safety Status of Devices

Most machines contain the Catbridge Dashboard on the right side of the **Main Operating Screen**, **Rewind Screen**, and/or **Unwind Screen**. The bottom of the Dashboard shows the status of each safety device on the machine at a moment's glance. Using this information will help reduce diagnostic time when the machine will not run properly. Refer to **Section 3 – *Safety Features*** for more information on resetting safety devices.

Use any Required Personal Protective Equipment

Every company has different standards to follow by to protect employees from hazardous substances or dangerous conditions. It is important to use the correct Personal Protective Equipment (PPE) to ensure protection. Equip any equipment required to perform the job safely before beginning. Catbridge does not provide Safety Standards for machinery.

Verify All Modes are Set Correctly

It is recommended that operators of the machine understand the different features and modes. At minimum, operators should consider setting the following:

1) Run mode (Length/Diameter), if applicable
2) Touch Roll/Lay-on modes (refer to ***Slitter/Rewinder*** for more information)
3) Cutoff mode, if applicable
4) Tabber mode, if applicable
5) Unload mode, if applicable
6) Manual/Automatic Tension Control mode – Unwind(s) and Rewind(s)

   a. Rewinds have multiple modes of tension control (refer to ***Slitter/Rewinder*** for more information)

7) Unwind/Rewind Direction
8) Web Guide Mode (refer to ***Unwinding*** for more information)

Enable any Slit Knives, Perforators, Coaters, Trim Systems, Corona Treaters, Blowers, Etc.

The purpose of the machinery that Catbridge builds is to produce either a final product from a master roll or handle material for further processing. It is important to enable the features that Catbridge has provided for the particular application in question. Catbridge provides control systems for enabling, disabling, and adjusting settings for all process components. Operators should enable these while attempting to straighten the web through the machine. Following this method will reduce waste and allow personnel to obtain the correct settings quicker.

Verify the Correct Parameters are Input

Operators should consider the input parameters before starting the machine. These are the variable set points that determine how the machine will handle the web. At minimum, operators should consider setting the following:

1) Run Length (or Diameter Set point, if applicable)
2) Run Speed
3) Tension (in force or linear force) and Taper – Unwind(s) and Rewind(s) (refer to ***Understanding & Setting Tension*** for more information)
4) Material Properties
   a. Thickness (Gauge)
   b. Web Width
   c. Density
5) Core Diameter
6) Initial Diameter, if applicable (refer to ***Understanding & Setting Diameters*** for more information)
7) Slitting Pressure (for Score Knives), if applicable
8) Any other components that are critical for machine production that Catbridge has NOT provided

Catbridge Machinery also provides every machine with a Recipe Control feature. It is at each customer's will to utilize this feature or not. Managing the Recipe Control feature can drastically reduce turnaround time and reduce waste. For more information on using the Recipe Control feature, refer to **Section 6 – *Recipe Control***

Do a Final Scan of the Area for Personnel Inside or Around the Machine

Though all Safety Devices may be reset, this cannot ensure that there are employees still within the Safety Zones or in hazardous locations. Be sure to do a scan of the area before starting the machine. Catbridge is not responsible for injuries of personnel once the machine has reached its final destination (or once the Startup training is completed).

Starting the Machine

After all of the above has been checked, the operator can finally start production. When the operator is ready, tap the **green** "Line Start" pushbutton at the Main Operator Station and release quickly. The warning horn will sound and the machine's motors will become enabled. If the machine is a Type MC machine, the Carriage will begin moving towards the Rewind Mandrels. Depending on the model of machine, the Rewind shaft(s) will begin to rotate but the material will not move. This feature is called "Slack Take-Up" and it allows the material to gain tension before starting. In the case of Two-Drum Winders, the drums will torque up to maintain their current position but will not rotate. Pressing the "Line Stop" pushbutton at this point will disable the Rewind stopping rotation, turning Slack Take-Up off. Slack Take-Up can also be turned on by using the "Slack Take-Up" button on the **Main Operating Screen**.

To start moving over the Pull Roll, the operator must hold down the "Line Start" pushbutton until the Speed Gauge on the **Main Operating Screen** begins moving. The warning horn will sound during the entire startup process. Depending on the machine model, there are two startup modes: Single Stage and Two Stage Start. The mode can be toggled from the **Line Run Setup Screen** on the HMI, if applicable.

In Single Stage Start, the machine will immediately ramp up to the speed set point that the operator sets on the **Main Operating Screen**. A Two Stage Start will ramp up to the Safe Speed Limit (49FPM) allowing operators to enter safety areas before the machine begins full speed production. In this phase, the machine will sound the warning horn indicating that it is at the Safe Speed Limit. To continue moving to the next step, the operator must hold the "Line Start" pushbutton for two seconds more. The machine will then begin normal speed production.

To summarize:

1) The "Line Start" pushbutton is always **green** for easy identification and can always be found on the Main Operator Station.
2) Slack Take-Up: A mode where the machine will rotate the Rewind shafts to maintain tension before the machine starts up.
    a. Tap the "Line Start" pushbutton and release quickly.
    b. Press the "Slack Take-Up" button on the **Main Operating Screen**.
3) Single Stage Start: A mode where the line will ramp directly up to the set speed by the operator.
    a. Press and hold the "Line Start" pushbutton until the Speed Gauge begins to move.
4) Two Stage Start: A mode where the line will first ramp up to the Safe Speed limit (49FPM) to allow operators to check the quality of production. Operators can then ramp the machine up to the set speed.
    a. Press and hold the "Line Start" pushbutton until the Speed Gauge begins to move.
    b. Verify the quality of the run at the Safe Speed Limit.
    c. Press and hold the "Line Start" pushbutton for two seconds to ramp up to the set speed.

Stopping the Machine

Every Catbridge machine has multiple ways to stop the flow of material. These include, but are not always limited to, Line Stop pushbuttons, Low Diameter controls, Web Break detection, Length/Diameter set point reached, maximum diameter stops, and Emergency Stopping among others.

Operators can initiate a commanded stop by pressing any of the **red** "Line Stop" pushbuttons in and around the machine. Tapping any of these pushbuttons will immediately decelerate the machine until it comes to a complete stop. Additionally, operators have the option to "Fast Stop" the machine. A "Fast Stop" is a stop that is more aggressive than a normal stop (on the order of an Emergency Stop) but does not Emergency Stop the machine. Operators can initiate a "Fast Stop" by holding down any of the **red** "Line Stop" pushbuttons for more than two seconds.

To summarize:

1) The "Line Stop" pushbuttons are always **red** for easy identification and can always be found in critical areas where functions need to be performed.
2) Mode of Stopping: There are many ways for the machine to stop. These ways include, but are not always limited to:
    a. Line Stop pushbuttons
    b. Low Diameter
    c. Web Breaks
    d. Length/Diameter set point reached
    e. Maximum Diameter line stop
    f. Emergency Stopping
3) Normal Stop: Stops the machine as soon as any "Line Stop" pushbutton is pressed.
    a. Tap any "Line Stop" pushbutton to immediately decelerate the machine to a full stop.
4) Fast Stop: A more aggressive stopping action. The machine will decelerate at a rate on the order of an Emergency Stop.
    a. Press and hold any "Line Stop" pushbutton for two seconds to stop the machine quicker than a normal stop.
    b. The web is not guaranteed to be salvageable.

Cutoff & Transfer

This machine is equipped with a 2-shaft turret system. The theory of operation behind the turret is to maximize production capabilities of the machine by automating certain steps. By removing finished rolls and placing new cores on the shaft, the material can be taped on the new cores and the machine can be run again until the finished length or roll diameter is achieved. Normally, this process is done by the operator, and would take additional time due to the multiple steps involved.

The turret system with the automatic turret sequence and cutoff performs all the same steps done by the operator in a fraction of time with the utmost accuracy. The operator's responsibilities are to ensure that everything is running smoothly and cores are unloaded and new cores are correctly placed. By minimizing contact with the machine, the possibility of operator error is greatly reduced as well as reducing safety hazards that would lead to serious injuries.

Caution: The Automatic Cutoff, Turret & Transfer Sequence will cause components to move without operator input. Personnel should exercise caution while the Cutoff & Transfer are running. Failure to do so may cause series injury or death. It is important to stay vigilant during operation.

How To Setup The Automatic Cutoff & Transfer Sequence

The operator will need to follow the steps below to begin the Automatic Cutoff and Transfer sequence.

1) Navigate to the **Main Operating Screen** on the HMI.
2) Enter a valid Run Length or Diameter in the set point field.
3) Enter a valid speed set point under the Speed Gauge. Generally, the speed set point should be equal to the feed forward speed. Any speed less than the feed forward speed will cause the feed forward to run at the line speed set point.
4) Under the "Cutoff Sequence" field, change the "Cutoff Sequence" Mode to Automatic.

   Note: Use the Cutoff Sequence Status Indicator to verify that the Cutoff Sequence is enabled. This process can also be done from the **Turret / Carriage Screen**.

5) Optionally, operators can also press the "Auto Line Start" button.

   Note: Enabling Auto Line Start will begin the line immediately after the cutoff sequence has finished.

6) Navigate to the **Turret / Carriage Screen** on the HMI.
7) Press the "Turret Auto and Jog Permissives" button to display a popup of the Automatic Cutoff Sequence Permissives.
8) Verify that the Auto Permissives are all **green**.

FOR MANUAL CORE LOADING:

9) Stack cores on the Rewind Mandrel(s) in the appropriate locations.
10) Press and hold "Cores Loaded" pushbutton until the button turns SOLID in color. This button can usually be found on the fence next to the Rewind or on the Main Operating Station.

    Note: When this button is pressed, the machine will be informed that cores have been loaded onto the new shaft and the Automatic Turret sequence can be initiated.

FOR AUTOMATIC CORE LOADING (IF APPLICABLE):

9) Allow the **Automatic Core Loading Sequence** to finish loading cores into the core boxes or tray.
10) Let the Core Loading System fill the shaft with a fresh set of cores.
11) If the cores have been successfully loaded, the "Cores Loaded" pushbutton pilot light will turn solid, indicating that cores are on the mandrel.

FOR MANUAL UNLOADING:

12) Upon successful turreting, the operators may manually unload the finished rolls from the machine, provided that the Winder Guard is in place or the Rewind Safety Laser is not tripped.
13) For machines that use the **Automatic Core Loading Sequence**, operators must confirm that the rolls have been removed on the HMI Screen.

    Note: Typically, a button is provided on the HMI's **Unload Screen**. When this button is pressed, it confirms that the rolls have been removed from the shaft.

14) Once the rolls have been confirmed as unloaded, the **Automatic Core Loading Sequence** will begin to load cores onto the mandrel.

    Note: For machines that use a 3-shaft system, the **Automatic Core Loading Sequence** will remain uninterrupted. The **Cutoff & Transfer Sequence** will not turret the machine until the rolls have been confirmed as unloaded.

FOR AUTOMATIC UNLOADING (IF APPLICABLE):

12) Upon successful turreting, the machine will automatically begin to unload the finished rolls from the shaft.
13) After a successful Unload cycle, the rolls will be confirmed as unloaded from the shaft.
14) If the sequence has been interrupted and operators must intervene, the operators must confirm that the rolls have been unloaded provided that the machine supports the **Automatic Core Loading Sequence**.

    Note: Typically, a button is provided on the HMI's **Unload Screen** although some machines have local pushbutton stations. When this button is pressed, it confirms that the rolls have been removed from the shaft.

15) Once the rolls have been confirmed as unloaded, the **Automatic Core Loading Sequence** will begin to load cores onto the mandrel. (if applicable)

    Note: For machines that use a 3-shaft system, the **Automatic Core Loading Sequence** will remain uninterrupted. The **Cutoff & Transfer Sequence** will not turret the machine until the rolls have been confirmed as unloaded.

The Turret Sequence will pause after the material has been cut, waiting for the Cores Loaded request (either in Manual or Automatic, where applicable) as well as roll unload confirmation. The sequence will be able to finish after the Cores Loaded pushbutton is SOLID and the finished rolls are confirmed as removed.

How the Automatic Cutoff & Transfer Sequence Works

The operator will need to setup the **Cutoff & Transfer Sequence** as described above in order to appropriately use the Automatic Cutoff & Transfer feature. The Sequence will begin shortly before the line reaches the desired Length or Diameter set point.

1) If a Tabber Sequence is active, the machine will slow down to apply the tab.
2) While the Tab Sequence runs, the Carriage will begin to back out signaling the beginning of the Cutoff Sequence. If no sequence is set, the carriage will back out shortly before the line reaches the desired Length or Diameter set point.
3) As the web feeds the Tab forward (or the carriage finishes moving backward in the case of no prior sequence), touch rolls retract, the bottom cutoff assembly (the cutoff bar) raises into position.
4) Once the line comes to a complete stop, the Carriage will move toward the Rewind mandrels until the Wiper Roll (the blue roll on the bottom cutoff assembly) touches the Rewind's rolls or the Touch Rolls begin to compress.

   Note 1: At this step, it is critical to verify that the tab or glue beads are between the cutoff bars. Adjust the feed forward distance on the **Tabber Maintenance Screen** to cut on the tape. Stop the cutoff and try again until the desired location is found.

   Note 2: If the location of the tab is inconsistent, consider adjusting the tension of the material while the machine is running or during the cutoff. Set points for Cutoff Tension can be found on the **Cutoff & Transfer Maintenance Screen**.

5) The Top Clamp will begin lowering, pinning the web to the cutoff bar.
6) As the Top Clamp lowers into place, the upper cutoff assembly (the cutoff knife) will fall into place.
7) The knife will fire across the web cutting the web as it moves across. There are a few items to note while this happens:
   a. As the knife cuts the material, each cut releases its tension. This increases the tension on the cuts that have not been cut yet. Certain materials may be affected by this as the tension increase and, as such, may need to be compensated for. This is mostly applicable on materials that require low tension and/or materials that are prone to stretching.
   b. The knife pressure can be adjusted to cut the material better. Use the regulator inside the Motor Guard to adjust the cutoff pressure. As a general rule of thumb, take the minimum amount of pressure needed to cut and add 10PSI to that. Set that value on the regulator.
   c. Tabber systems tend to leave residue on the knife as it moves across the web. Check the cutting surface of the knife and clean with solvent often to prevent the cutting surface from becoming sticky from this residue. A wick can help with this; however, the wick will also need to be cleaned often.
8) Once the material has been cut across the web, the tension will change depending on the set point of the tail wipe tension. Additionally, the Rewind will rotate at a fixed RPM determined by a set point.

   Note: The "Tail Wipe Tension Multiplier" and "Tail Wipe RPM" set points can both be found on the **Cutoff & Transfer Maintenance Screen**.

9) After a short tail wipe period to seal the finished rolls, the upper and lower cutoff assemblies (NOT THE TOP CLAMP) will retract.

> **Note:** At this phase, the Transfer Sequence will wait for the operator to press and hold the "Cores Loaded" pushbutton or wait for the **Automatic Core Loading Sequence** to load cores and/or confirm rolls unloaded. If the pushbutton has already been pressed and/or cores have been loading automatically, the sequence will continue to the next step.

10) The Winder Guard will raise (if applicable).
11) Vertical end support for the inboard mandrel will extend (if applicable).
12) Inboard Mandrel locks will retract from the Rewind Mandrels.
13) Vertical end support will retract (if applicable).
14) Turret Motor flux's up and pre-loads to compensate for the backlash & weight of the material.
15) The turret lock will retract.
16) **For a 2-shaft system:** The Mandrels will then rotate 1/2 of a full rotation (180°, "turret") leaving the finished rolls on the outboard side and the newly positioned cores on the inboard side.
17) **For a 3-shaft system:** The Mandrels will then rotate 1/3 of a full rotation (120°, "turret") leaving the finished rolls on the unload side, the newly positioned cores on the rewind position, while the previously unloaded shaft is in the core loading position.
18) After the transfer, the mandrel locks and turret locks will engage again, locking the Mandrels and turret in place. The Winder Guard will also begin to move back down (if applicable).

> **Note:** For Manual Core Loading and Unload systems, operators may begin to offload the new rolls and load new cores onto the mandrels as soon as the Winder Guard has moved back down into place.

19) Machine will jog enough material required to extend the touch roll
20) Touch Roll starts extending
21) The Carriage will begin to move toward the Rewind Mandrels until the Touch Rolls begin to compress.
22) Once the jog has completed, the Top Clamp will retract.
23) Machine will jog few inches forward then rewind will move quarter revolution back to seal the tail to the core

The **Cutoff & Transfer Sequence** will be completed once the Top Clamp has retracted. If the "Auto Line Start" feature is enabled, the line will start up again once the Top Clamp retracts. The cycle will begin and continue until the "Auto Line Start" feature is disabled.

> **Note:** For machines that have a quick cycle time, if Auto Line Start is Enabled, the jog step is omitted and the line is started immediately. The top clamp will come up shortly after the line is started. If Auto Line Start is Disabled, the jog step still occurs (only for the material that don't have issue sticking to the core).

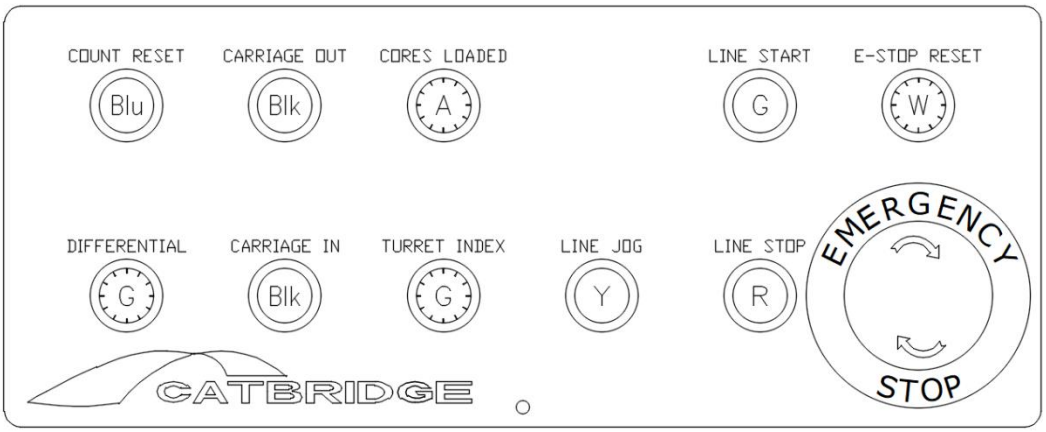
Section
5

DESCRIPTION OF CONTROLS

Introduction

This section contains detailed information on the functions of each control and their impact on the equipment's operation. The discussion will also include operator stations. If a control is available in multiple locations, those locations will be mentioned. Generally, any controls used during equipment thread up are hard-wired and positioned near the relevant area. Conversely, process variables that are specific to a particular product or setup are located at the Main Operator Station.

Main Operator Station



Machine Interface: The **Human Machine Interface** (HMI) provides the operator with informative displays of machine information and set points to configure machine functionality.

E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

E-Stop Reset Pushbutton (white): When pressed, the E-Stop Reset Pushbutton latches the E-Stop Relay and enables the machine for operation. All E-Stop devices on the machine must be reset before the E-Stop circuit can latch. The illuminated pushbutton indicates the reset status to the operator. There is only one E-Stop Reset Pushbutton on the machine.

> **Note:** If the E-Stop light is on, the machine is ready for operation. If the white light is off or blinking, it indicates an open E-Stop interlock somewhere. Once all E-Stops are cleared, pressing the button will illuminate the light, indicating that the system is now ready for normal operation.

Line Start Pushbutton (green): Used to start the machine, after which it will run until the length or diameter set point has been reached. If applicable, in Two Stage Start mode, the mode must first be enabled, and then the operator must press and hold the Line Start Pushbutton until the line starts. Once the line starts moving, the button can be released. The line will ramp up to the safe speed of 50FPM

and hold. This allows the operator to inspect the roll without triggering the Rewind Laser Scanner. If everything is verified and correct, the operator must press and hold the Line Start Pushbutton again, which will then ramp the machine to the Line Speed set point. Tapping the Line Start pushbutton at a complete stop will put the machine in "Slack Take-Up" Mode and/or simply enable the drives. If a Type MC machine is used, the Carriage will begin to move to the Rewind to initialize the Touch Rolls in position if the Touch Rolls are enabled. For this machine, when the corona treater mode is enabled, the machine will ramp up to 10FPM and hold until a "corona treater running" signal is received from the Enercon units. Then, the machine will accelerate to the line run speed setpoint.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP. For Turret machines, the Main Operator Station Line Stop Pushbutton also serves as a Master Reset if held for 3 or more seconds.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

Cores Loaded Pushbutton (yellow): Operates in two stages. The first stage is the core adjustment inflation. Tapping the button sends air to the shafts at approximately 10 PSI. The pushbutton will intermittently flash yellow if this mode is active, allowing operators to verify correct core positioning in the core locator strips or bearings (if applicable). Pressing the pushbutton for 1 second or more will fully inflate the shaft. The pushbutton will hold a solid yellow light if the second stage of inflation is active. It is necessary to verify that the pushbutton is fully illuminated and the shafts are fully inflated before the machine can perform an index.

Turret Index (green): Allows the operator to manually index the mandrels (turret) when the cutoff sequence is not active, the Cores Loaded indicator is solid yellow, and the carriage is in the clear position.

Carriage IN/OUT (black): Manually moves the Carriage forward or backward. Note: The carriage is a large moving mass. Ensure no personnel or obstructions are near the machine before moving it.

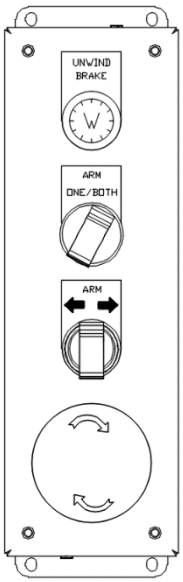
Count Reset (blue): Allows the operator to manually reset the length of material wound on the inboard mandrel. Length is automatically reset when a cutoff sequence is completed.

Differential (green): Inflates/deflates the inboard shaft when the line is stopped and drives are not holding tension.

Caution: Moving the Carriage while personnel are inside the Safety Zone can cause serious injury. Clear the area to prevent any inadvertent injury.

Operator Stations

Unwind 1 Right Front/Unwind 3 Right Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

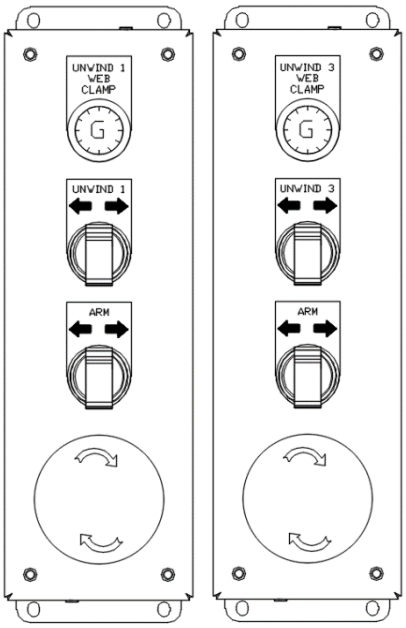
Unwind Brake (White): Engages/Disengages unwind brake. This pushbutton is helpful when threading the machine or splicing a new master roll. If the brakes are disengaged, they will engage as soon as the line is running or jogging.

Arm One/Both Selector Switch: Allows the operator the ability to select between two modes of unwind arm operation. In Arm One mode, the operator can control each arm of the unwind independently of the other. In Arm Both mode, the operator can control both unwind arms simultaneously. (Note: Unwind arm controls are either OPEN or CLOSE.)

Arm Selector Switch: This three-position selector switch allows the operator to control the OPEN/CLOSE movement of the unwind arm/s. If One mode is selected on the Arm One/Both selector switch, only the arm connected to this operator station will OPEN/CLOSE based on the position of this selector switch. If Both mode is selected on the Arm One/Both selector switch, both arms of the unwind will OPEN/CLOSE based on the position of this selector switch.

Caution: Please ensure that the roll is adequately supported by the cart before opening the unwind chucks, as failure to do so may result in serious injury.

Unwind 1 Left Front/Unwind 3 Left Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

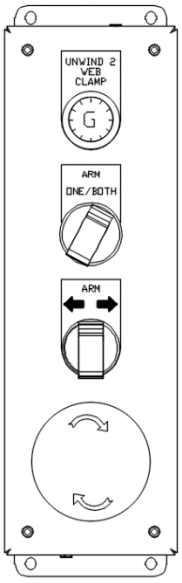
Unwind 1/3 Web Clamp (Green): Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Unwind 1/3 Selector Switch: This three-position selector switch allows the operator to move unwind left/right by moving the web guide actuator.

Arm Selector Switch: This three-position selector switch allows the operator to control the OPEN/CLOSE movement of the unwind arm/s. If One mode is selected on the Arm One/Both selector switch, only the arm connected to this operator station will OPEN/CLOSE based on the position of this selector switch. If Both mode is selected on the Arm One/Both selector switch, both arms of the unwind will OPEN/CLOSE based on the position of this selector switch.

Caution: Please ensure that the roll is adequately supported by the cart before opening the unwind chucks, as failure to do so may result in serious injury.

Unwind 2 Right Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

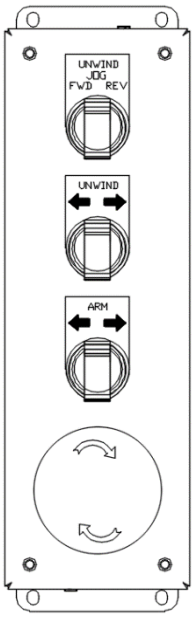
Unwind 2 Web Clamp (Green): Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Arm One/Both Selector Switch: Allows the operator the ability to select between two modes of unwind arm operation. In Arm One mode, the operator can control each arm of the unwind independently of the other. In Arm Both mode, the operator can control both unwind arms simultaneously. (Note: Unwind arm controls are either OPEN or CLOSE.)

Arm Selector Switch: This three-position selector switch allows the operator to control the OPEN/CLOSE movement of the unwind arm/s. If One mode is selected on the Arm One/Both selector switch, only the arm connected to this operator station will OPEN/CLOSE based on the position of this selector switch. If Both mode is selected on the Arm One/Both selector switch, both arms of the unwind will OPEN/CLOSE based on the position of this selector switch.

Caution: Please ensure that the roll is adequately supported by the cart before opening the unwind chucks, as failure to do so may result in serious injury.

Unwind 2 Left Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

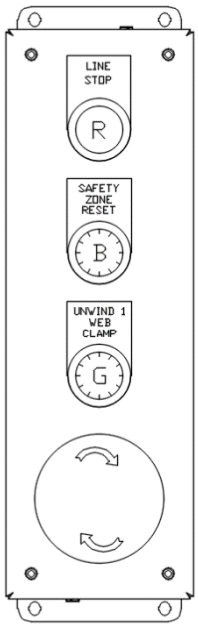
Unwind Jog FWD/REV: Allows the operator ability to jog the Unwind #2 forward/reverse to assist with splicing and threading the machine.

Unwind 1/3 Selector Switch: This three-position selector switch allows the operator to move unwind left/right by moving the web guide actuator.

Arm Selector Switch: This three-position selector switch allows the operator to control the OPEN/CLOSE movement of the unwind arm/s. If One mode is selected on the Arm One/Both selector switch, only the arm connected to this operator station will OPEN/CLOSE based on the position of this selector switch. If Both mode is selected on the Arm One/Both selector switch, both arms of the unwind will OPEN/CLOSE based on the position of this selector switch.

Caution: Please ensure that the roll is adequately supported by the cart before opening the unwind chucks, as failure to do so may result in serious injury.

Unwind Fence Left Back Operator Station



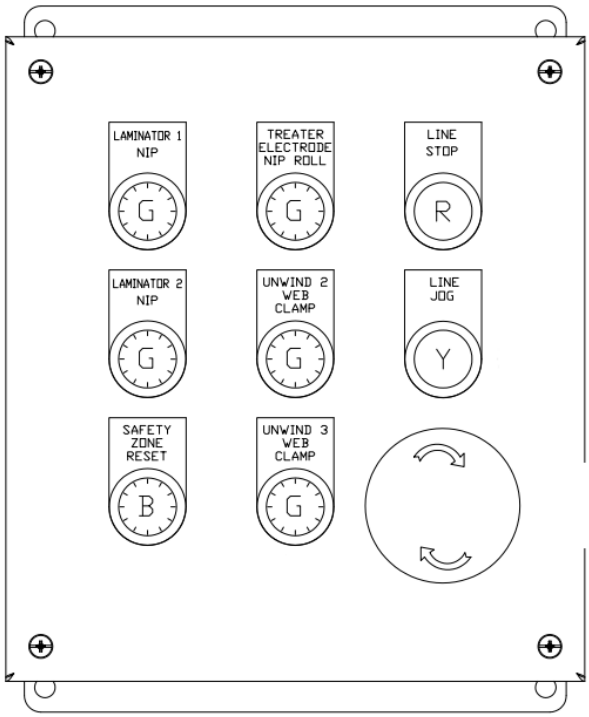
E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Safety Zone Reset (Blue): Controls the safety reset of the unwind 1 back light curtain. A SOLID button indicates that the zone is reset. A FLASHING button indicates that the unwind light curtain was tripped, and the Safety Reset Pushbutton must be pressed to reset the zone. An OFF button indicates the safety zone is not clear, and reset is not allowed.

Unwind 1 Web Clamp (Green): Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Unwind Fence Right Front/Left Front Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Safety Zone Reset (Blue): Controls the safety zone reset of the unwind 1-3, corona treater, and laminators. A SOLID button indicates that the zone is reset. A FLASHING button indicates that one of the light curtain was tripped, and the Safety Reset Pushbutton must be pressed to reset the zone. An OFF button indicates the safety zone is not clear, and reset is not allowed.

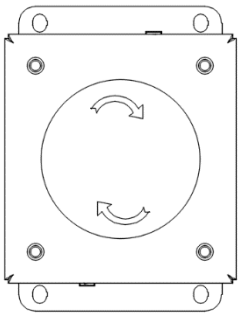
Unwind 2/3 Web Clamp (Green): Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

Laminator 1/2 Nip (Green): Used to Open/Close the Laminator Nip. The laminator safety zone must be clear to use this pushbutton. If the safety zone is tripped, pressing the button will not perform any action.

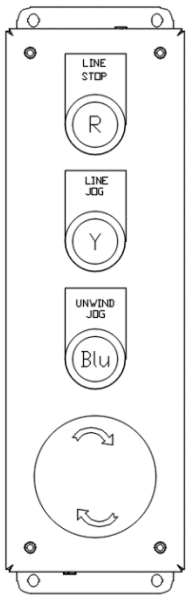
Treater Electrode/Nip Roll (Green): Used to Open/Close the Corona Treater Nip and Electrode. The corona treater safety zone must be clear to use this pushbutton. If the safety zone is tripped, pressing the button will not perform any action.

Laminator 1 (Left Back/Left Front/Right Back), Unwind Fence Right Back, and Liner Winder Left Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Laminator 1 Right Front Operator Station

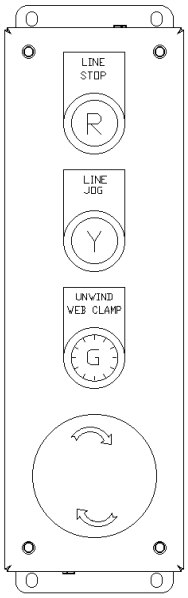


E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

Unwind Jog FWD/REV: Allows the operator ability to jog the Unwind #2 and corona treater forward to assist with threading the machine.

Unwinder Winder Left Front Operator Station



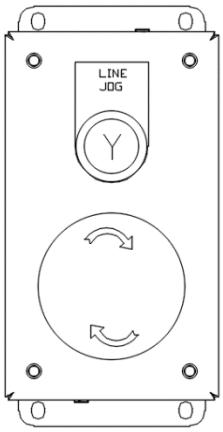
E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

Unwind Web Clamp (Green): Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

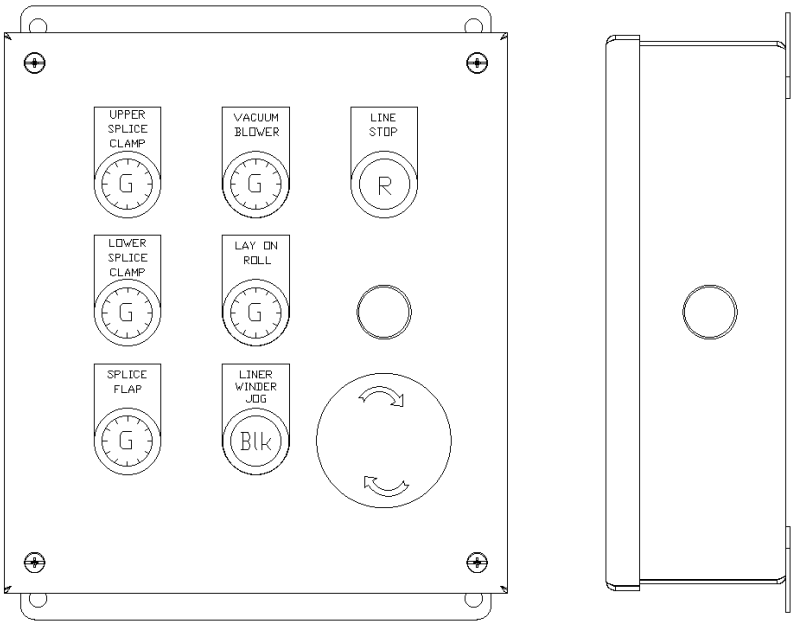
Unwinder Winder Right Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

Unwinder Winder Right Front Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Vacuum Blower Pushbutton (Green): Turns on vacuum blower to hold the tape in place while splicing.

Lay On Roll Pushbutton (Green): Allows the operator to raise the lay on roll.

Line Winder Jog Pushbutton (Black): When the operator selects the scrap winder mode on the HMI, this pushbutton can be used to jog the unwinder winder.

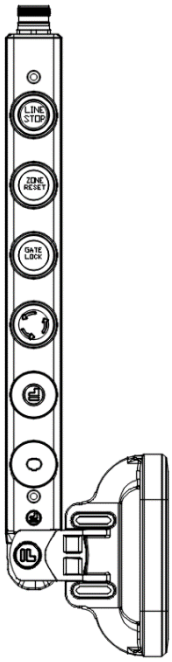
Upper Splice Clamp Pushbutton (green): Raises/lowers upper splice clamp. Clamp will be automatically extended when the line starts.

Lower Splice Clamp Pushbutton (Green): Raises/lowers lower splice clamp. Clamp will be automatically extended when the line starts.

Splice Flap (Green): Extends/Retracts splice flap to spread the material, to place the tape onto the vacuum strip.

Horn (Sound): There is a horn attached to the side of the operator station, which will annunciate when the tilt table is in motion.

Winder Fence Right Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Gate Lock (white): Allows operators or maintenance personnel to open or close a safety gate door. The door must be unlocked when attempting to enter the indicated zone and must be locked and reset when leaving that same zone. A solid button indicates the gate has been locked. A flashing button indicates the gate is unlocked. This button should be pressed before resetting the safety gate. When the line is running below safe speed, the operator is able to open the gate. However, when the line speed is above safe speed, the operator will not be able to open the gate.

Safety Zone Reset (Blue): Controls the safety zone reset of the infeed section. A SOLID button indicates that the zone is reset. A FLASHING button indicates that the gate is locked, and the Safety Reset Pushbutton must be pressed to reset the zone. An OFF button indicates the safety zone is not clear, and reset is not allowed.

Tilt Table Operator Station

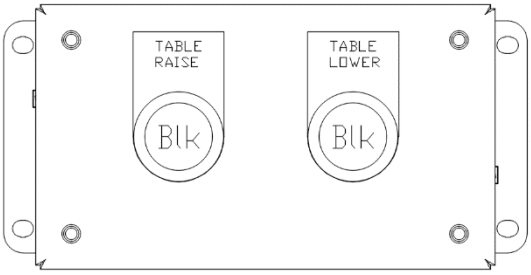
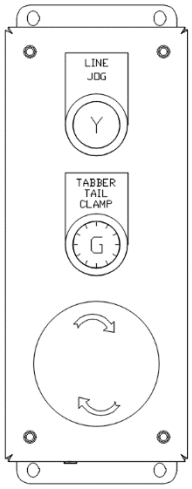


Table Raise: Allows the operator to raise the tilt table.

Table Lower: Allows the operator to lower the tilt table.

Caution: Moving any of the upender & unload table components while personnel are near or under the equipment may cause serious injury or death.

Winder Right Back Operator Station

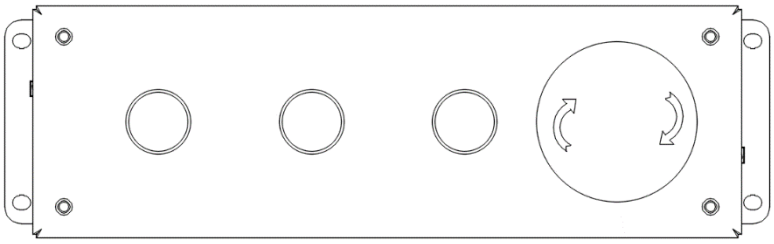


E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Jog Pushbutton (yellow): Causes the driven shafts to turn at a slow speed, moving the material through the machine without the need to pull on it at the rewind. As long as the pushbutton is depressed, the machine will jog; releasing the pushbutton will stop the machine.

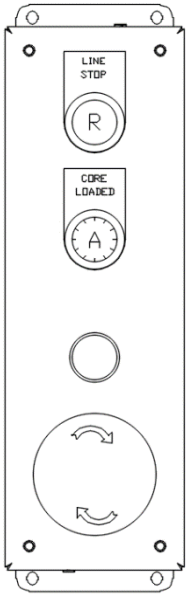
Tabber Tail Clamp Pushbutton (Green): Allows the operator to engage and disengage tabber tail clamp. This is useful when threading the tabber.

Winder Left Back Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Winder Right Front Operator Station



E-STOP Pushbutton: One of three available methods to stop the machine in the event of an emergency. There are twenty-three (23) E-STOP pushbuttons located throughout the machine in critical areas. The head may be twisted to reset the contacts once the emergency is resolved.

Line Stop Pushbutton (red): Initiates the deceleration of the Line Speed until the machine comes to a complete stop. If the Line Stop Pushbutton is held for more than two seconds, the machine will perform a fast stop, which is faster than a normal stop and almost as aggressive as an E-STOP.

Cores Loaded Pushbutton (yellow): Operates in two stages. The first stage is the core adjustment inflation. Tapping the button sends air to the shafts at approximately 10 PSI. The pushbutton will intermittently flash yellow if this mode is active, allowing operators to verify correct core positioning in the core locator strips or bearings (if applicable). Pressing the pushbutton for 1 second or more will fully inflate the shaft. The pushbutton will hold a solid yellow light if the second stage of inflation is active. It is necessary to verify that the pushbutton is fully illuminated and the shafts are fully inflated before the machine can perform an index.

PanelView Screens

General Information Regarding Screens

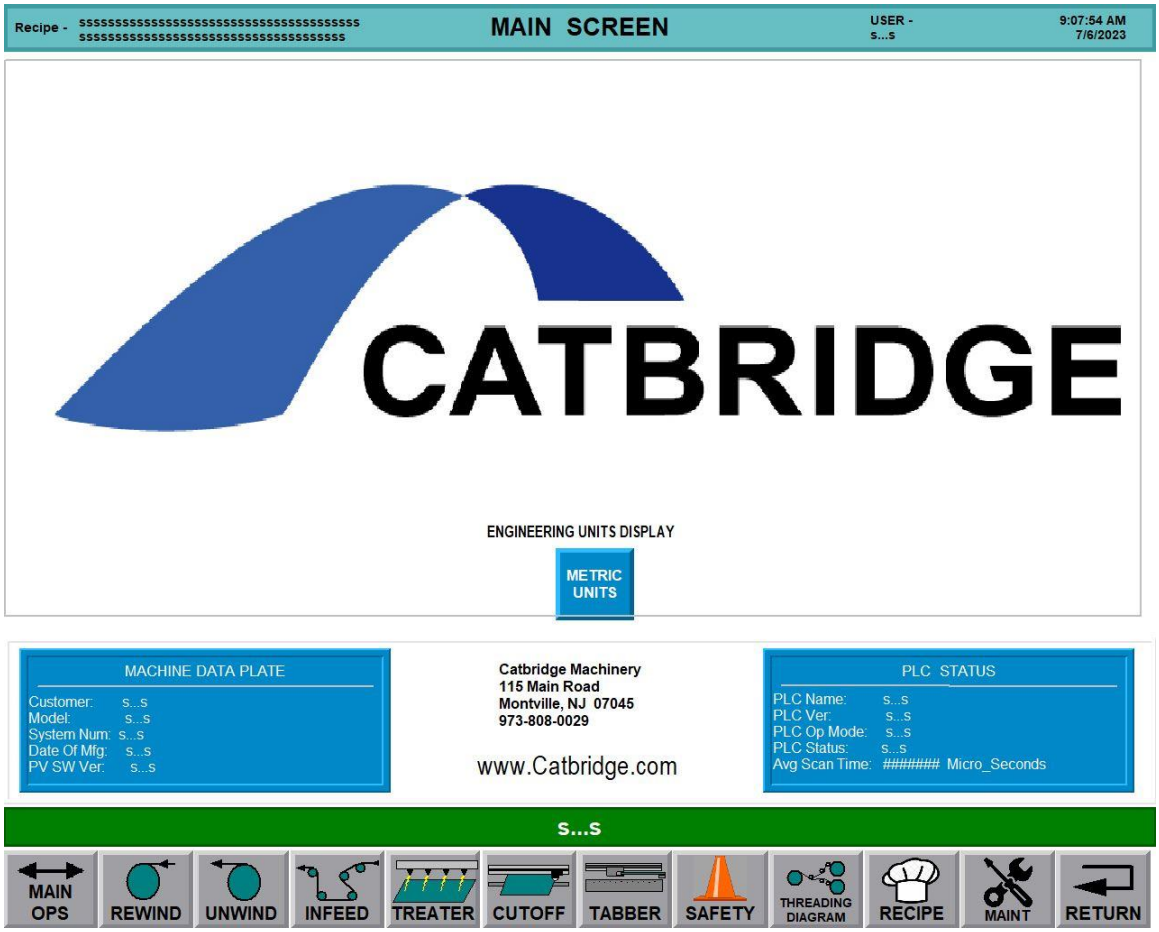
All screens will indicate a title at the top of the screen. Screen selection keys are located at the bottom of the screen. The date and time are displayed on each screen, along with a message display window.

When entering data use the keypad on the **PanelView Screen**. Once the desired value is selected, press the enter key (↵) to submit the data. If an incorrect value is entered or if the data entry box was opened accidentally, use the backspace (←) or ESC key.

Each screen has a similar group of screen selection pushbuttons. The message display can be found on the **Main Operating Screen**. It provides an informative message regarding the status of the machine and hints why machine functions may not be executing when certain conditions exist.

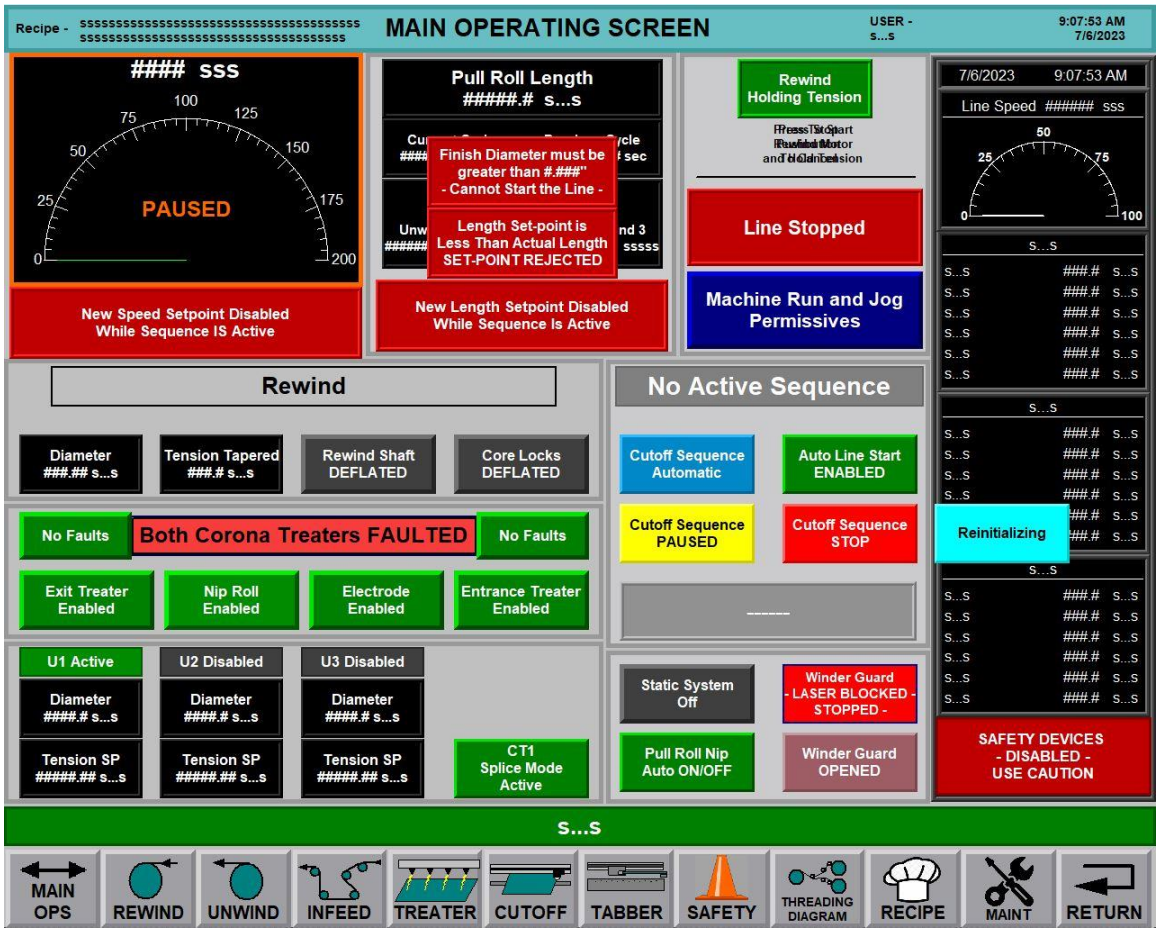
Screen data entry fields are a **light blue** color with white text. Data display fields are either **gray**, **black** or a **dark blue** color with white text. Pushbuttons will display an OFF or Disabled state with **gray** and ON or Enabled with **green**. Multi-state pushbuttons will possess a different color for each state with **red** and **green** being used for the states closest to the conditions explained above.

Welcome Screen



The **Main Menu Screen** is the default screen to be displayed when the system is first powered up. The operator can select the desired screen from the **Main Menu Screen.** This screen will give a brief description of the Company name, model of the Catbridge machine, and other details regarding PLC & HMI versions being used along with the basic PLC information.

Main Operating Screen



The **Main Operating Screen** is where an operator can monitor process values, set machine speed, and enter desired finished roll length. The machine can operate in English (inches, feet) or Metric (meters, millimeters) units. Depending on the unit selected (which is set on a different screen), display of measurement units will vary. This screen is the "Main Hub" and will mostly be used to operate machine functions. All essential functions are available from this screen.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Finished Roll Diameter/Length:** Determines the set point for a finished roll. The rewind speed will ramp down and then stop to reach the desired length or diameter.

Displays

- The machine's data display fields, on the right-side of the screen, provide real-time information as to the current conditions and **actual** running lengths, diameters, and positions of the machine. There are two displays which include the Unwind and Rewind. The displays available are:
    - Unwind:
        - » Unwind 1,2,3 Diameter: The current diameter of the Unwind Master Roll.

- » Unwind 1 & 3 Load Cell FB: Actual unwind tension feedback measured using the load cell.
- » Unwind 2 Dancer %: Displays actual dancer position.

- Rewind:
  - » Diameter: The current estimated diameter of Rewind rolls.
  - » Tapered Tension: The calculated tension set point incorporating the taper value. This is the set point the machine follows.
  - » Rewind Motor Torque: The percent of total motor torque being output by the Rewind motor.
  - » Touch Roll Pressure: Displays rewind touch roll pressure.
  - » Pull Motor Torque: The percent of total motor torque being output by the pull roll motor.
  - » Unwinder Winder Motor Torque: The percent of total motor torque being output by the Unwinder Winder motor.
- Infeed:
  - » Laminator 1 Load Cell FB: Actual laminator 1 tension feedback measured using the load cell.
  - » Laminator 1 Torque: The percent of total motor torque being output by the laminator 1 motor.
  - » Laminator 2 Dancer %: Displays actual dancer position.
  - » Laminator 2 Torque: The percent of total motor torque being output by the laminator 2 motor.
  - » Corona Treater Dancer %: Displays actual dancer position.
  - » Corona Treater Torque: The percent of total motor torque being output by the corona treater motor.

- **Winder Line Speed Gauge:** Current line speed of the Winder section of the machine – not the set point. Pressing this while accelerating will stop the line from accelerating and remain at the speed at which the button was pressed.
- **Pull Roll Length:** Accumulated length of the rolls on the Rewind since the last reset. This is automatically reset when the Unload Sequence is run (if applicable) or the Cutoff & Transfer Sequence is finished.
- **Current Cycle Timer:** The cycle time since the most recent Cutoff & Transfer sequence. This value represents the sum of the Run Time and the Transfer Time. The time will reset any time the Cutoff & Transfer Sequence is finished or stopped.
- **Previous Cycle Timer:** The previous cycle time, Current Cycle value will be moved into Previous Cycle any time the Cutoff & Transfer Sequence is finished or stopped.
- **Unwind 1, 2, 3 Remaining Length:** Displays length remaining on the unwind roll, calculated based on the diameter and material thickness.
- **Rewind Diameter:** The current diameter of the rewind roll.
- **Tapered Tension:** The taper tension set by the operator.
- **Corona Treater Status:** Displays the status of the corona treater.
- **U1, 2, 3 Status:** Displays status of the 3 unwinds as either **Activated** or **Disabled.**
- **U1, 2, 3 Diameter:** Displays the measured diameter of the three unwind rolls.

- **U1, 2, 3 Tension SP:** Displays the tension set point for the three unwind rolls.
- **Active Sequence Display:** Displays the status of the of the cutoff sequence.
- **Winder Guard Status:** Displays whether the winder guard is okay to close.
- **Safety Devices Status:** Displays the current status of the machine's safety devices.

Buttons

- **Line Run Acceleration Pause:** Pressing the speed gauges pauses the acceleration of the line. The line will run at the speed at which it was paused. Pressing the speed gauge again will un-pause the line and it will continue accelerating to Line Speed.
- **Line Speed Increase/Decrease:** Increases (or decreases) the Line Speed of the machine by a default value every time the button is pushed. **Green** (left) will increase the speed, while **Red** (right) will decrease the speed. Default increase/decrease is fifty (50) feet per minute (FPM).
- **Length Reset:** Resets the Length Footage counter. Even if the operator chooses to have the set point as diameter based, the Roll Length indicator will automatically display the Length accumulated. This controls the Master Length seen by the machine. When the Unload Sequence is run, the length will automatically reset.
- **Rewind Slack Take-Up:** Performs a Slack Take-Up to maintain tension while at Zero Speed (Zero Speed Reference).
- **Machine Run and Jog Permissives:** Brings the User to the **Machine Run Permissives Popup**. The screen will display interlocks that must be cleared in order to run or jog.
- **Rewind Shaft Deflated/Inflated:** Allows the operator to inflate and deflate the rewind shaft.
- **Exit Treater Enabled/Disabled:** Enables or disables the exit treater. When enabled, a part of the web facing up when exiting the treater will be treated.
- **Entrance Treater Enabled/Disabled:** Enables or disables the entrance treater. When enabled, the web entering the corona treater will be treated.
- **Nip Enabled/Disabled:** Enables or disables the corona treater nip roll. The nip should be enabled whenever material is being run through the roll to ensure that the material does not slip.
- **Electrode Enabled/Disabled:** Allows the ability to engage/disengage electrodes.
- **Entrance/Exit Fault Reset:** Allows the user the ability to reset the corona treater fault from the HMI.
- **Static System Auto ON/OFF:** Selecting "Static System Off" will keep the static bars deactivated until the button is pressed again. When "Auto" is chosen, the static bars will automatically activate once the line speed reaches the static bar enable speed, which is set on the unwind maintenance screen.
- **Pull Roll Nip Auto ON/OFF:** Selecting "Pull Roll Off" will keep the nip disengaged until the button is pressed again. When "Auto" is chosen, the nip roll will automatically activate once the line drives are enabled.
- **Winder Guard:** Opens/closes the rewind guard door. Rewind safety must be clear in order to open & close winder guard.

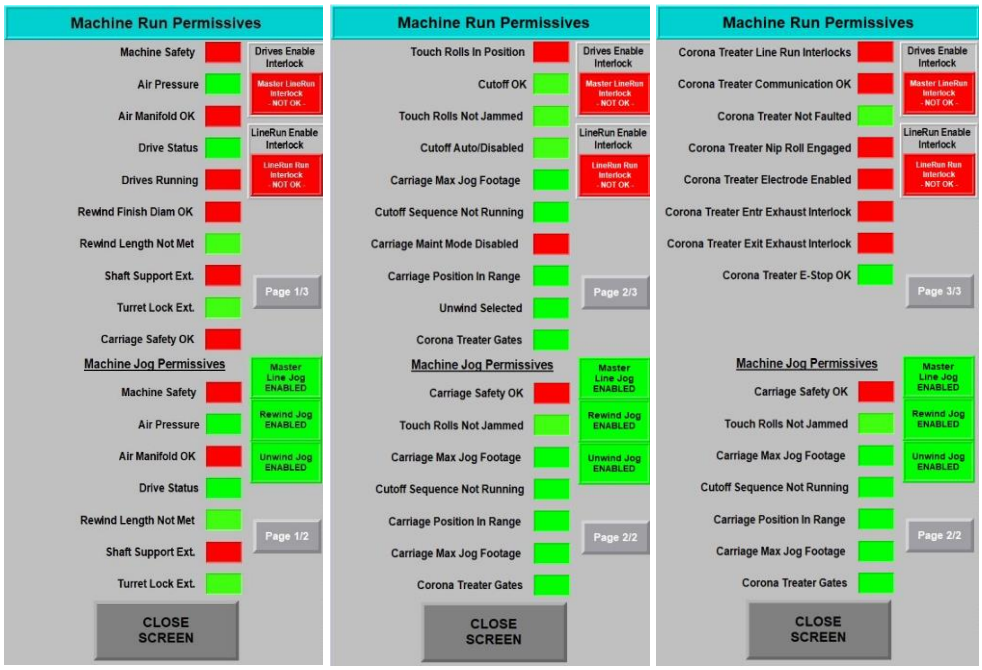
- **Attempt Cutoff Reinitialize:** Reinitializes the Cutoff & Transfer Sequence to clear bring the Cutoff Assemblies to their normal (line running) position. This button will only appear when the Cutoff & Transfer Sequence is started while the Cutoff Assemblies are not in the correct position.
- **Auto Line Start Enable/Disable:** Toggles the mode of line start operation from automatic to manual mode after the Cutoff & Transfer Sequence. Enabled will start the line immediately after the Cutoff Sequence has been finished; disabled means the line will stop as soon as the Cutoff Sequence finishes.
- **Cutoff Sequence Mode:** Toggles the Cutoff Sequence between Automatic and Disabled. This button is different from the one on the **Turret Screen** as it only toggles between the two modes above. In Automatic mode, the Cutoff & Transfer Sequence will start automatically as the machine reaches the length of diameter set point. If the Cutoff Sequence mode is Disabled, the machine will not run the Cutoff & Transfer Sequence and simply run to the length or diameter set point. Use the "Cutoff Sequence Status Indicator" as an indication of the Cutoff current mode.
- **Cutoff Sequence Pause:** Pauses the Cutoff & Transfer Sequence at the current step. Pressing the button again while the sequence is paused will resume the sequence at the current step.

Caution: Resuming the Cutoff & Transfer Sequence will cause the machine to begin moving again. Clear the area before continuing to ensure personnel have breached any of the Safety Zones.

- **Cutoff Sequence Stop:** Stops the Cutoff & Transfer Sequence at the current step.

Note: If the Cutoff Sequence is stopped, the Sequence may be restarted from the step it stopped at; however, restarting may not produce recoverable rolls.

Machine Run and Jog Permissive Popup



The **Machine Run Permissives Screen** shows the permissives that are required to start the line. Machine run and jog permissives can be seen in succession. All indicators on this screen should ideally be **green**. If any permissive under the respect section is **red**, the machine will not operate the function until the permissive is cleared.

Displays

- **Machine Run Permissives:** Dictate the interlocks that are needed to run the machine normally.
- **Machine Jog Permissives:** Interlocks needed to jog the machine.
- **Machine Safety:** The status of the Estops on the machine. **Green** indicates the Estop circuit is cleared. **Red** indicates the Estop circuit is tripped.
- **Air Pressure:** The status of the air pressure incoming to the machine. **Green** indicates the Air Pressure feedback is within an operable range. **Red** indicates the Air Pressure has gone below the threshold (75 PSI, 517 kPa).
- **Air Manifold OK:** The status of the Winder Festo Manifold Relay. **Green** indicates the manifold relay is energized. **Red** indicates the manifold is de-energized or faulted.
- **Drive Status:** The status of the machine's drives. **Green** indicates all drives are operable. **Red** indicates there is a faulted drive or Motor Temperature Overload.
- **Drives Running:** The status of the machine's drives. **Green** indicates all drives are enabled. **Red** indicates that the drives are disabled.
- **Rewind Finish Diam OK:** The status of the calculated rewind diameter. **Green** indicates that the calculated diameter is less than the machine maximum diameter. **Red** indicates that the calculate diameter based off of length setpoint is greater than the maximum diameter.
- **Rewind Length Not Met:** Status of the rewind length. **Green** indicates that the machine has not ran to the defined length setpoint. **Red** indicates that the line is currently at its maximum length setpoint and will not allow the line to start.

- **Shaft Support Ext:** Status of the shaft support. **Green** indicates that the shaft supports are extended. **Red** indicates that the shaft supports are either retracted or faulted.
- **Turret Lock Ext:** Status of the turret locks. **Green** indicates that the turret locks are extended. **Red** indicates that the turret locks are either retracted or faulted.
- **Carriage Safety OK:** The safety status of the Carriage. **Green** indicates the Carriage Safety has been cleared. **Red** indicates the Carriage is either faulted, has reached an overtravel limit, or one of the Safety Devices or Safety Gates are tripped (or the Touch Rolls are in a fixed position).
- **Touch Rolls In Position:** The location status of the Touch Rolls. **Green** indicates Touch Rolls (or Carriage, in Gap Mode) are within the limits for beginning the run, or the Touch Rolls are in a fixed position. **Red** indicates the Touch Rolls (or Carriage, in Gap Mode) are not within the threshold needed to start the line.
- **Cutoff OK: Green** indicates the cutoff safety zones are okay. **Red** indicates a zone is either broken or not reset.
- **Touch Rolls Not Jammed:** Status of the touch rolls. **Green** indicates the touch rolls are not jammed. **Red** indicates the touch rolls are jammed. The carriage will need to be backed up to unjam them.
- **Cutoff Auto/Disabled:** Displays the Cutoff Sequence to one of two different modes, Disable and Automatic. **Green** indicates the Cutoff Sequence is in Auto or Disabled. **Red** indicates that the Cutoff Sequence is not in Auto and not Disabled.
- **Carriage Max Jog Footage:** The status of the Carriage Line Jog length accumulator. **Green** indicates the jog length is below the threshold to continue jogging. **Red** indicates the machine has reached the maximum length while jogging (200 ft, 60 M).

  Note: The Carriage does not move during jogging. This length status is to prevent the Touch Rolls from reaching their maximum compression limit and jamming the machine.

- **Cutoff Sequence Not Running: Green** indicates that the cutoff sequence is not currently running. **Red** indicates that the cutoff sequence is actively running.
- **Carriage Maintenance Mode**: The status of the Carriage Maintenance mode. **Green** indicates that Carriage Maintenance mode is Disabled. **Red** indicates that Carriage Maintenance mode is Enabled.

  Note: Carriage Maintenance mode is only used for jogging the Carriage while the line is at zero speed.

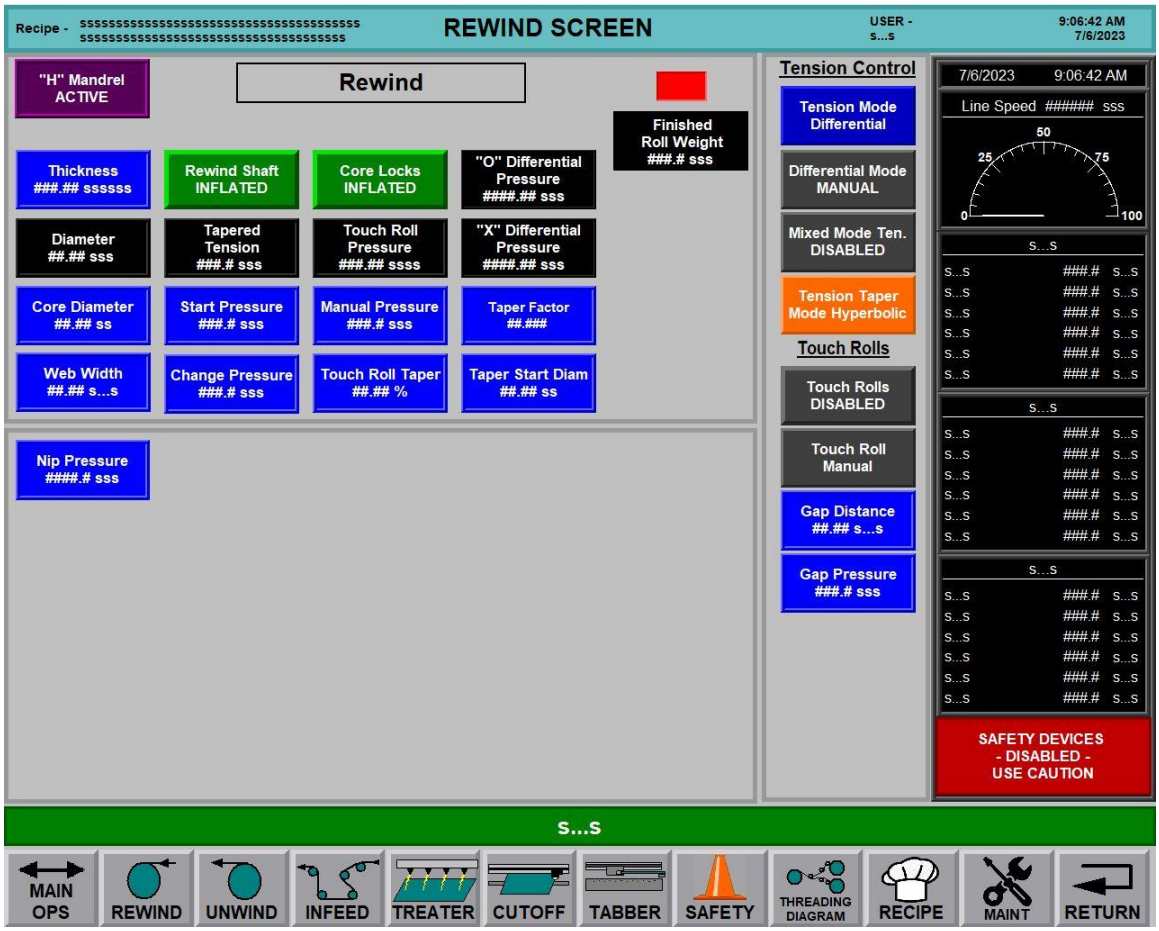
- **Carriage Position In Range**: The status of the Carriage Position. **Green** indicates that Carriage has not reached either positive or negative travel limit. **Red** indicates that Carriage has reached positive or negative travel limit.
- **Unwind Selected:** Interlock that makes sure that at least one unwind is selected before running. Green indicates that an unwind is selected. Red indicates that no unwind is selected.
- **Corona Treater Gates:** Interlock that makes sure that corona treater gates are closed before running or jogging the line. Green indicates that corona treater gates are closed. Red indicates that corona treater gate/s are open.
- **Corona Treater Line Run Interlocks:** Displays whether the interlocks to run the Corona Treater are met. Green shows that the interlocks are met and the line is ready to run. Red means that not all interlocks are met.

- **Corona Treater Communication OK:** Displays whether the machine can communicate with the corona treater. Green means that the machine can communicate. Red means that the communication may be faulted.
- **Corona Treater not Faulted:** Displays fault status of the corona treater. Green means that the corona treater is currently not faulted.
- **Corona Treater Nip Roll Engaged:** Interlock that makes sure that corona treater nip is engaged before running or jogging the line. Green indicates that corona treater nip is engaged. Red indicates that corona treater nip is disengaged.
- **Corona Treater Electrode Enabled:** Interlock that makes sure that corona treater electrodes are engaged before running or jogging the line. Green indicates that corona treater electrodes are engaged. Red indicates that corona treater electrodes are disengaged.
- **Corona Treater Entr Exhaust Interlock:** Makes sure that corona treater exhaust interlock is met before running or jogging the line. Green indicates that corona treater exhaust is on. Red indicates that corona treater exhaust is off.
- **Corona Treater Exit Exhaust Interlock:** Makes sure that corona treater exhaust interlock is met before running or jogging the line. Green indicates that corona treater exhaust is on. Red indicates that corona treater exhaust is off.
- **Corona Treater Estop OK:** Indicates if there is external E-stop preventing the corona treater from turning on. Green indicates that external E-stops are ok. Red indicates that external E-stops are not ok.
- **Drive Enable Interlock:** The status of the machine's drives. **Green** indicates that the drives can be turned on (tension enable). **Red** indicates the drives cannot be enabled (no tension allowed).
- **Line Run Enable Interlock:** The status of the machine's line run interlock. **Green** indicates the line can be started. **Red** indicates there is an interlock that is not met to allow the machine to start.
- **Master Line Jog:** Consists of the Rewind and Unwind Interlocks; **Green** = One or less of the Interlocks is tripped, **Red** = Two or more of the Interlocks are tripped.
- **Rewind Jog:** Consists of the Infeed/Unwind Light Curtain, Safety Gates and Laser Scanners; **Green** = Devices are safe and cleared, **Red** = A Device is tripped and not reset.
- **Unwind Jog:** Consists of the Rewind Laser Scanner and the Infeed Light Curtain; **Green** = Devices are safe and cleared, **Red** = A Device is tripped and not reset.

Buttons

- **Close:** Closes the display, bringing the user back to the screen previously active.

Rewind Screen



The **Rewind Setup Screen** is where the operator can change and view all of the settings regarding tension values, real-time feedbacks, and various modes of machine operations related to the material being converted on the Rewind.

Set points

- **Thickness:** The actual thickness of the material on the Rewind. This set point is important as it determines how the machine calculates the running diameter on the Rewind. Increasing the thickness causes the diameter to increase quicker, while decreasing the thickness will cause the diameter to increase slower. Diameter directly affects the amount of torque applied for maintaining tension and so if the diameter is incorrect the tension may be off causing issues with winding. For more information on diameter calculations and how it affects tension, refer to **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.
- **Core Diameter:** Used as the starting point for the PLC to correctly calculate how much material is being converted, adjustments to tensions, and correct RPM to run and to maintain the operators Line Speed and Tension set points. If, for some reason, the core diameter on the rewind differs in diameter from the actual core size that was entered, the operator must measure the roll diameter and enter the correct number in this field. Failure to do so could result in poorly wound material.
- **Web Width:** Rewind tension is measured in PLI (Pounds per Linear Inch), or KgLCm (Kilos per Linear Centimeter), which is the web width x PLI [KgLCm] tension set point = LBS [Kg] of tension. The Total Web Width set point should be the total width of the material being wound.

- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the Rewind drive speed(s) and torque value in order to achieve the desired tension level. Increasing this value will result in a tighter wind of the material being run. For more information on Tension, refer to **Section 4 – *System Concepts* – Slitter/Rewinder** and/or **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.

  Note: It is always important to balance the Tension set points for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Taper Tension:** Determines the reduction of tension as the roll builds up in diameter. A set point of 0 represents zero taper. This means that the tension will be constant throughout the entire run. A set point greater than 0 will follow the slope of the line up to the Max Rewind Diameter. This means a linear reduction in tension as the roll builds up in diameter. For more information on Taper, refer to **Section 4 – *System Concepts* – Slitter/Rewinder** of this manual.
- **Manual Pressure:** Sets a manual nip pressure to the Touch Rolls. This set point is only available in Touch Roll – Manual Mode.
- **Touch Roll Force:** Sets the running Touch Roll force measured in PLI or lbs. being applied to the material in Automatic Mode.
- **Touch Roll Taper:** Sets the nip force taper on the surface of the material when rewinding.
- **Tension Taper Factor:** In hyperbolic taper mode, this setpoint determines how quickly the tension will taper off. Taper Factors greater than 1 create parabolic profiles (tension will drop slowly, then begin to rapidly decrease), while Taper Factors less than 1 create hyperbolic profiles (tension will rapidly drop, then slowly approach a fixed value). A Taper Factor of 1 creates a linear taper profile as if hyperbolic taper mode is disabled. For more information on taper factors, refer to the Catbridge Taper Factor Worksheet provided with the machine.

  Note: ONLY ADJUST TAPER FACTORS WITH SUPERVISION FROM A TRAINED PERSONNEL. Utilize the Catbridge Taper Factor Worksheet when setting taper factors.

- **Taper Start Diam:** Sets the Diameter at which the Roll will begin following the taper profile.
- **Gap Mode Distance:** Sets the Gap Mode distance that the Touch Rolls will maintain from the surface of the winding material. This set point is only available in Touch Roll – Gap Mode.
- **Gap Mode Pressure:** Sets the Pressure the Touch Rolls will retain in Gap Mode.
- **Nip Pressure:** Sets the pressure applied to the rewind pull roll nip.

Displays

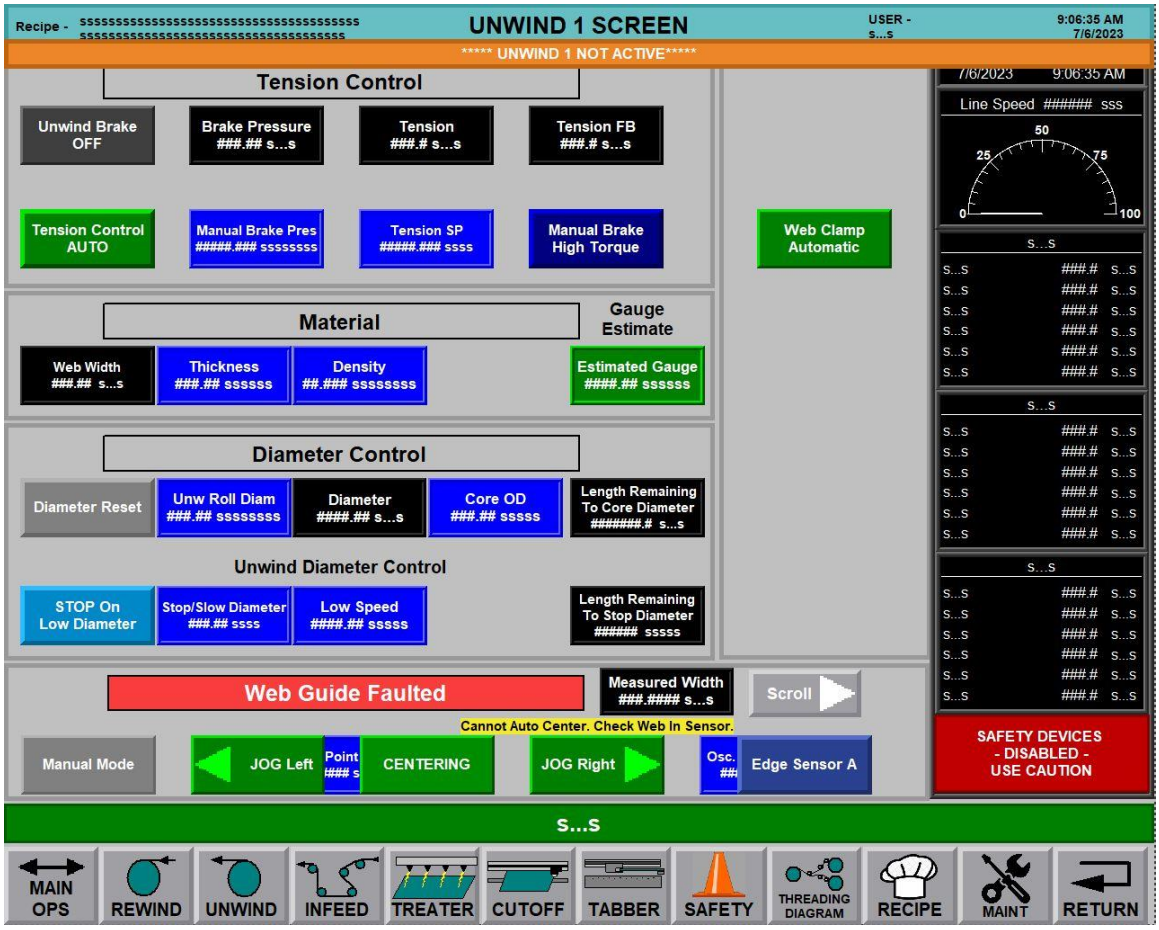
- **Active Mandrel (“O”/”X”):** The active mandrel. If indexing, the display will show “Indexing.”
- **Diameter:** The current diameter of the rewind roll(s).
- **Tapered Tension:** The taper tension set by the operator.
- **Touch Roll Pressure:** The pressure in the Touch Roll cylinders.
- **Maximum Roll Weight Indicator:** Shows when the estimated weight of the current roll has exceeded the Rewind shaft capacity. **Green** indicates the roll is under the maximum weight. **Red** indicates the roll has exceeded the weight limit.

- **Finished Roll Weight:** The estimated finished weight of the roll based upon the **Roll Length** or **Finish Diameter** set points.

Buttons

- **Rewind Shaft Inflated/Deflated:** Allows the operator to inflate or deflate the Rewind Shaft. The shaft will also automatically inflate when the line is started.
- **Tension Mode:** Toggles between Differential and Lock Core Modes for Tension Control. Differential Mode is best used for applications where multiple cores are in use. Each roll slips independent of the other(s) allowing for non-uniform diameter build up but constant tension across the web. This mode is good for precision tension control. Lock Core Mode is best suited for full web width winding (log winding) where gage banding occurs. The rate at which the Rewind Mandrel rotates dictates the rotation of the roll as no slipping occurs. For more information on tension, refer to **Section 4 – *System Concepts* –Rewinder** and/or **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.
- **Differential Tension Mode:** Toggles between Automatic and Manual Differential Tension Mode. In Automatic, the machine will automatically calculate the pressure required to maintain the tension set point at the rewind. In Manual Mode, the operator must choose a starting pressure and pressure step change. For more information on tension, refer to **Section 4 – *System Concepts* –Rewinder** and/or **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.
- **Linear/Hyperbolic Mode**: Toggles between tension options. In Linear mode, the tension tapers in direct proportion to the unwind diameter. In hyperbolic mode, the tension will decrease exponentially (i.e., fast taper on diameter low, slow on diameter high).
- **Touch Roll Mode:** Toggles between the three different modes of Touch Roll application: Disabled, Touch Mode, and Gap Mode. Disabled will not move the Touch Rolls keeping them at a constant distance from the center of the Rewind shaft. Touch Mode will keep the Touch Rolls in contact with the surface of the winding material. Gap mode will keep the Touch Rolls at a set distance from the surface of the winding material. For more information on Touch Rolls, refer to **Section 4 – *System Concepts* –Rewinder** of this manual.
- **Touch Roll Control Mode:** Toggles between the Touch Roll Control Mode. If Automatic is selected, the Touch Rolls will automatically calculate the Nip force to maintain on the material; for manual, the Nip force must be set and will be maintained at that force.

Unwind 1 Screen



The **Unwind Screen** has options to control the behavior of the Unwind. The initial settings of the material can be entered here as well as other tension and line run parameters.

Set points

- **Manual Brake Pressure:** Pressure sent to the Unwind Brake that is input by the operator. The operator must have the machine's unwind in Manual Mode to control the brake pressure. This directly influences how much tension the Unwind will have.

  Note: Having a constant brake pressure while the Unwind is decreasing in diameter will cause the Unwind tension to slowly increase. The operator will need to update the Brake Pressure in order to maintain the same tension set point.

- **Unwind Tension:** Sets the tension that the operator wants the Unwind to maintain throughout the run, in lbs. (or kg).

- **Material Thickness (Gauge):** The actual thickness of the material on the Unwind. It is important to get an accurate measurement with this set point because this is one of the values that is used in the calculations to determine the running diameter of the master roll on the Unwind.

- **Web Width:** The actual width of the master roll on the Unwind. This set point is important as it determines the estimated Roll Weight which directly influences the performance during acceleration and deceleration of the line.

- **Density:** The actual density of the material on the Unwind measured in pounds per cubic inch (lbs. /in^3). This set point does not have to be as accurate as the other ones. For example: The material being ran is .038 lbs. /in^3. The operator forgot to change the density for the new material and ran the machine with a density of .045 lbs. /in^3. There would hardly be any noticeable difference. If the material being ran is .038 lbs./in^3 and an operator entered .38 lbs./in^3 for the set point, that is when many issues could occur and tensions could go out of control, which could result in web breaks, telescoping rolls, and possibly overloading/faulting any of the drives. This set point is mostly important during acceleration and deceleration for inertia compensation.
- **Roll Diameter:** The beginning master roll diameter. Roll diameter should be measured from the top of the core to the edge of the material and then multiplied by 2 and then add the core size. This will give the operator a fairly accurate diameter so that it can be entered.

  Note: It is important that the operator enter the correct dimensions for the new master roll. All dimensions are used in the PLC's calculations; incorrect dimensions could lead to poorly wound rolls.
- **Core Diameter:** Represents the outer diameter of the core in the Unwind. Measure this prior to mounting the master roll in the Unwind for convenience. The machine will always stop at the unwind core diameter set point.
- **Stop/Slow Diameter:** Determines at what diameter value the machine will slow or stop the line (based upon **Low Diameter Mode**).
- **Low Diameter Speed:** Determines at what unwind roll diameter the line will begin to decelerate at given that the Low Diameter button is in the "Slow" or "Stop" state. This set point is only available when the Low Diameter Mode is set to "Slow" or "Stop."
- **Guide Point Offset:** Allows the operator to adjust the guide point of the edge guide. Material will be shifted left or right depending on the positive/negative guide point value.

Displays

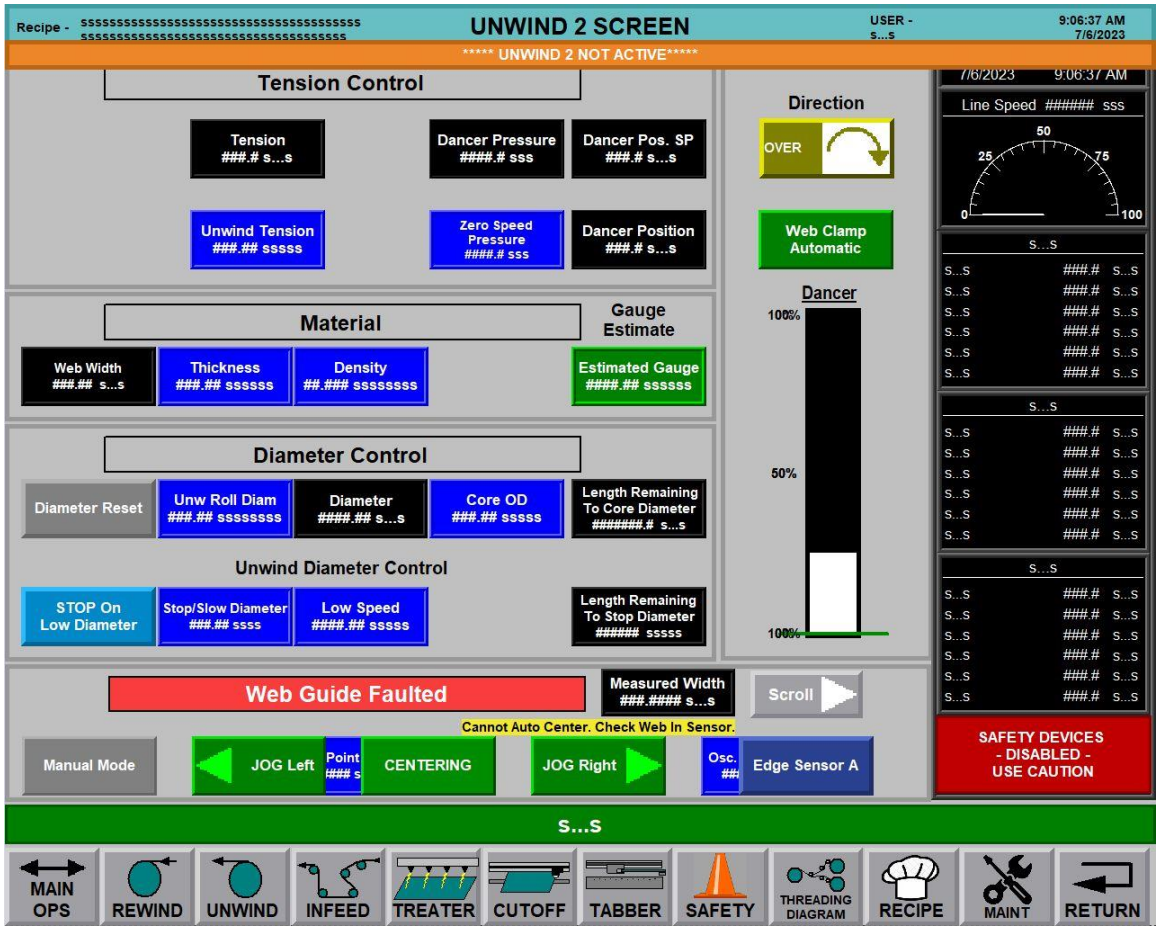
- **Unwind Tension:** The Tension set by the operator.
- **Unwind Brake Pressure:** Current pressure applied to the brakes.
- **Unwind Tension Feedback:** Tension feedback of the pressure unwind brakes are exerting on the web. (If applicable)
- **Unwind Diameter:** The current diameter of the Unwind roll.
- **Length Remaining to CORE Diameter:** Total calculated footage remaining before reaching the roll's core.
- **Length Remaining to STOP Diameter:** Total calculated footage remaining before reaching the roll's Stop diameter (Stop diameter set by the operator).
- **Web Guide Fault Status:** Displays the status of the web guide, and if it is faulted.

Buttons

- **Unwind Brake ON/OFF:** Turns unwind brake on/off. When line drives are enabled, brakes will automatically turn on to achieve required unwind tension.
- **Unwind Tension Auto/Manual Mode:** Toggles between the Tension Control Modes. Automatic mode will maintain the Unwind Tension set point by itself engaging and adjusting the brake pressure when needed. Manual Mode will maintain an entered set point value torque to be supplied by the unwind motor.

- **Manual Brake Torque Range:** Toggles between the high and low torque range for the Unwind brakes in **Unwind Manual Tension Mode**. Using the high range will engage all brake pads and produce more torque (and consequently more tension). Using the low range will produce a lower tension with less pads engaged.
- **Diameter Slow/Stop/Ignore:** Allows the operator to toggle between three modes of how the machine will stop based on diameter. The first mode is slow on diameter. When this mode is selected two set points will appear. One is for speed and one is for diameter. The operator will enter what speed the machine should run at once the diameter set point that was entered is met. The machine will ramp down to that speed set point until core diameter. The next mode is stop on diameter. When this mode is selected a set point box will appear and this will be the diameter the operator wants to the machine to stop. The machine will run at Line Speed and automatically start ramping down in speed based off calculations in the PLC to stop the line on the diameter set point. The last mode is diameter ignore. In this mode, the machine will run and automatically will start to ramp down and stop on the actual core diameter. For more information about Diameters, see **Section 4 – *System Concepts* – Basic Machine Operation**.
- **Diameter Reset:** Resets the internal diameter calculator to the Roll Diameter snapshot from the Diameter sensors. That is, if the operator changes the Unwind master roll, they would press this button to bring the calculated diameter back to the correct diameter.
- **Edge Sensor Selection:** Selects edge guide sensor A, B, or both (centered between both sensors).
- **Web Guide Manual/Auto:** Selects the Edge Guide to be in either Manual or Auto modes of operation. In Manual mode, the edge guide will not guide while the line is running. Manual mode is used for setting up the edge guide/Line guide initially before being placed in Auto Mode. In Auto Mode, the guider will start to guide when the line speed is above a web guide enable speed setpoint located on the maintenance menu.
- **Web Guide Jog Left/Right:** Slides the Unwind Stand to the left or right on its rails.
- **Web Guide Servo Center:** Automatically centers the Unwind Stand in the middle of its rails and will maintain that position.
- **Web Clamp Automatic:** Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Unwind 2 Screen



The **Unwind Screen** has options to control the behavior of the Unwind. The initial settings of the material can be entered here as well as other tension and line run parameters.

Set points

- **Unwind Tension:** Sets the tension that the operator wants the Unwind to maintain throughout the run, in lbs. (or kg).
- **Zero Speed Pressure:** The pressure applied to the dancer when the machine is at 0 FPM so the machine can maintain tension in the web without causing the web to break.
- **Material Thickness (Gauge):** The actual thickness of the material on the Unwind. It is important to get an accurate measurement with this set point because this is one of the values that is used in the calculations to determine the running diameter of the master roll on the Unwind.
- **Web Width:** The actual width of the master roll on the Unwind. This set point is important as it determines the estimated Roll Weight which directly influences the performance during acceleration and deceleration of the line.
- **Density:** The actual density of the material on the Unwind measured in pounds per cubic inch (lbs. /in^3). This set point does not have to be as accurate as the other ones. For example: The material being ran is .038 lbs. /in^3. The operator forgot to change the density for the new material and ran the machine with a density of .045 lbs. /in^3. There would hardly be any noticeable difference. If the material being ran is .038 lbs./in^3 and an operator entered .38

lbs./in^3 for the set point, that is when many issues could occur and tensions could go out of control, which could result in web breaks, telescoping rolls, and possibly overloading/faulting any of the drives. This set point is mostly important during acceleration and deceleration for inertia compensation.

- **Roll Diameter:** The beginning master roll diameter. Roll diameter should be measured from the top of the core to the edge of the material and then multiplied by 2 and then add the core size. This will give the operator a fairly accurate diameter so that it can be entered.

  Note: It is important that the operator enter the correct dimensions for the new master roll. All dimensions are used in the PLC's calculations; incorrect dimensions could lead to poorly wound rolls.

- **Core Diameter:** Represents the outer diameter of the core in the Unwind. Measure this prior to mounting the master roll in the Unwind for convenience. The machine will always stop at the unwind core diameter set point.
- **Stop/Slow Diameter:** Determines at what diameter value the machine will slow or stop the line (based upon **Low Diameter Mode**).
- **Low Diameter Speed:** Determines at what unwind roll diameter the line will begin to decelerate at given that the Low Diameter button is in the "Slow" or "Stop" state. This set point is only available when the Low Diameter Mode is set to "Slow" or "Stop."
- **Guide Point Offset:** Allows the operator to adjust the guide point of the edge guide. Material will be shifted left or right depending on the positive/negative guide point value.

Displays

- **Tension:** The unwind tension set by the operator.
- **Dancer Pressure:** Displays the current pressure applied to the dancer.
- **Dancer Position Set Point:** Displays the position that the dancer should sit at to maintain optimal web tension.
- **Dancer Position:** Displays the actual position of the dancer. This value corresponds to the reading from the **Dancer** graphic to the right
- **Unwind Diameter:** The current diameter of the Unwind roll.
- **Length Remaining to CORE Diameter:** Total calculated footage remaining before reaching the roll's core.
- **Length Remaining to STOP Diameter:** Total calculated footage remaining before reaching the roll's Stop diameter (Stop diameter set by the operator).
- **Web Guide Fault Status:** Displays the status of the web guide, and if it is faulted.

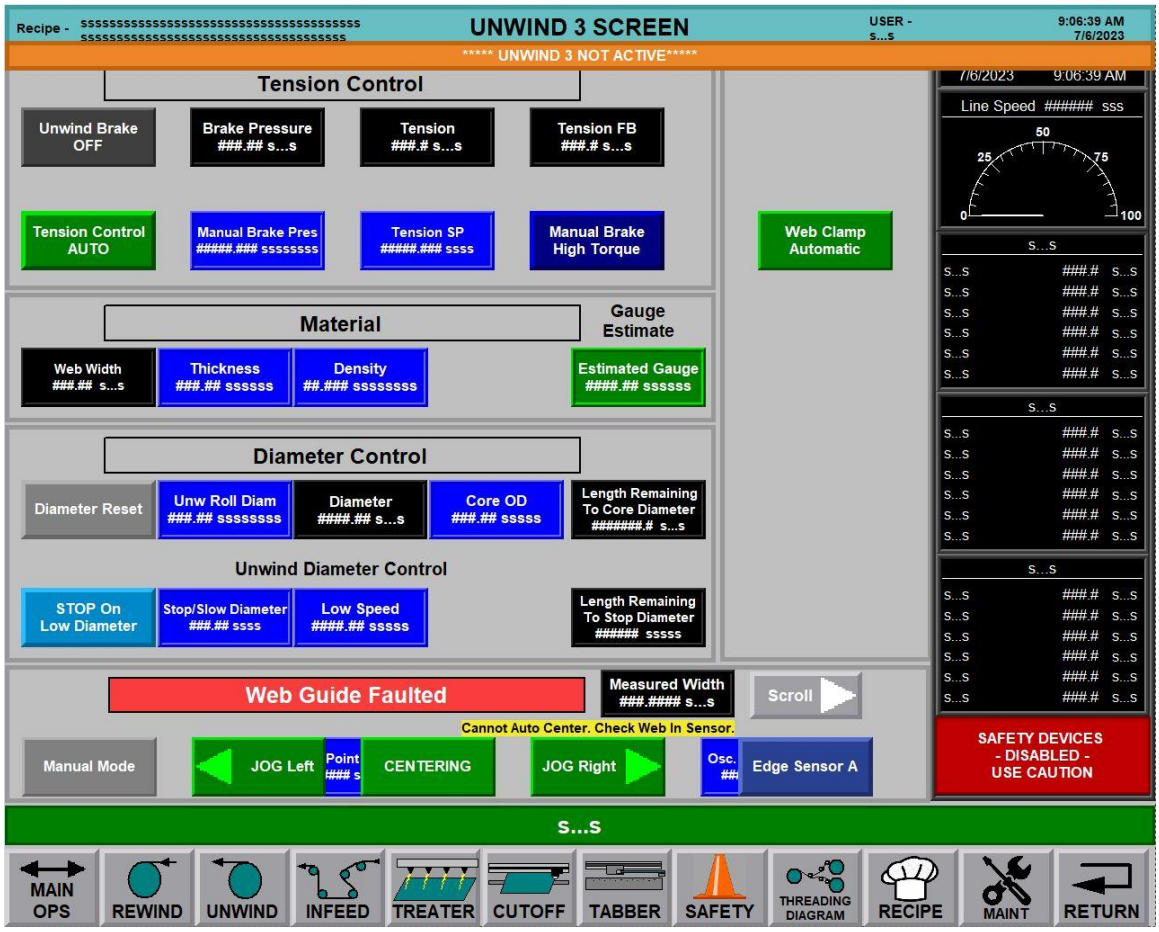
Buttons

- **Diameter Reset:** Resets the internal diameter calculator to the Roll Diameter snapshot from the Diameter sensors. That is, if the operator changes the Unwind master roll, they would press this button to bring the calculated diameter back to the correct diameter.
- **Diameter Slow/Stop/Ignore:** Allows the operator to toggle between three modes of how the machine will stop based on diameter. The first mode is slow on diameter. When this mode is selected two set points will appear. One is for speed and one is for diameter. The operator will enter what speed the machine should run at once the diameter set point that was entered

is met. The machine will ramp down to that speed set point until core diameter. The next mode is stop on diameter. When this mode is selected a set point box will appear and this will be the diameter the operator wants to the machine to stop. The machine will run at Line Speed and automatically start ramping down in speed based off calculations in the PLC to stop the line on the diameter set point. The last mode is diameter ignore. In this mode, the machine will run and automatically will start to ramp down and stop on the actual core diameter. For more information about Diameters, see **Section 4 – *System Concepts* – Basic Machine Operation**.

- **Web Guide Jog Left/Right:** Slides the Unwind Stand to the left or right on its rails.
- **Web Guide Manual/Auto:** Selects the Edge Guide to be in either Manual or Auto modes of operation. In Manual mode, the edge guide will not guide while the line is running. Manual mode is used for setting up the edge guide/Line guide initially before being placed in Auto Mode. In Auto Mode, the guider will start to guide when the line speed is above a web guide enable speed setpoint located on the maintenance menu.
- **Edge Sensor Selection:** Selects edge guide sensor A, B, or both (centered between both sensors).
- **Web Guide Servo Center:** Automatically centers the Unwind Stand in the middle of its rails and will maintain that position.
- **Over/Under Wind:** Allows the operator to tell the machine whether the unwind roll is being over or under-wound.
- **Web Clamp Auto/Manual:** Toggles between automatic and manual web clamp application. In Automatic mode, the web clamp will automatically engage when the line stops running. In manual mode, the operator must press the web clamp button to engage and disengage the web clamp.

Unwind 3 Screen



The **Unwind Screen** has options to control the behavior of the Unwind. The initial settings of the material can be entered here as well as other tension and line run parameters.

Set points

- **Manual Brake Pressure:** Pressure sent to the Unwind Brake that is input by the operator. The operator must have the machine's unwind in Manual Mode to control the brake pressure. This directly influences how much tension the Unwind will have.

  Note: Having a constant brake pressure while the Unwind is decreasing in diameter will cause the Unwind tension to slowly increase. The operator will need to update the Brake Pressure in order to maintain the same tension set point.

- **Unwind Tension:** Sets the tension that the operator wants the Unwind to maintain throughout the run, in lbs. (or kg).

- **Material Thickness (Gauge):** The actual thickness of the material on the Unwind. It is important to get an accurate measurement with this set point because this is one of the values that is used in the calculations to determine the running diameter of the master roll on the Unwind.

- **Web Width:** The actual width of the master roll on the Unwind. This set point is important as it determines the estimated Roll Weight which directly influences the performance during acceleration and deceleration of the line.

- **Density:** The actual density of the material on the Unwind measured in pounds per cubic inch (lbs. /in^3). This set point does not have to be as accurate as the other ones. For example: The material being ran is .038 lbs. /in^3. The operator forgot to change the density for the new material and ran the machine with a density of .045 lbs. /in^3. There would hardly be any noticeable difference. If the material being ran is .038 lbs./in^3 and an operator entered .38 lbs./in^3 for the set point, that is when many issues could occur and tensions could go out of control, which could result in web breaks, telescoping rolls, and possibly overloading/faulting any of the drives. This set point is mostly important during acceleration and deceleration for inertia compensation.
- **Roll Diameter:** The beginning master roll diameter. Roll diameter should be measured from the top of the core to the edge of the material and then multiplied by 2 and then add the core size. This will give the operator a fairly accurate diameter so that it can be entered.

  Note: It is important that the operator enter the correct dimensions for the new master roll. All dimensions are used in the PLC's calculations; incorrect dimensions could lead to poorly wound rolls.
- **Core Diameter:** Represents the outer diameter of the core in the Unwind. Measure this prior to mounting the master roll in the Unwind for convenience. The machine will always stop at the unwind core diameter set point.
- **Stop/Slow Diameter:** Determines at what diameter value the machine will slow or stop the line (based upon **Low Diameter Mode**).
- **Low Diameter Speed:** Determines at what unwind roll diameter the line will begin to decelerate at given that the Low Diameter button is in the "Slow" or "Stop" state. This set point is only available when the Low Diameter Mode is set to "Slow" or "Stop."
- **Guide Point Offset:** Allows the operator to adjust the guide point of the edge guide. Material will be shifted left or right depending on the positive/negative guide point value.

Displays

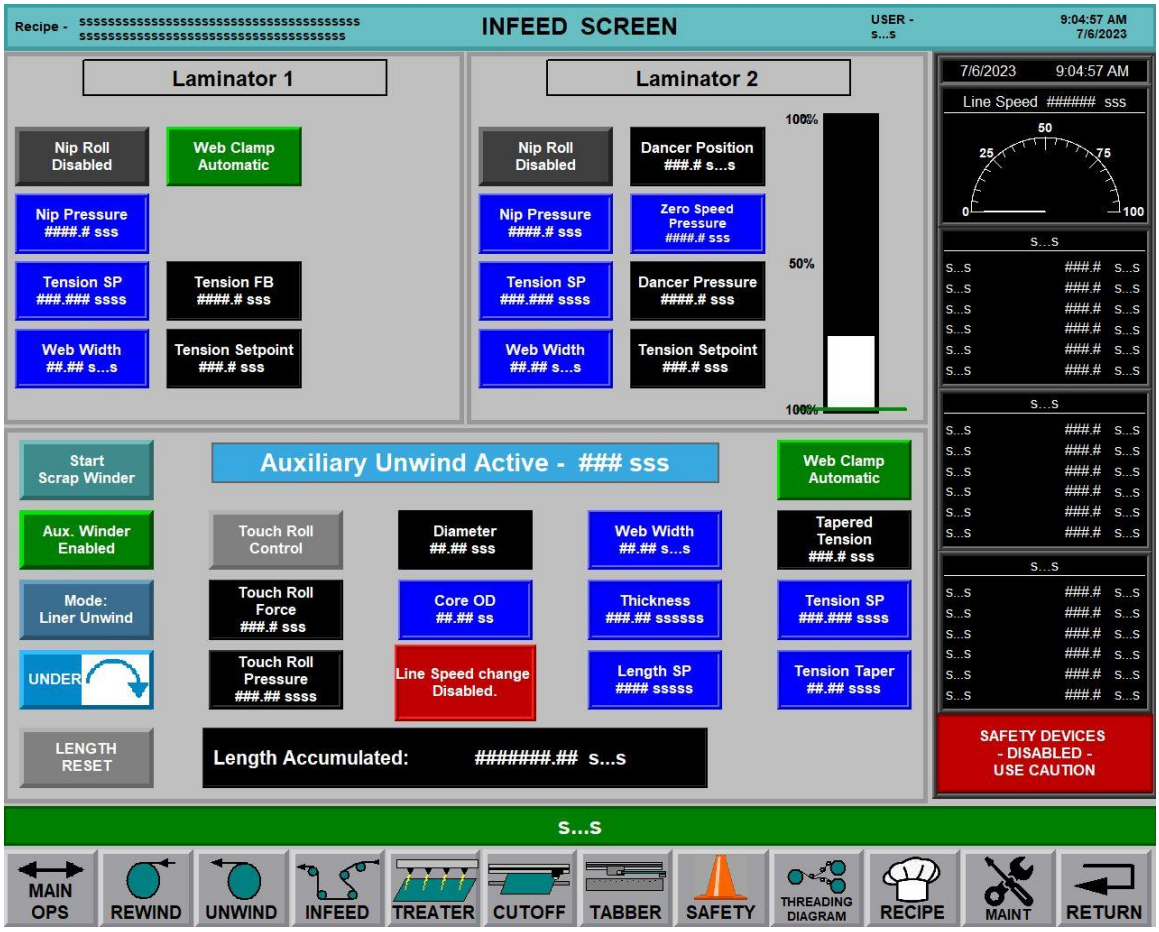
- **Unwind Tension:** The Tension set by the operator.
- **Unwind Brake Pressure:** Current pressure applied to the brakes.
- **Unwind Tension Feedback:** Tension feedback of the pressure unwind brakes are exerting on the web. (If applicable)
- **Unwind Diameter:** The current diameter of the Unwind roll.
- **Length Remaining to CORE Diameter:** Total calculated footage remaining before reaching the roll's core.
- **Length Remaining to STOP Diameter:** Total calculated footage remaining before reaching the roll's Stop diameter (Stop diameter set by the operator).
- **Web Guide Fault Status:** Displays the status of the web guide, and if it is faulted.

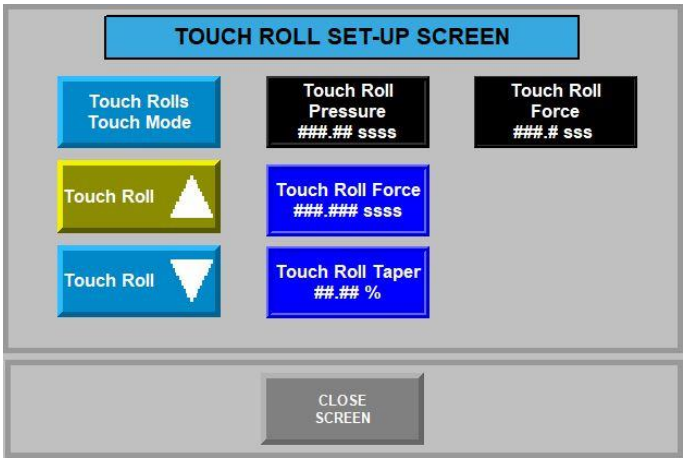
Buttons

- **Unwind Brake ON/OFF:** Turns unwind brake on/off. When line drives are enabled, brakes will automatically turn on to achieve required unwind tension.
- **Unwind Tension Auto/Manual Mode:** Toggles between the Tension Control Modes. Automatic mode will maintain the Unwind Tension set point by itself engaging and adjusting the brake pressure when needed. Manual Mode will maintain an entered set point value torque to be supplied by the unwind motor.

- **Manual Brake Torque Range:** Toggles between the high and low torque range for the Unwind brakes in **Unwind Manual Tension Mode**. Using the high range will engage all brake pads and produce more torque (and consequently more tension). Using the low range will produce a lower tension with less pads engaged.
- **Diameter Slow/Stop/Ignore:** Allows the operator to toggle between three modes of how the machine will stop based on diameter. The first mode is slow on diameter. When this mode is selected two set points will appear. One is for speed and one is for diameter. The operator will enter what speed the machine should run at once the diameter set point that was entered is met. The machine will ramp down to that speed set point until core diameter. The next mode is stop on diameter. When this mode is selected a set point box will appear and this will be the diameter the operator wants to the machine to stop. The machine will run at Line Speed and automatically start ramping down in speed based off calculations in the PLC to stop the line on the diameter set point. The last mode is diameter ignore. In this mode, the machine will run and automatically will start to ramp down and stop on the actual core diameter. For more information about Diameters, see **Section 4 – *System Concepts* – Basic Machine Operation**.
- **Diameter Reset:** Resets the internal diameter calculator to the Roll Diameter snapshot from the Diameter sensors. That is, if the operator changes the Unwind master roll, they would press this button to bring the calculated diameter back to the correct diameter.
- **Edge Sensor Selection:** Selects edge guide sensor A, B, or both (centered between both sensors).
- **Web Guide Manual/Auto:** Selects the Edge Guide to be in either Manual or Auto modes of operation. In Manual mode, the edge guide will not guide while the line is running. Manual mode is used for setting up the edge guide/Line guide initially before being placed in Auto Mode. In Auto Mode, the guider will start to guide when the line speed is above a web guide enable speed setpoint located on the maintenance menu.
- **Web Guide Jog Left/Right:** Slides the Unwind Stand to the left or right on its rails.
- **Web Guide Servo Center:** Automatically centers the Unwind Stand in the middle of its rails and will maintain that position.
- **Web Clamp Automatic:** Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.

Infeed Screen





The **Infeed Screen** gives the operator control over the infeed section and liner winder. Operators can adjust tensions and scrap winder settings from here. Depending on the mode only selected setpoints will be visible at a time.

Set points

- **Nip Pressure:** Allows the operator to set the pressure applied by the laminator nip rolls.
- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the drives speed(s) and torque value in order to achieve the desired infeed tension level. Dancer pressure will be adjusted based on the infeed tension.

  Note: It is always important to balance the Tension set points for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Web Width:** Sets the web width used for the tension calculation in the infeed section and auxiliary winder/unwind section.
- **Zero Speed Pressure:** The pressure applied to the Dancer when the machine is at zero speed. This is meant to be a holding pressure so the machine can hold the web without building too much stored energy in case the web is broken.
- **Core Diameter:** Represents the outer diameter of the core on the Liner Winder. Measure this prior to mounting the roll in the Auxiliary Unwind/ or placing core for liner Winding for convenience. The machine will stop at the auxiliary unwind core diameter set point when Auxiliary Unwind mode is selected.
- **Speed:** Allows the operator to set the speed scrap winder run speed.
- **Thickness:** The actual thickness of the material on the Auxiliary Winder. It is important to get an accurate measurement with this set point because this is one of the values that is used in the calculations to determine the running diameter of the roll.
- **Length SP:** Determines the set point for a finished roll. The scrap winder speed will ramp down and then stop to reach the desired length. On some machines length setpoint is ignored based on the machine requirement.
- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the auxiliary unwind/rewind drive speed(s) and torque value in order to achieve the desired tension level. Increasing this value will cause the winding roll to be "packed" tighter. For more information on Tension, refer to **Section 4 – *System Concepts* – Slitter/Rewinder** and/or **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.
- **Tension Taper SP:** Determines the amount of tension reduction as roll diameter builds. A set point of 0 represents zero taper. This means that the tension will be constant throughout the entire run. A set point greater than 0 will follow the slope of the line up to the Max Liner/Scrap Winder Diameter. This means a linear reduction in tension as the roll builds up in diameter. For more information on Taper, refer to **Section 4 – *System Concepts* – Slitter/Rewinder** of this manual.
- **Touch Roll Force:** Sets the running Touch Roll force measured in PLI or lbs. being applied to the material in Automatic Mode.
- **Touch Roll Taper:** Sets the nip force taper on the surface of the material when rewinding.

Displays

- **Tension Feedback:** Displays the tension feedback (using load cell) between laminator 1 and 2.
- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the Rewind drive speed(s) and torque value in order to

achieve the desired tension level. Increasing this value will result in a tighter wind of the material being run. For more information on Tension, refer to **Section 4 – *System Concepts* – Rewinder** and/or **Section 4 – *System Concepts* – Basic Machine Operation** of this manual.

> **Note:** It is always important to balance the Tension set points for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Dancer Position:** Displays the actual position of the dancer. This value corresponds to the reading from the **Dancer** graphic to the right
- **Dancer Pressure:** Calculated dancer pressure required to achieve desired laminator 2 tension.
- **Diameter:** The current diameter of the Auxiliary winder roll.
- **Speed:** Displays current speed of the Auxiliary winder/unwind in scrap winder mode.
- **Tapered Tension:** Displays liner winder taper tension as the roll diameter builds up.
- **Length Accumulated:** Total calculated footage on the auxiliary winder.
- **Touch Roll Pressure:** The pressure in the Touch Roll cylinders.
- **Touch Roll Force:** Displays the force applied by the touch roll.

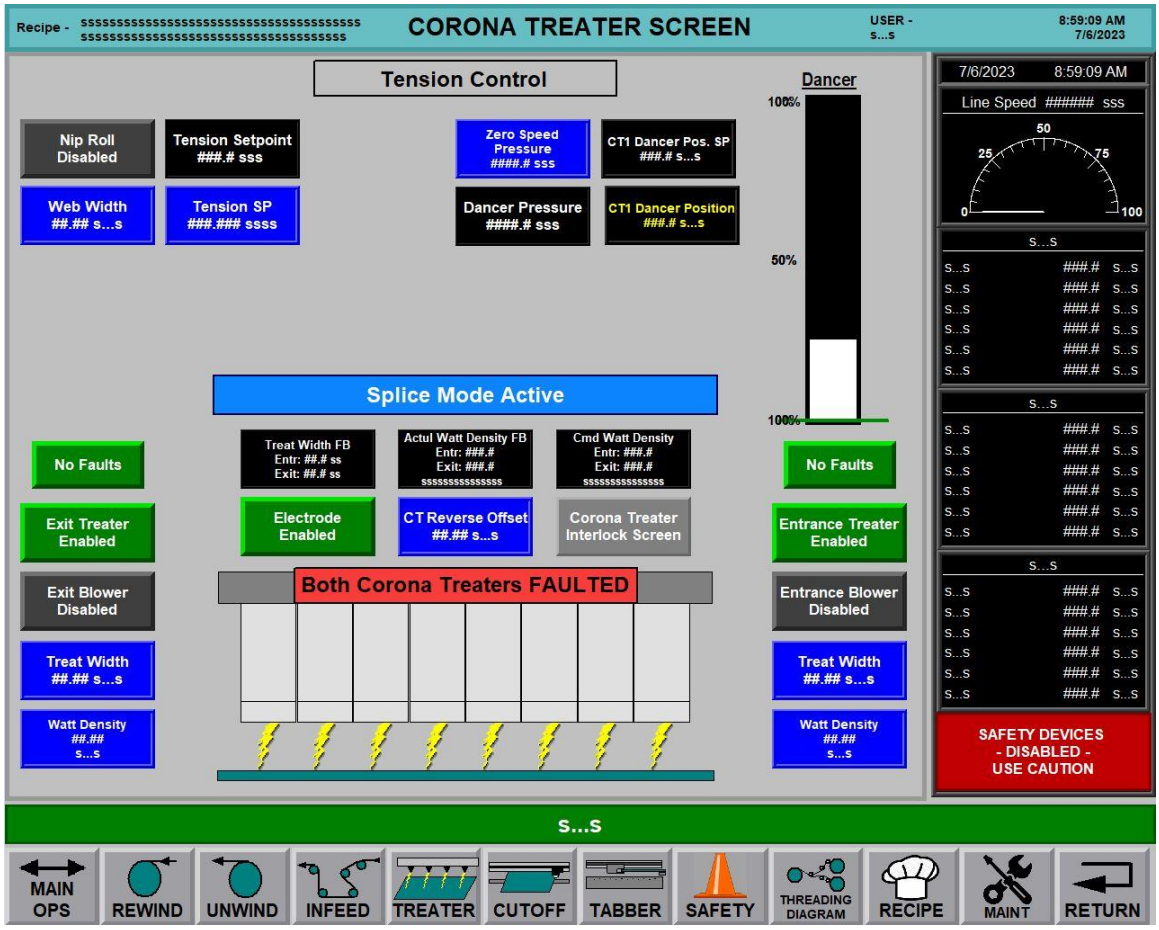
Buttons

- **Nip Roll Enabled/Disabled:** Enables or disables the nip roll located in the laminator section. The nip should be enabled whenever material is being run through the roll to ensure material is being laminated.
- **Web Clamp Auto/Manual:** Toggles between clamp auto and OFF. In Auto Mode, the unwind web clamp will automatically open when the line starts and close when the line stops. In the OFF mode, the unwind web clamp will remain OFF until the operator toggles the button. If the pushbutton is not illuminated, pressing the button will put the web clamp in auto mode and illuminate the button. If the line is not running, the clamp will engage and stay engaged until the line drives turn on or the operator presses the button again.
- **Aux Winder Mode Enabled/Disabled:** Enables or disables the auxiliary winder. The auxiliary winder must be enabled to allow a mode to be selected.
- **Auxiliary Winder Mode Liner Unwind/Aux. Unwind/Liner Winder/Scrap Winder:** Selects the auxiliary winder mode desired by the operator. Note: The winder must be in scrap winder mode to enable liner winder jog pushbutton and foot paddle located in the infeed section.
- **Over/Under:** Selects the direction the auxiliary winder material will run. It is important the operator sets this correctly as a reversal of direction will stall the motor and possibly stretch the material.
- **Length Reset:** Resets the accumulated auxiliary winder length setpoint.
- **Start Scrap Winder:** Pressing the button once will enable scrap winder and infeed pull roll drives to allow scrap winder to hold tension (Zero Speed Hold). Pressing and holding the button for 4 seconds will start running the scrap winder. Pressing any of the line stop buttons will stop the scrap winder.
- **Touch Roll Control:** Open the touch roll set-up screen.
- **Touch Rolls Mode:** Toggles between the three different modes of Touch Roll application: Disabled and Touch Mode. Disabled will not move the Touch Rolls keeping them at a constant

distance from the center of the Rewind shaft. Touch Mode will keep the Touch Rolls in contact with the surface of the winding material. For more information on Touch Rolls, refer to **Section 4 – *System Concepts* – Rewinder** of this manual.

- **Touch Rolls Up/Down:** Allows the operator to raise/lower the auxiliary winder touch roll.

Corona Treater



The **Corona Treater Screen** has options to control the behavior of the Entrance & Exit Treaters. The initial settings of the material can be entered here as well as other tension and treating parameters.

Set points

- **Web Width:** The actual width of the master roll on Unwind #2. This set point is important as it determines the pressure required for the corona treater dancer to achieve appropriate tension.
- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, tension is used by the PLC to continuously adjust the drive speed(s) in order to keep the dancer at the reference position and achieve the desired corona treater tension. Dancer pressure will be adjusted based on the corona treater tension.

  Note: It is always important to balance the tension set points for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Zero Speed Pressure:** The pressure applied to the dancer when the machine is at zero speed. This is meant to be a holding pressure so the machine can hold the web without building too much stored energy in case the web is broken.
- **Treat Width (Entrance/Exit):** The treat width is the sum of the active electrode length.

Note: It is always important to enter the correct treat width because Treat Width, along with Watt Density, will be used to calculate the power required. Using an incorrect value will result in undesired treatment.

- **Watt Density (Entrance/Exit):** This set point is used to calculate the power required to achieve the desired treating. Watt Density is represented in watts per square foot/meter.

$$\text{Power} = [\text{Watt Density Number X Treat Width (Feet) X Current Line Speed (FPM) X Number of Sides Treated}]$$

Note: It is always important to enter the correct watt density because Treat Width, along with Watt Density, will be used to calculate the power required. Using an incorrect value will result in undesired treatment.

- **CT Reverse Offset:** Determines how much the corona treater will go in reverse to continuously treat the web.

Note: It is recommended to run or jog the line for a couple of seconds before stopping to allow the corona treater dancer to retract enough for the reverse function to work. Starting and stopping the line without giving the corona treater dancer enough time to retract will cause the reverse function not to work, resulting in untreated parts of the web.

Displays

- **Tension Setpoint:** The tension set by the operator in lbs, obtained by multiplying the Tension SP in PLI by the width of the material.
- **Dancer Pressure:** The current pressure applied to the dancer.
- **CT Dancer Pos. SP:** The reference position for the corona treater dancer.
- **CT Dancer Position:** The actual position of the corona treater dancer.
- **Treat Width FB (Entrance/Exit):** The feedback of the Treat Width being used by the Enercon units to achieve the desired power.
- **Actual Watt Density FB (Entrance/Exit):** The actual watt density outputted by the Enercon units.
- **Cmd Watt Density:** The watt density commanded to the Enercon units.
- **Corona Treater Status Display:** Displays important information about the corona treater, such as run status, fault status, splice mode, etc.

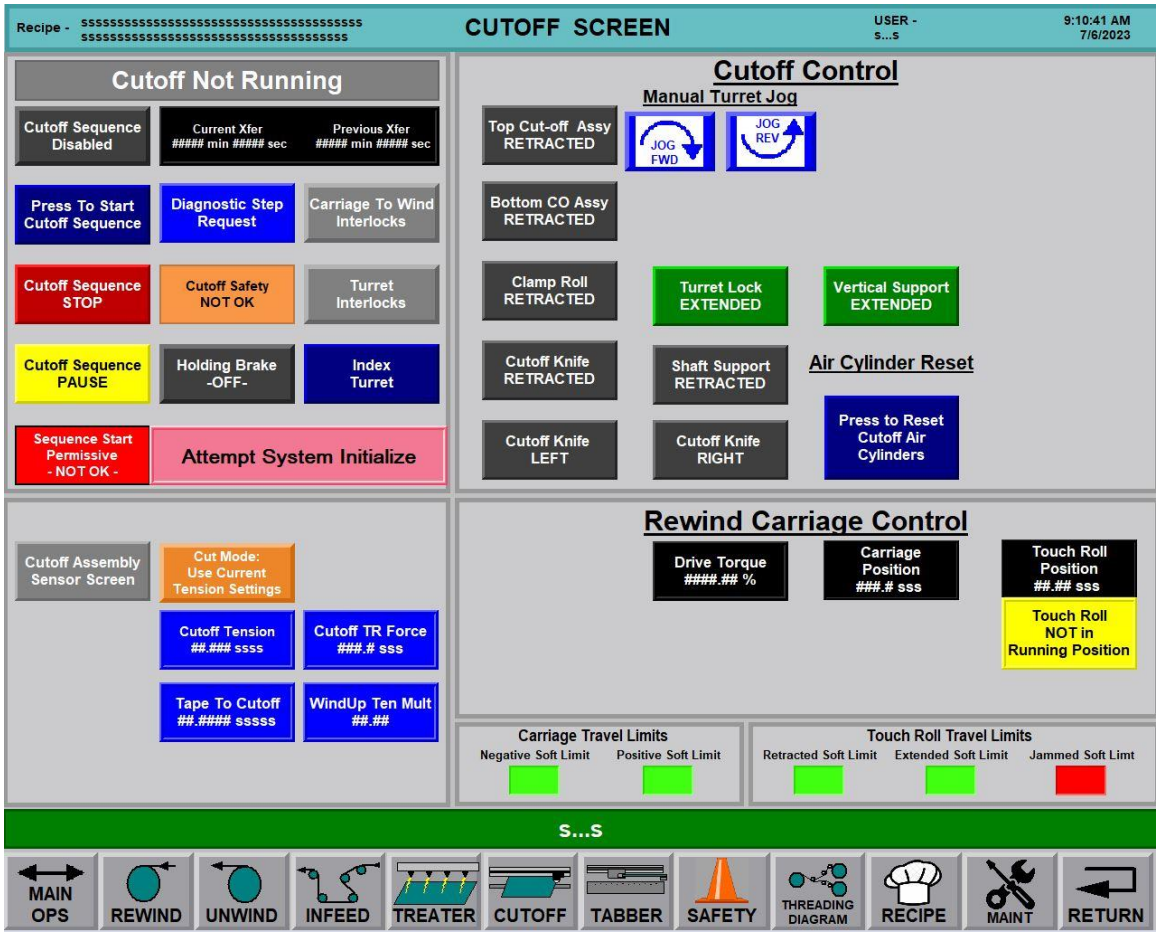
Buttons

- **Nip Enabled/Disabled:** Enables or disables the corona treater nip roll. The nip should be enabled whenever material is being run through the roll to ensure that the material does not slip.
  - **Exit Treater Enabled/Disabled:** Enables or disables the exit treater. When enabled, a part of the web facing up when exiting the treater will be treated.
  - **Entrance Treater Enabled/Disabled:** Enables or disables the entrance treater. When enabled, the web entering the corona treater will be treated.
  - **Exit/Entrance Blower:** Allows the ability to turn the blowers on/off. When drives are enabled, the Entrance/Exit blowers will turn on automatically, respective to which side of the treater is enabled.

Caution: Blowers must be turned on when corona treating materials. Having the blowers off can cause ozone to circulate in the building, which can result in serious injury or even death. For more information about this, please refer to the Enercon manual.

- **Electrode Enabled/Disabled:** Allows the ability to engage/disengage electrodes.
- **Corona Treater Interlock Screen:** Brings up a popup where the user can view the interlocks preventing the corona treater from starting.
- **Entrance/Exit Fault Reset:** Allows the user the ability to reset the corona treater fault from the HMI.

Cutoff Screen



The **Turret and Carriage Screen** displays many features to control the Cutoff & Transfer Sequence and carriage operation. When moving the carriage, clear the area to prevent any injuries from occurring.

Setpoints

- **Cutoff Tension:** Sets the tension the machine will follow while in **Cutoff & Transfer Sequence** "Maintenance Mode." In some cases, it will be used during auto sequence.
- **Cutoff TR Force:** Sets the pressure that the touch roll will maintain (in PSI) during the **Cutoff & Transfer Sequence**.
- **Tape to Cutoff:** Distance from the tabber transfer roll apply point to the center of the cutoff knife anvil.
- **Wind Up Tension Multiplier:** Tension multiplier for the windup portion of the cutoff sequence. If Tension multiplier is less than 1, tension will be reduced for the windup. If Tension multiplier is greater than 1, tension will be increased for the windup.

Displays

- **Current Xfer:** Accumulated time of the current cutoff sequence.
- **Previous Xfer:** Time of the previous cutoff sequence.

- **Drive Torque:** The current motor torque percentage output by the Carriage motor.
- **Carriage Position:** The position of the Carriage in length units.
- **Touch Roll Position:** The position of the Touch Rolls in length units. A value of 0 corresponds to no compression. A positive value means the touch rolls are compressed. If this value exceeds 1.5" [38.1mm].
- **Touch Roll Running Position Indicator:** Shows whether the Touch Rolls are in the correct running position according to the model determined by the machine.
- **Cutoff Sequence Start Permissive Status:** Status of the Turret sequence safety permissions. **Green** indicates the permissive has been met. **Red** indicates there is either an Air Pressure fault, a safety device is tripped, the Carriage and/or Turret is faulted, or one of the drives is faulted.
- **Carriage Travel Limits Indicators:** Indicates whether or not the Carriage exceeds the software-based travel limits. If the indicator turns **Green**, the Carriage is within the limit, or if the indicator turns **Red**, the Carriage has exceeded the soft limit and either must be homed or brought back within the limits.
- **Touch Roll Travel Limits Indicators:** Indicates if the Touch Rolls are in the farthest backward/forward position or at the collision limit. If the indicator turns **Green**, the Touch Rolls are within the limit, or if the indicator turns **Red**, the Touch Rolls have exceeded the soft limit.

Buttons

- **Cutoff Sequence:** Toggles the Cutoff Sequence to one of four different modes: Disable, Automatic, Diagnostic Step, and Maintenance. This button is different from the one on the **Main Operating Screen** as it will toggle between all modes for Cutoff & Transfer. In Automatic mode, the Cutoff & Transfer Sequence will start automatically as the machine reaches the length of diameter set point. Diagnostic Step mode will go step by step through the Cutoff & Transfer Sequence, allowing the user to move to the next step when requested. Finally, Maintenance mode allows for manual control of each component without the use of the Auto sequence. Use the "Cutoff Sequence Status Indicator" as an indication of the Cutoff current mode.

Caution: In Automatic and Diagnostic Step modes, the machine will automatically begin the Cutoff & Transfer Sequence. Stand back from the machine during this process.

- **Press To Start Cutoff Sequence:** Immediately starts the cutoff sequence by moving the Carriage to the Clear Position and continuing from there.
- **Cutoff Sequence Stop:** Stops the Cutoff & Transfer Sequence at the current step.

  Note: If the Cutoff Sequence is stopped, the Sequence may be restarted from the step it stopped at; however, restarting may not produce recoverable rolls.

- **Cutoff Sequence Pause:** Pauses the Cutoff & Transfer Sequence at the current step. Pressing the button again while the sequence is paused will resume the sequence at the current step.

Caution: Resuming the Cutoff & Transfer Sequence will cause the machine to begin moving again. Clear the area before continuing to ensure personnel have breached any of the Safety Zones.

- **Diagnostic Step Request:** Brings the Cutoff & Transfer Sequence to the next state then stops until the next step is requested, during "Diagnostic Step" mode. This is to help diagnose issues with the Cutoff & Transfer Sequence.

- **Carriage To Wind Interlocks:** Displays a pop-up that shows the Carriage To Wind Interlocks during the **Cutoff & Transfer Sequence**.
- **Turret Interlocks:** Brings up a popup where the user can view the Turret Automatic and Manual Interlocks.
- **Holding Brake ON/OFF:** Enables and disables the use of the Rewind Holding Brakes. On turret machines, the Holding Brakes are normally mounted on the outboard side of the turret. In Auto mode, the Holding Brakes will come on if the **Cutoff & Transfer Sequence** is not running. When disabled, the Holding Brakes will remain off.
- **Turret Lock Extend/Retract:** Extends or Retracts the Turret Locks into the Rewind shaft mandrels.
- **Shaft Support Extend/Retract:** Extends or Retracts the Support Shafts in the Rewind.
- **Vertical Support Extend/Retract:** Extends or Retracts the vertical support. Note: make sure vertical support is in retract position before moving the turret.
- **Manual Turret Jog Forward/Reverse:** Jogs the turret either forward or backward when held.

  Note: In order to properly index or jog the turret, the turret locks, shaft supports, cutoff assembly, and Winder Guard must all be retracted.

- **Index Turret:**
  - For 2-shaft machines: revolves the turret 180 degrees (1/2 of a revolution) or to the closest proximity sensor ("O"/ "X" mandrel).
  - For 3-shaft machines: revolves the turret 120 degrees (1/3 of a revolution) or to the closest proximity sensor ("O"/ "X"/"H" mandrel).

  Note: In order to properly index or jog the turret, the turret locks, shaft supports, cutoff assembly, and Winder Guard must all be retracted.

Caution: Indexing the Turret will cause the machine to move the inboard rolls to the outboard and vice-versa. Keep clear to avoid potential injury during this process.

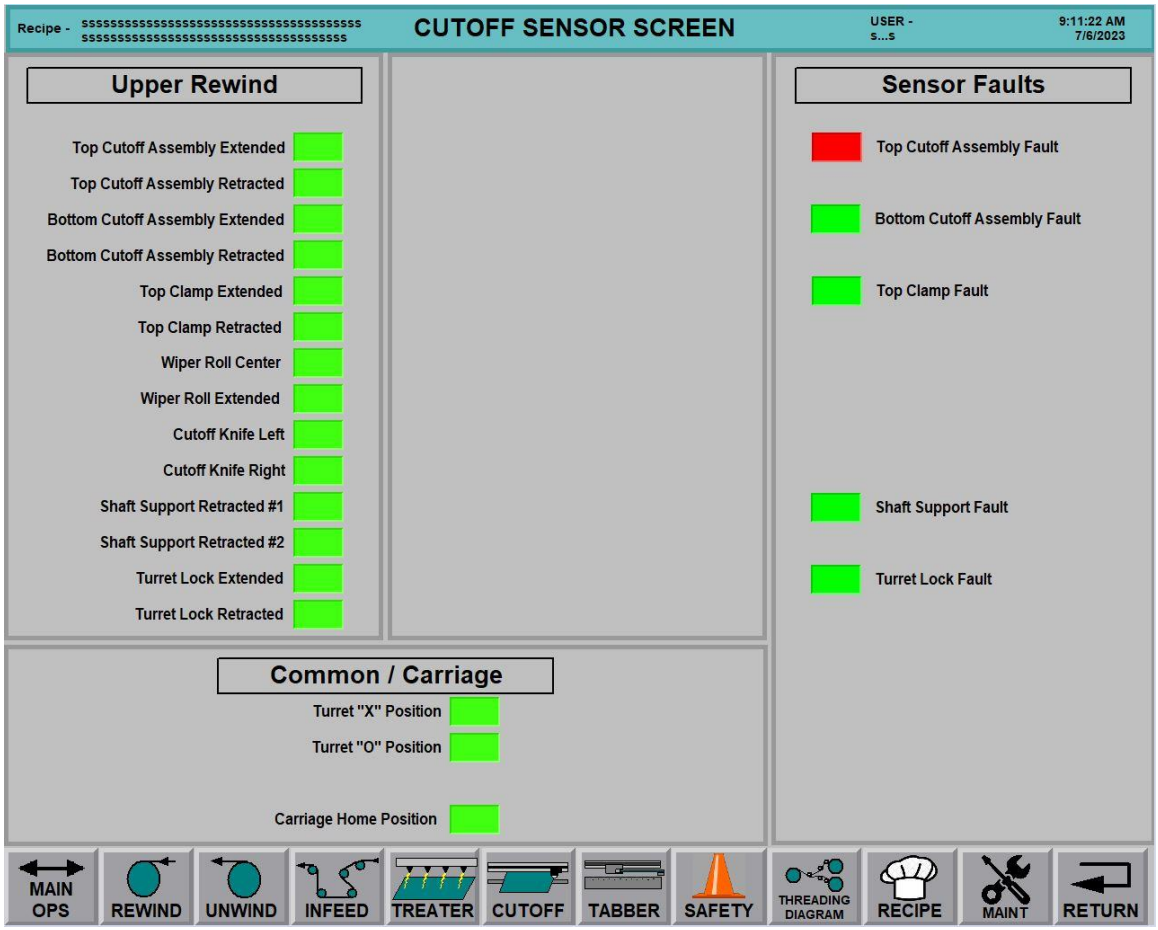
- **Top Cutoff Assembly Extend/Retract:** Extends or Retracts the Top cutoff assembly in the Rewind section.
- **Bottom Cutoff Assembly Extend/Retract:** Extends or Retracts the Bottom cutoff assembly in the Rewind section.
- **Clamp Roll Extend/Retract:** Extends or Retracts the Clamp that holds the web in place during cutoff.
- **Cutoff Knife Position Request:** Moves the cutoff Score Knife to the left or right. When not cutting material, the blade should be retracted before moving.

Caution: Ensure that no personnel are near the cutoff when moving the cutoff knife left/right to prevent the risk of serious injury or death.

- **Cutoff Knife Extend/Retract Request:** Extends or Retracts the Cutoff Knife from the housing.
- **Reset Air Cylinders Request:** Initializes all the pneumatic (air) driven components to their initial position.

- **Cutoff Assembly Sensor Screen:** Brings up a popup where the user can view the Turret/Cutoff Assembly Sensors for diagnostic purposes.
- **Cutoff Sequence Cut Mode:** Toggles between cut modes for the **Cutoff & Transfer Sequence**. In "Manual Lock Core", the machine will run the **Cutoff & Transfer Sequence** with lock core tension control with the manual motor torque set point. This mode is used best for higher tension materials with less gauge banding and/or rigid materials. In "Manual Differential Pressure," the machine will run the **Cutoff & Transfer Sequence** with differential tension control from the manual input differential pressure set point. This mode is used best for low tension materials, gauge banding, and/or stretchy materials. Toggling this feature will help to even the tension across the web as the cutoff knife cuts through the material. The operator has the ability to also use the current machine tension settings (this is the usual setting).

Turret /Cutoff Sensors Screen

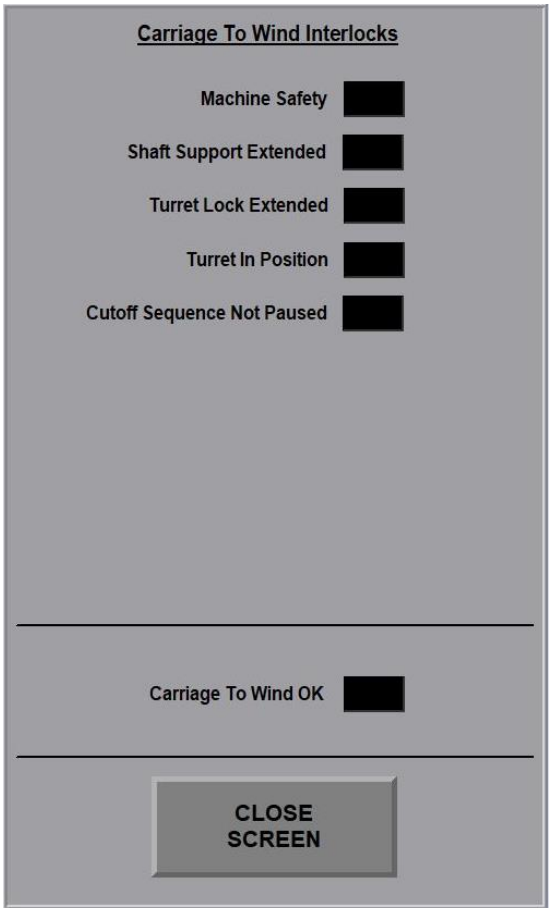


The **Turret/Cutoff Sensors Screen** displays the current state of each of the Cutoff Assembly sensors. When the same sensor for the Upper and Lower sections are not in the same state, a fault status will occur. The fault can be seen from this screen.

Displays

- **Cutoff Assembly Sensors:** Shows the status of each sensor for the Cutoff Assembly.
- **Turret – Carriage Sensors:** Shows the status of each sensor pertaining to the Turret and Carriage.
- **Sensor Faults:** When the Rewind Assembly sensors are not in the same state, a fault is thrown to prevent certain functions from occurring.

Carriage To Wind Interlocks Screen

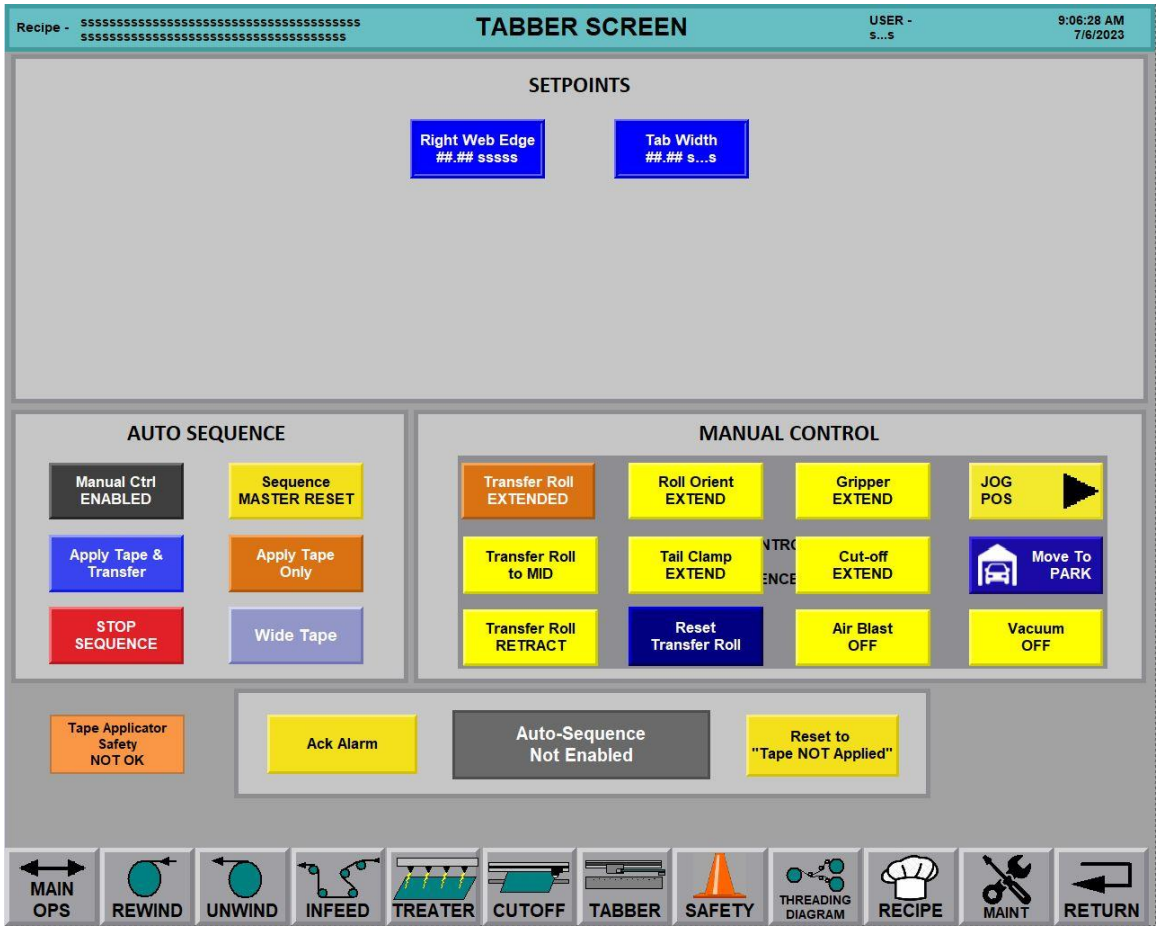


The **Carriage To Wind Interlocks Screen** displays the current state of each of the Interlock preventing carriage from moving to the rewind.

Displays

- **Machine Safety:** Shows the status of the machine safety.
- **Shaft Support Extended:** Shows the status of the shaft support. Retracted shaft support will prevent carriage from moving forward.
- **Turret Lock Extended:** Shows the status of the turret lock. Retracted shaft support will prevent carriage from moving forward.
- **Turret In Position:** Shows the status of the turret position. If the turret is not parallel to the floor, carriage will be prevented from moving forward.
- **Cutoff Sequence Not Paused:** Shows the status of the cutoff sequence. Carriage will not be allowed to move when sequence is paused.

Tabber Screen



The **Tabber Screen** allows users to use, make adjustments to, and control the Tabber. For more information about the Tabber see **Section 4 – *System Concepts* – Tabber.**

Set points

- **Right Edge:** Sets the distance from the right side of the frame at which the tape will first begin applying to the web.
- **Tab Width:** Sets the width of the tab to be applied to the web.

Displays

- **Auto Sequence Status:** Indicates the current status of the Auto Sequence – DISABLED, READY, ACTIVE, Axis Fault, LOW Roll Diam, Web Break, Tape Applied Waiting for Cutoff.
- **Tabber Safety:** Shows the status of the tabber safety.

Buttons

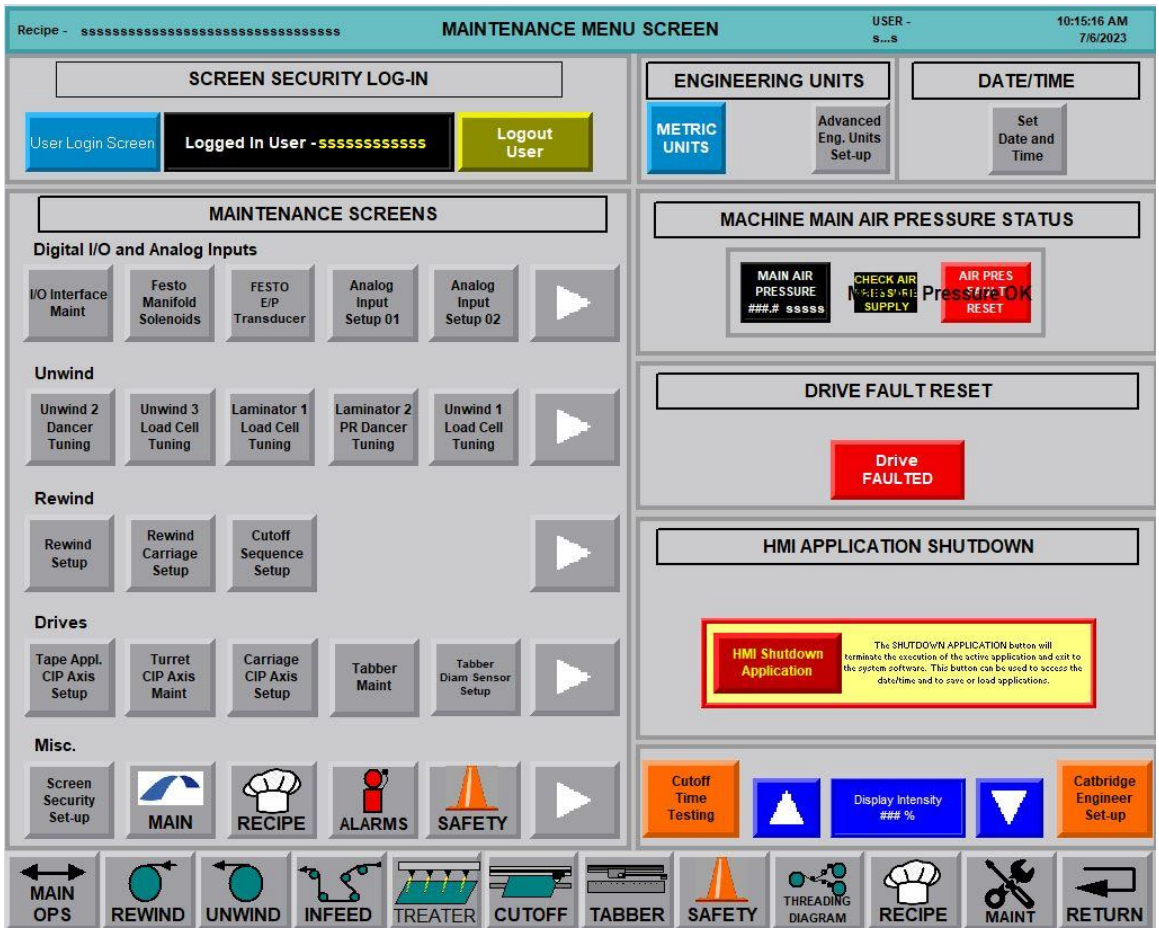
- **Tabber Sequence Auto/Manual Ctrl:** Toggles between the Manual Control and the Automatic Tabber Sequence.
- **Apply Tape Only:** Applies tape strips to the web according to the current configuration without advancing the tape to the cutoff.
- **Apply Tape & Transfer:** Applies tape strips to the web according to the current configuration and start the Cutoff Sequence.

- **STOP Sequence:** Stops the Automatic Film Tape Application Sequence.
- **Sequence Master RESET:** Resets the tabber sequence to initialization.
- **Transfer Roll Extend/Retract:** Extends and retracts the vacuum transfer roll.
- **Transfer Roll to Mid:** Moves the vacuum Transfer Roll to the Mid Position.
- **Roll Orient Extend/Retract:** Extends and retracts the roll orient arm. Roll orient arm is normally below the vacuum roll cam, this allows the vacuum roll to stay in correct position while tabber is placing the tape on it.
- **Tail Clamp Extend/Retract:** Extends and retracts the tail clamp. Tail clamp holds the tape in place, so tabber is able to grip the tape from the same position each time. This also helps knife cut the tape after required amount of tape has been pull.
- **Reset Transfer Roll:** Resets all transfer roll pneumatics to their initial position.
- **Gripper Extend:** Extends the gripper to hold the tape while tabber actuator moves back.
- **Cut-off Extend:** Extends the Cut-off razor to cut the tape off.

Caution: Toggling the Cut-off Extend/Retract will cause the knife to move. Keep hands clear of Tabber when extending or retracting the tabber knife.

- **Air Blast On/Off:** Turns on and off the use of the air blast.
- **Jog Pos:** Allows the operator to jog the tabber.
- **Move to Home:** Moves the Tabber to the Home Position.
- **Vacuum On/Off:** Allows the user to manually turn the vacuum on and off.
- **Alarm Acknowledge:** Acknowledges the alarm.
- **Reset to "Tape NOT Applied":** Used to tell the machine there is no tape on the vacuum roll.

Maintenance Menu



The **Maintenance Screens** are where set points that affect the performance of the system are made. **Maintenance Screens** are **password protected** to ensure that only individuals authorized and qualified to make adjustments to the settings have access to them. **Note:** These screens allow access to essential machine setpoints. Damage to the machine and/or injury to those operating the machine may result from incorrect setting adjustment.

Please contact the appropriate superior or Catbridge Machinery for the default passwords to access the Maintenance Screens.

Set points

- **Display Intensity:** The arrows to the left and right of the display intensity location box adjust the intensity of the screen. The location box will display an on-screen numeric keyboard for manual number input display intensity where 0% is minimum brightness and 100% maximum brightness.

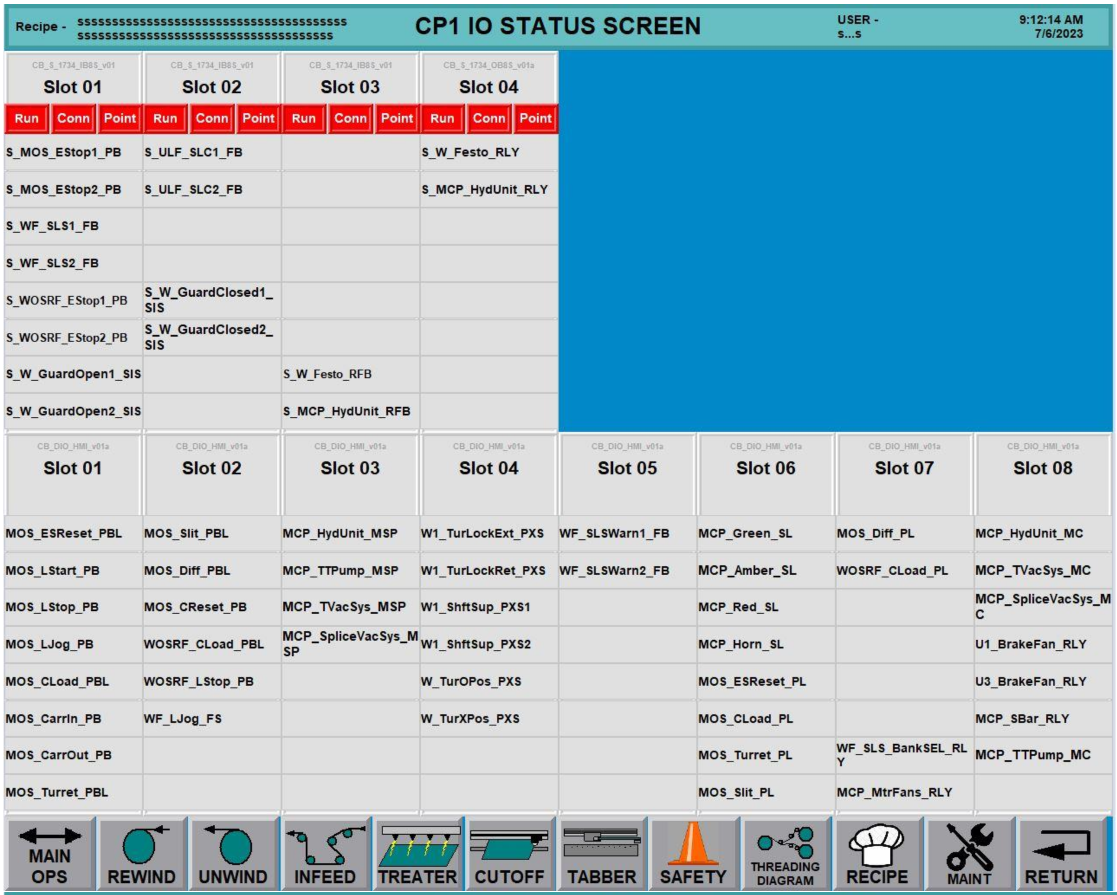
Displays

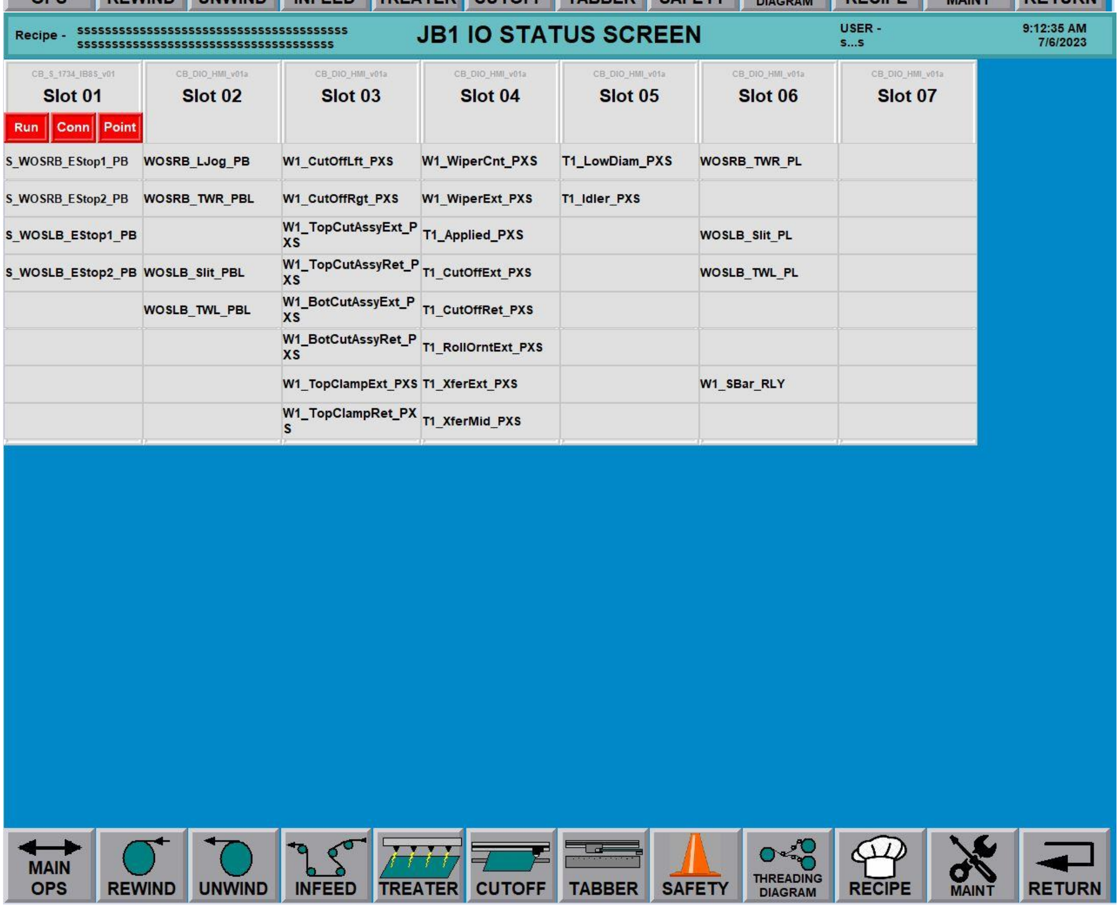
- **Logged In User Display:** Shows the current User Level Status.
- **Main Air Pressure:** Shows the supplied air pressure to the machine.

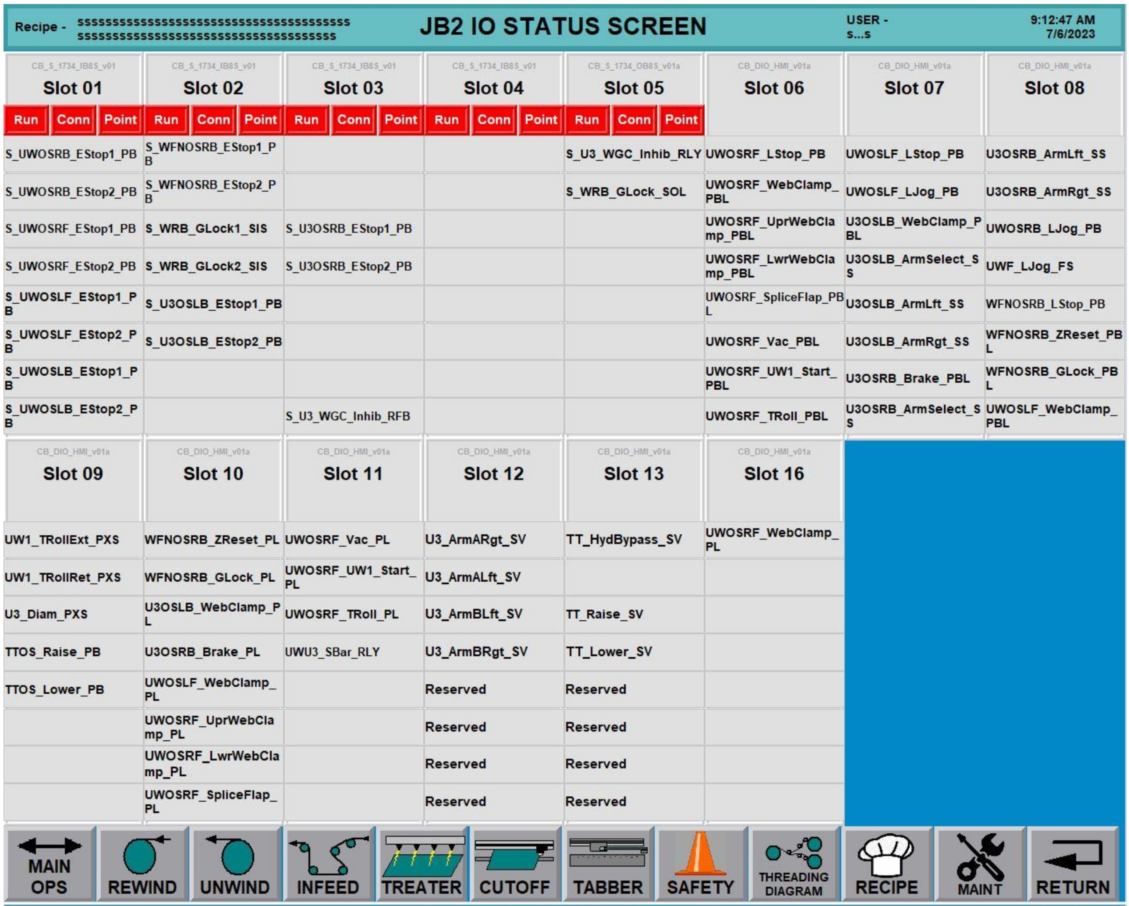
Buttons

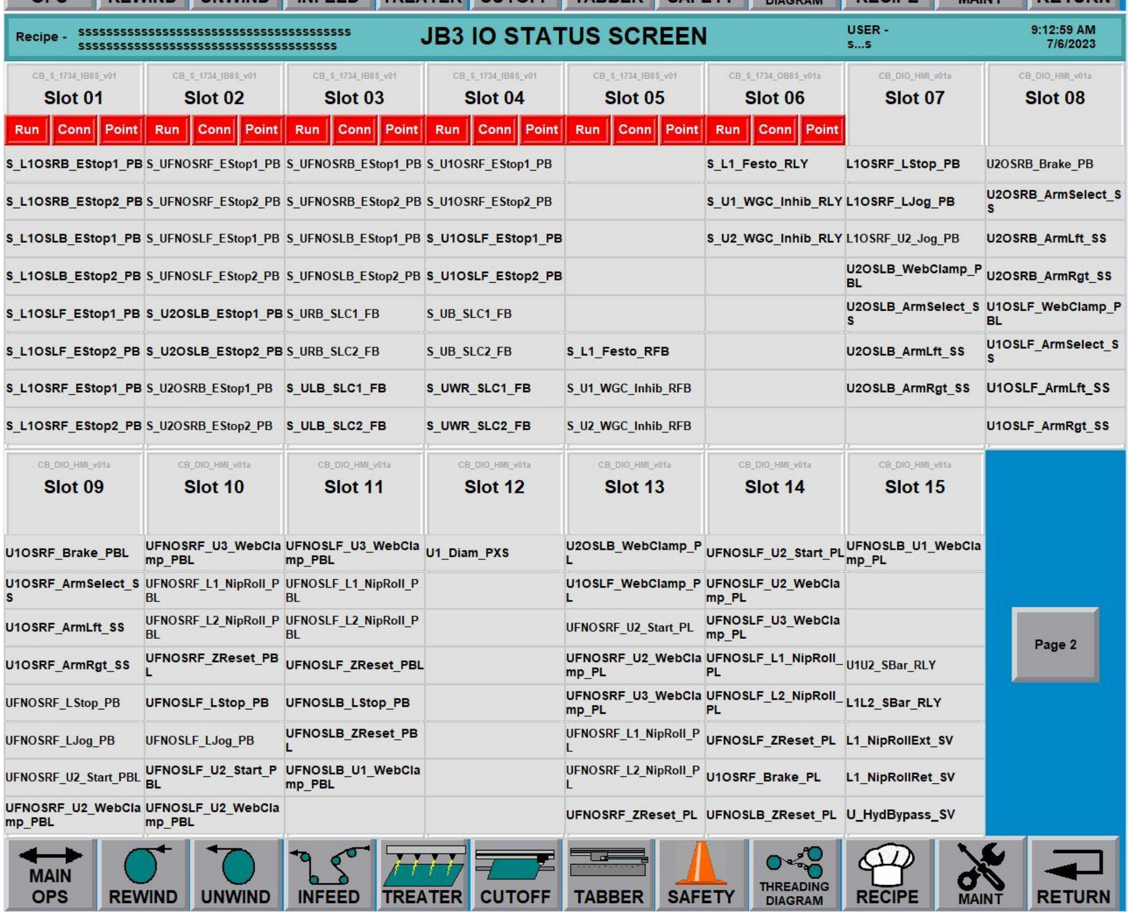
- **User Login Screen:** Brings the user to the **User Login Screen** where they may login as a user or change user levels. This cannot be accessed unless the machine is stopped.
- **Logout User:** Immediately logs out the current user and sets the user level to 0. This cannot be accessed unless the machine is stopped.
- **Metric/English Units:** Toggles between English and Metric Units as the display units for the machine.
- **Advanced Eng. Units Setup:** Displays the Engineering Units Setup Popup where the user may mix between English and Metric Units.
- **Set Date and Time:** Displays the Set Date and Time Popup where the user may edit the date and time of the system.
- **Air Pressure Fault Reset:** Resets the Main Air Pressure Fault Status indicator if a fault is detected.
- **Drive Status:** Resets the faulted status of a drive that is in the FAULTED state. The button will turn **red** and display FAULTED to indicate that action is required.
- **HMI Shutdown:** Shuts down the HMI application bringing the user to the HMI Terminal Menu. HMI System values may be edited from here.

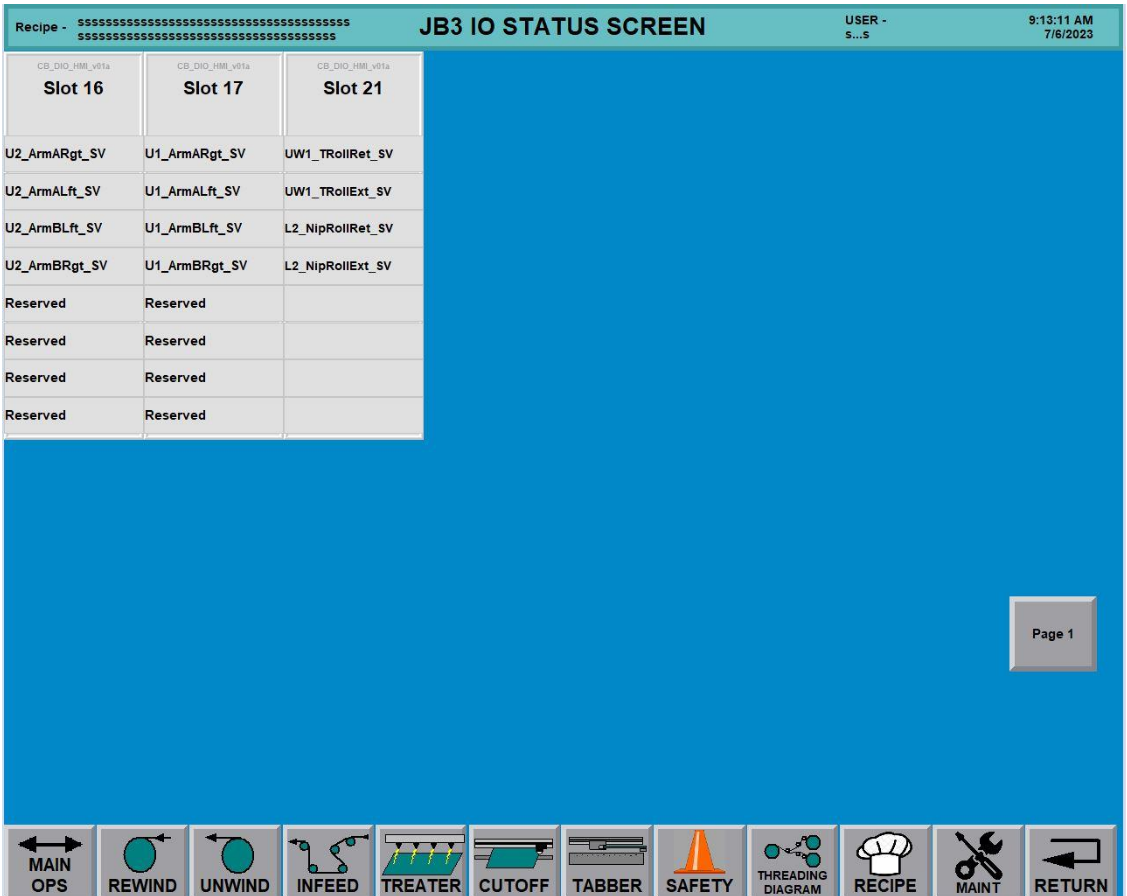
Discrete (Digital) Input/Output (I/O) Screen(s)

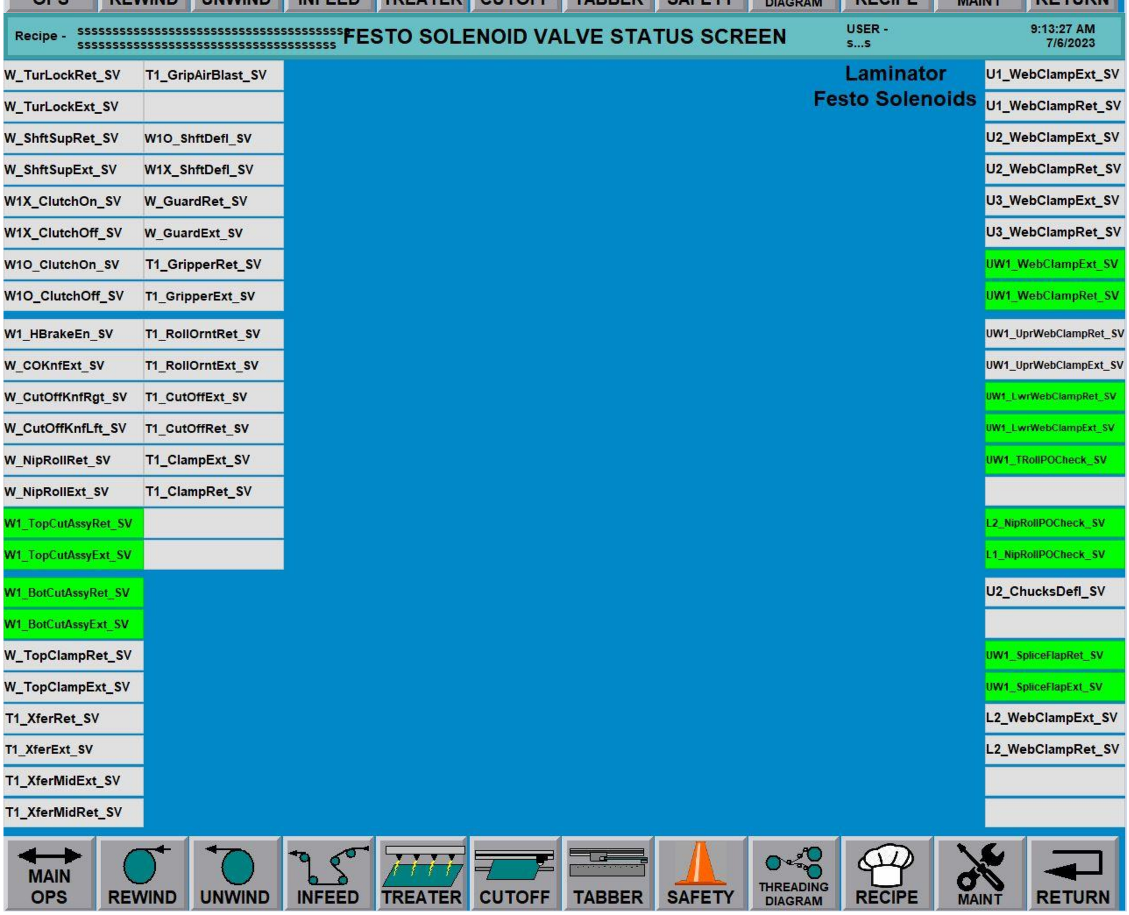












The **Discrete (Digital) Input/Output (I/O) Screens** display the status of the controller's inputs and outputs. Input devices include pushbuttons and sensors, while Output devices include lights and solenoids, relays and contactors. Each I/O point is given a name in the program; the structure of the I/O Screen shows each point individual of each other. If a device is "ON," the corresponding indicator will turn **green**. If a device is "OFF," the indicator is **gray**.

I/O racks contain multiple types of I/O need for running the machine called modules. These I/O types can be, but are not limited to, Digital Inputs, Digital Outputs, Analog Inputs, Analog Outputs, Safety Digital Inputs, Safety Digital Outputs, Relay Outputs, and more. Discrete (Digital) signals can be found here. To distinguish between Safety and normal I/O, Safety modules contain **green**/**red** indicators across the top of the slot. These indicators show the status of the safety module for reference. Safety devices include E-STOPs, Light Curtains, Guard Doors, Safety Mats, Bumpers, and Safety Gates among others.

> **Note:** Some inputs and outputs should always be ON (e.g., Line Stops, power contactor relays, etc.). If an input or output is ON or OFF when it should be the opposite, check wiring and voltage of the afflicted point.

These screens may be used to troubleshoot I/O in the machine. Devices can be activated while observing the screen to see if they are working properly. For example, navigate to the screen containing the Main E-Stop Reset pushbutton (MOS_ESReset_PBL) and press the E-Stop Reset Pushbutton on the **Main Control Panel**; observe Input 00 (E-STOP Reset Pushbutton). The indicator will turn **green** when the E-Stop Reset Pushbutton is pressed. Release the pushbutton and the indicator will turn back to **grey**.

> **Note:** I/O cannot be forced on or off using these screens. Users can only Force I/O on or off from within the program.

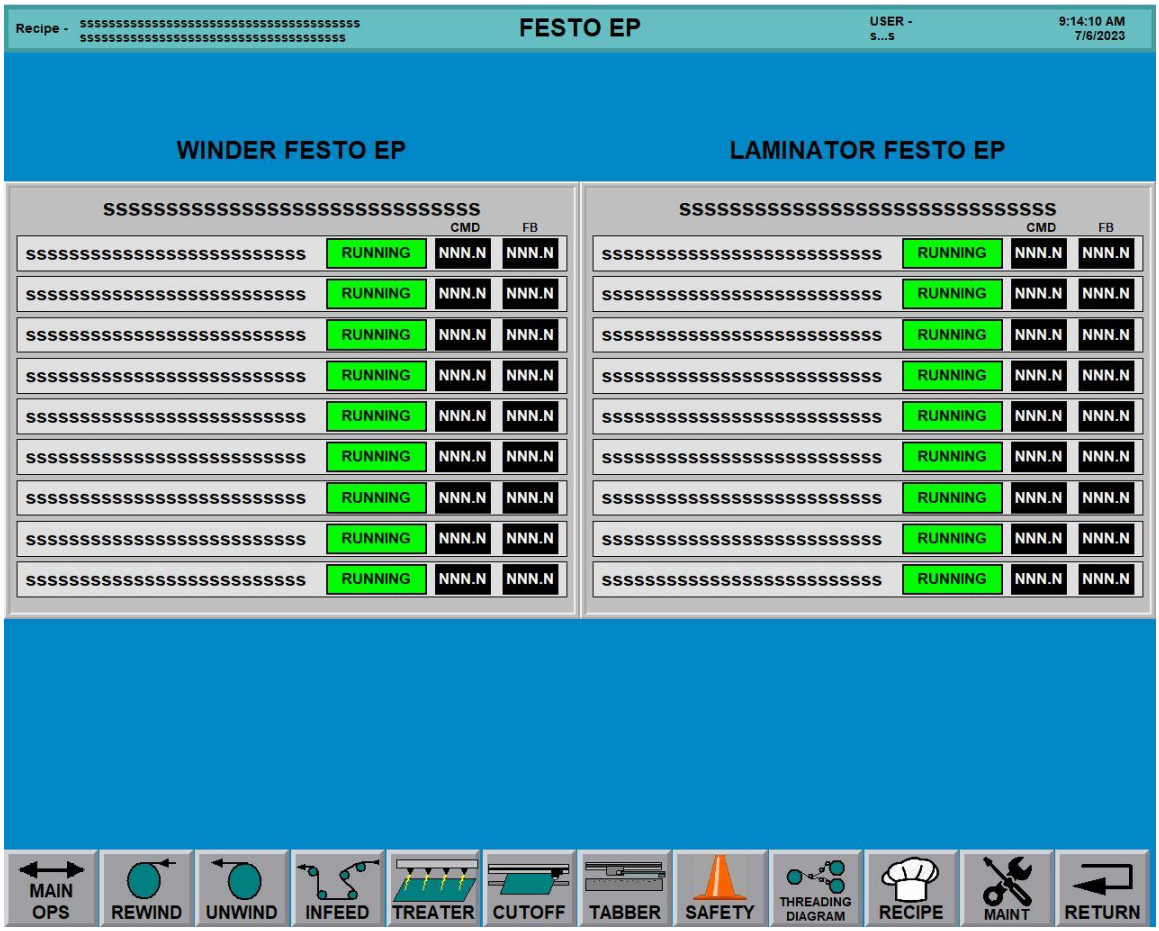
Solenoid valves from the Festo Pneumatic Manifold contain their own screen. Solenoids are divvied up from top to bottom, left to right. Each group of 8 solenoid outputs represents four [4] Festo MPA module slots. As each solenoid contains 2 bits (a bit being defined as > 0 state – OFF, 1 state – ON, so two sets of data that can either be 0 or 1), one MPA module is 8 bits (or 1 byte). The number of modules depends highly upon the machine type.

> **Note:** Festo Solenoids are not controlled over I/O racks. Cabling between the PLC and Festo Manifold is run through Ethernet IP addressing. Contact Catbridge Machinery for issues regarding communication between the PLC and Festo Manifold.

Displays

- I/O Assembly: The I/O assembly refers to an individual PLC (Controller) module or Remote Point I/O. These are digital input/output modules consisting of 8 (0-7), 16 (0-15) or 32 (0-31) inputs. Inputs/Outputs are displayed in blocks of 8 units being 0-7 and broken down into groups explained below. In other words, the Assembly is the slot.
- Individual Indicators: These indicators represent the status of an individual input to, or output from, the PLC. When the indicator is **green** in color, it indicates the input/output is in an "ON" state where power is received at the input point or power is source from the output point, and when the indicator is **white** it represents the input/output is in an "OFF" state where no power exists on the point.
- Individual Indicators: These indicators represent the status of an individual input to the PLC. When the indicator is **green** in color, it indicates the input is in an "ON" state where power is received at the input point, and when the indicator is **white** it represents the input is in an "OFF" state where the input is receiving no power.

Festo E/P

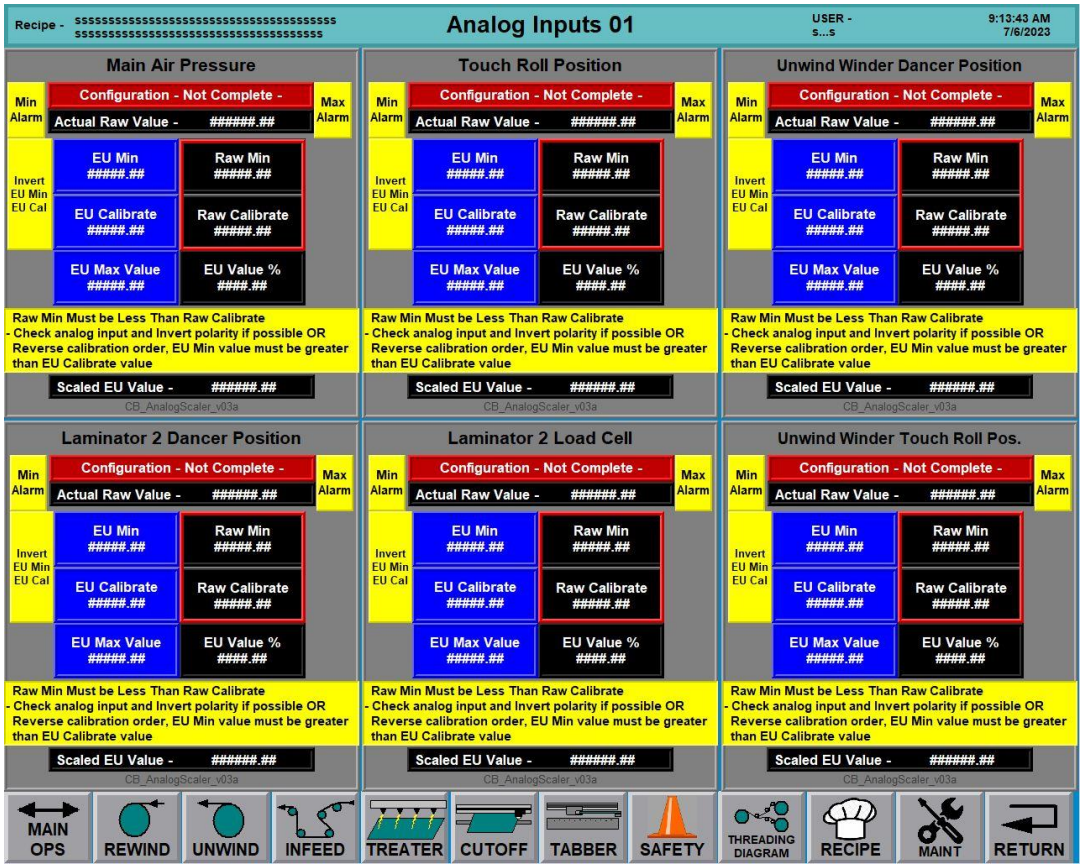


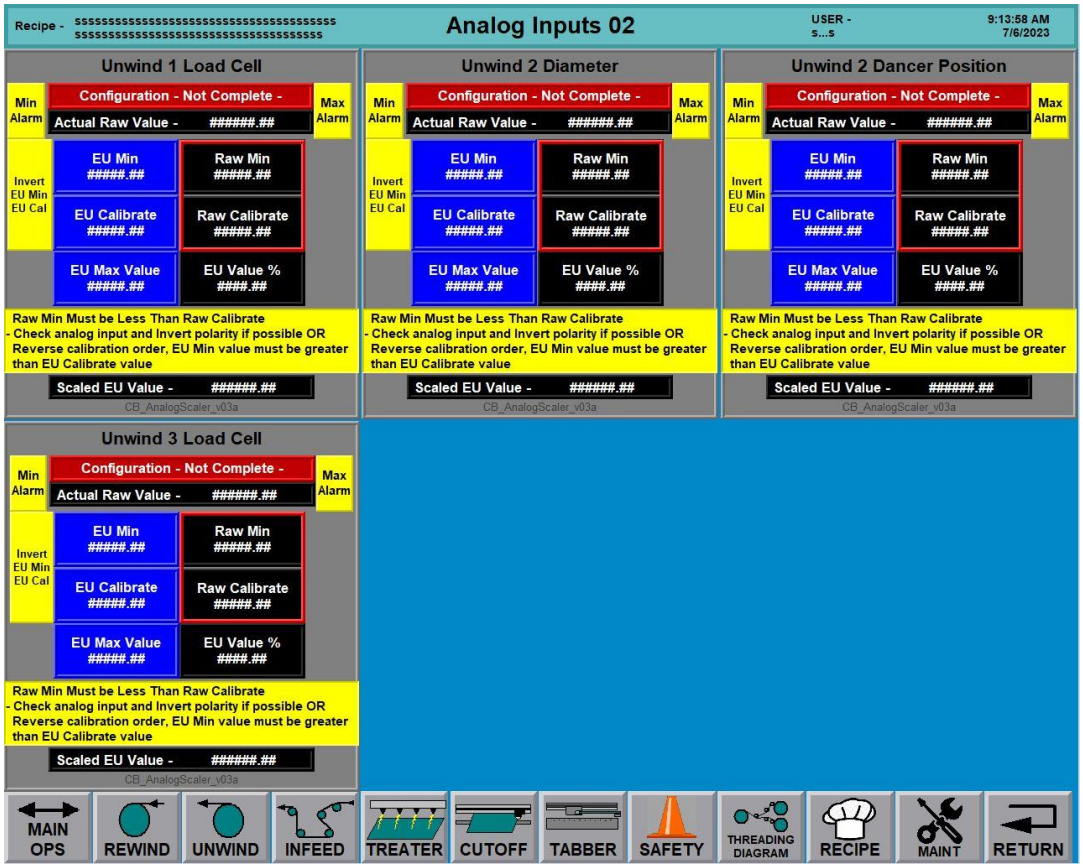
The **Festo E/P** displays the status of the Festo Pneumatic Manifold. The Rewind & Laminator manifold consists pressure regulators (E/P - Voltage to Pressure).

The user can select an individual unit and select a pressure setting, while monitoring the pressure setting and observing the feedback pressure.

The pressure regulator displays on this screen show values that the controller sends to the manifold. The manifold, in turn, applies the appropriate air pressure to the device it is connected to.

Analog Input Screens





The **Analog Inputs 1 & 2 Screen** allows the user to set up the parameters of the analog input, to set the minimum and maximum range of the input, as well as filtering and offset values. In addition, the scaled values are displayed. Analog inputs are utilized for the main air pressure, load cells, diameter sensors, etc.

Input screen 1 specifically refers to: Main Air Pressure (Pressure Transducer), Touch Roll Position (String Potentiometer), Laminator 2 Load Cells (Semiconductor Strain Gauge), Laminator 2 & Unwinder Winder Dancer Position (Rotary Encoder), Unwinder winder touch roll position.

Input screen 2 specifically refers to: Unwind 1 & 2 Load cells (Semiconductor Strain Gauge), Unwind 2 Diameter (TOF), & Unwind 2 Dancer Position (Rotary Encoder).

Set points

- **EU Min:** Activates a keypad from which the operator can enter the **EU (Engineering Units) Minimum** for an analog input. This is the starting point.
- **EU Calibrate:** Activates a keypad to enter the **EU (Engineering Units) Calibrate** for an analog input. This is the value used to calibrate the sensor (e.g., a 20lb weight on a load cell, diameter sensor distance, etc.)
- **EU Max Value:** Activates a keypad to enter the **EU (Engineering Units) Maximum** for an analog input. This is the maximum value that the input will give. Any value beyond this one will produce only this value.
- **Filter Rate:** Activates a keypad to enter the **Filter Rate** for an analog input. The higher the filter rate, the less responsive the Scaled Value will be to changes. If the rate is too high, the value will overshoot the actual value and oscillate around that value.

Displays

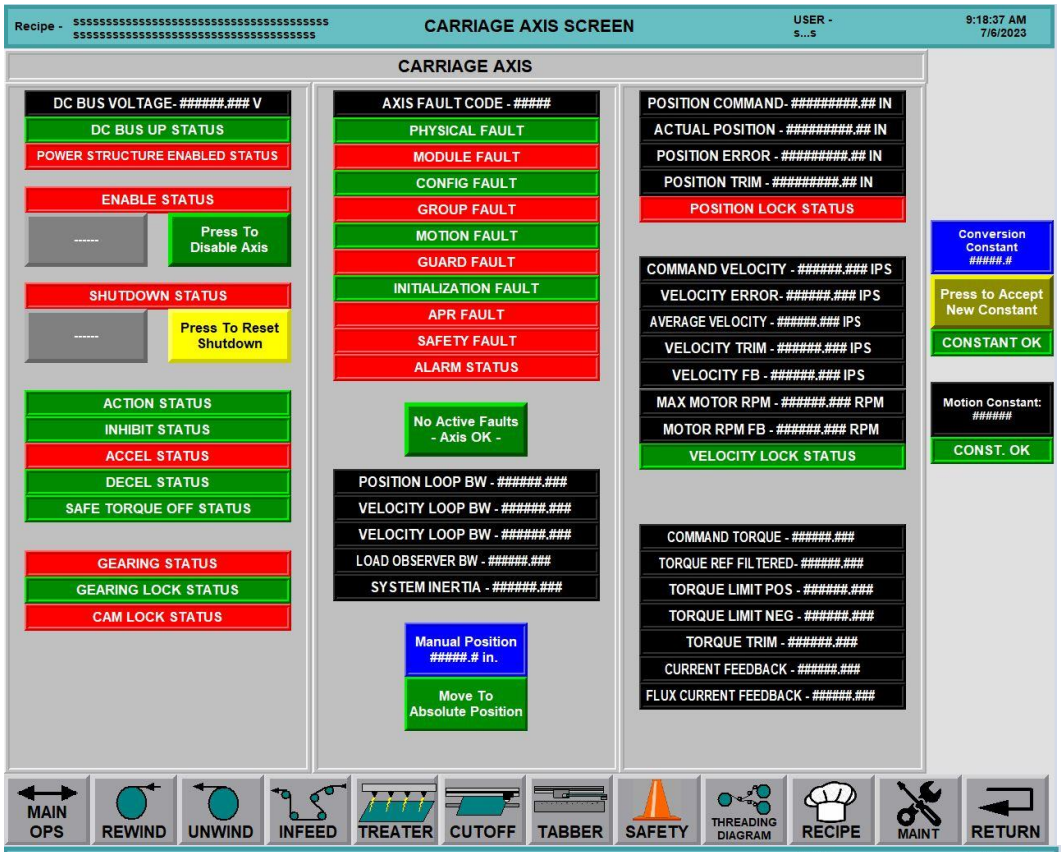
- **Actual Raw Value:** The input directly from the sensor without being scaled as a readable input to the PLC.
- **Raw Minimum:** The calibrated minimum input from the sensor without being scaled as a readable input to the PLC. A **red** box will appear around the Raw Min and Calibrate if the Minimum value is greater than the Calibrated value.
- **Raw Calibrate:** The calibrated maximum input from the sensor without being scaled as a readable input to the PLC. A **red** box will appear around the Raw Min and Calibrate if the Minimum value is greater than the Calibrated value.
- **EU Value %:** The percentage of the total output allowed.
- **Scaled EU Value:** The final output from the Analog Input filtering and scaling process. This is the value that the PLC will use in relevant calculations and displays.

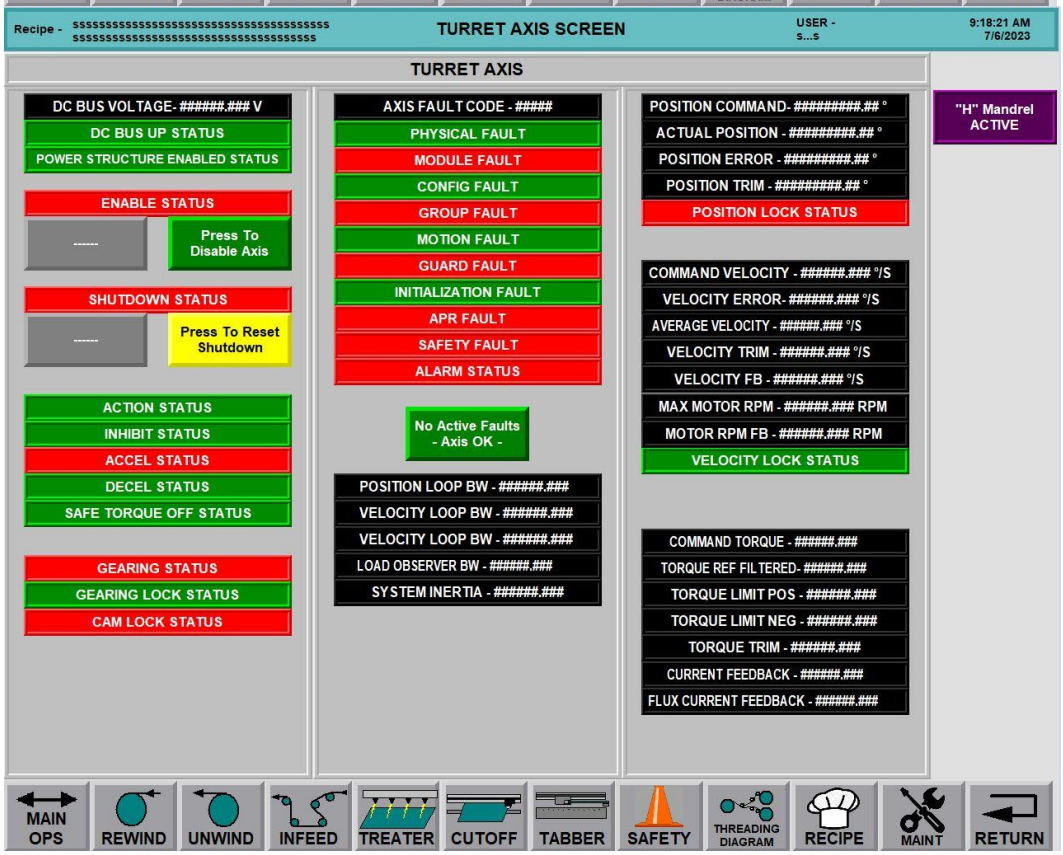
Buttons

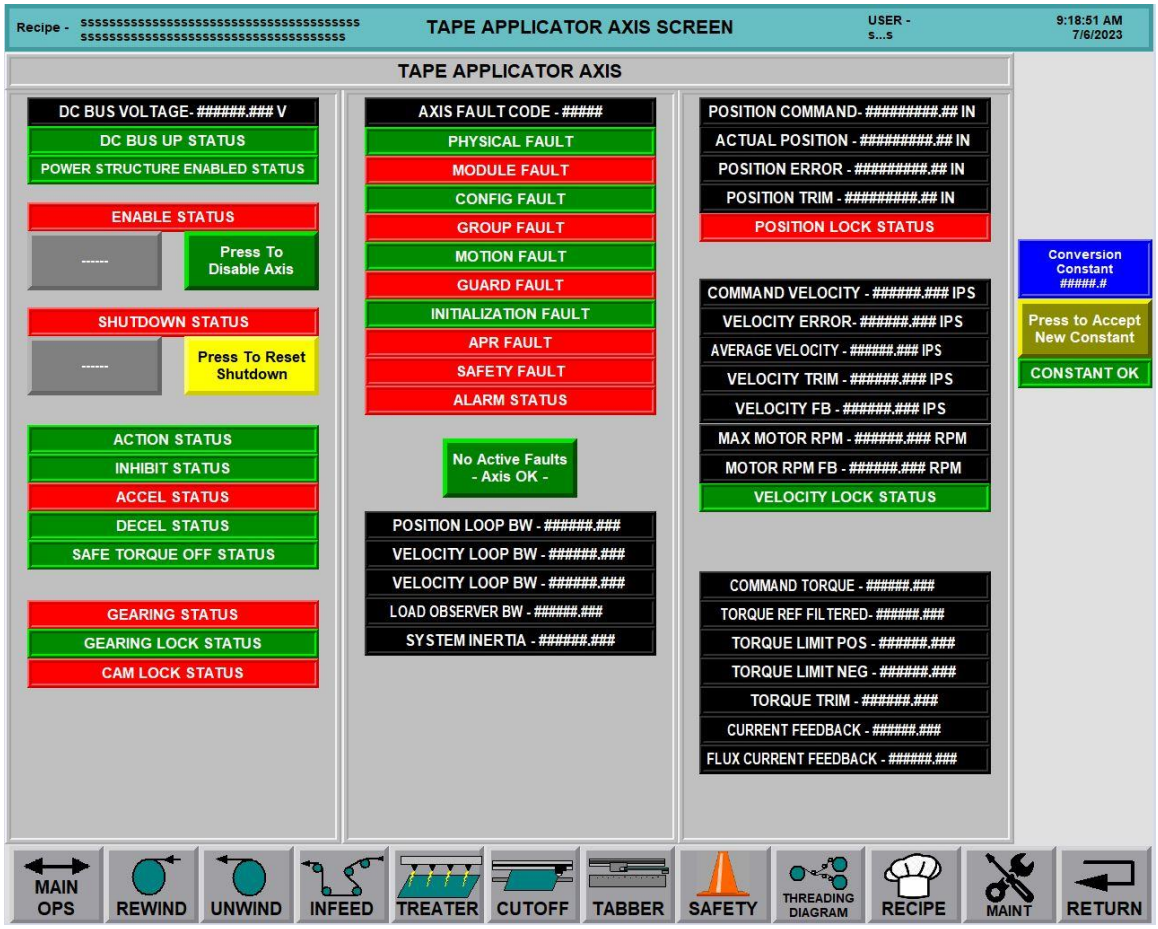
- **Filter Type Button:** Toggles between three different modes of filtering: No Filter, Low Pass Filter, and Rate Limiter.
- **No Filter:** No type of filtering will be used for signal processing. The input from the sensor is directly scaled to the output.
- **Low Pass Filter:** A filter that will only allow low frequency bands of data. This type of filter is ideal for data that is erratic and constantly changing (such as a load cell feedback and air pressure).

- **Rate Limiter:** A filter that restricts the rate of change of a signal. The input rate can change rapidly; however, this filter will prevent unexpected rapid changes. This type of filter is ideal for data that does not change drastically over a short period of time (such as diameter sensors and position sensors).

CIP Axis Screen(s)







CIP Drive Axis Screens are screens that show the current status of the Motion Axis selected. They may also include auxiliary axes such as a Carriage, Turret, or Tabber.

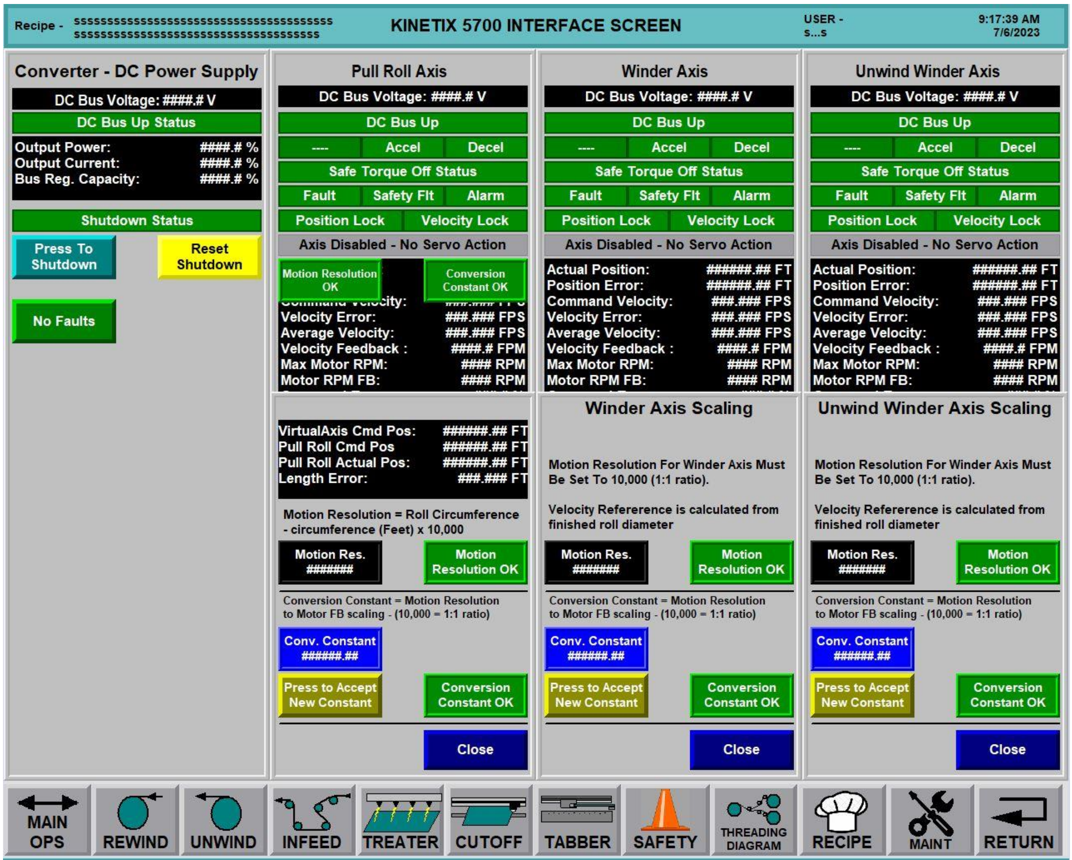
On the left side, users can view basic Axis statuses. To operate on a CIP Axis, all indicators except the "Accel" and "Decel" statuses should be **Green**. **Red** indicates a problem with the axis and will not properly operate. Users may also manually Enable and Disable the Axis, as well as Shutdown and Shutdown Reset the Axis. These controls may be used when attempting to diagnose motion issues.

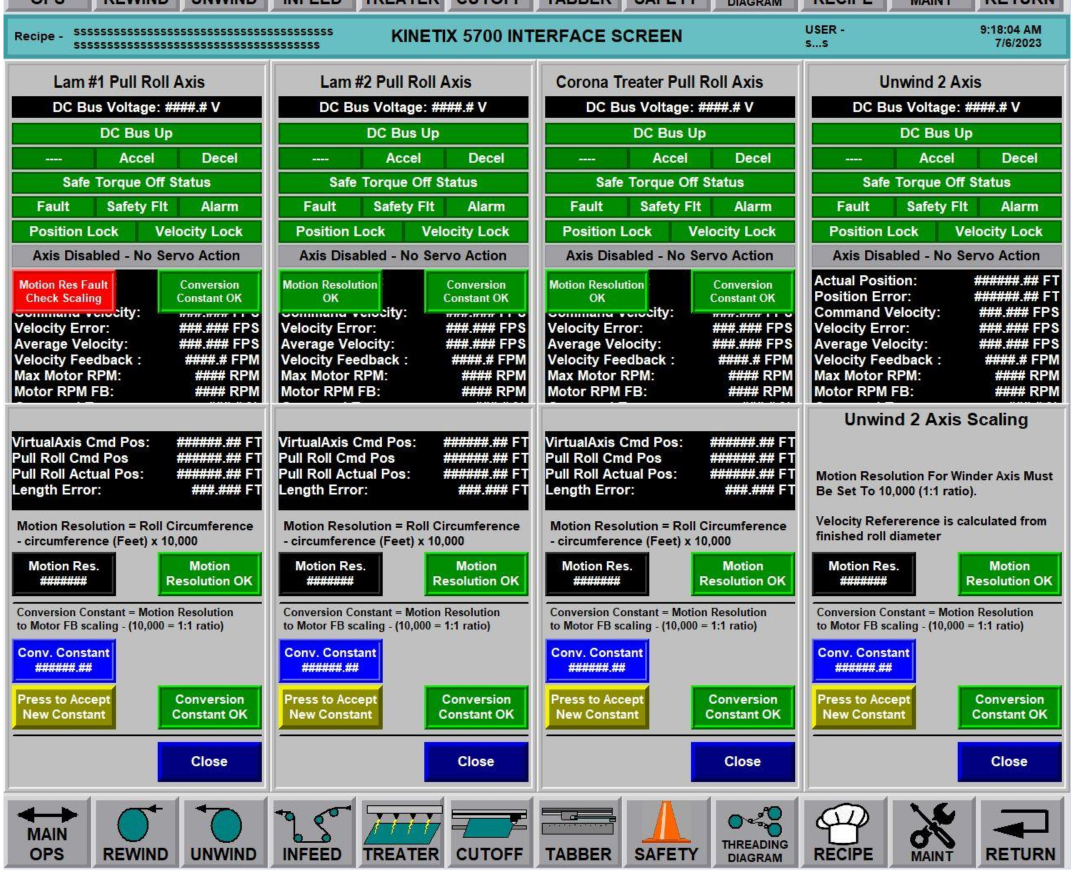
Fault Statuses and codes can be viewed in the center. Similar to the Axis status indicators, the Fault indicators should all remain **Green**. **Red** indicators show there is/are fault(s) that exist on the CIP Axis. The user must press the "Press to Reset Fault" button in order to clear any existing faults.

Other information, such as loop bandwidths, position and velocity displays, and torque feedbacks can be viewed from this screen. This information is received directly from the axis and can be used to diagnose issues with commands or axis faults.

This Screen is only applicable for machines equipped with the Allen Bradley Kinetix 5700 Family of Drives or certain Powerflex 755 Drives. For more information regarding the usage of CIP Axis controls, please see the Allen Bradley CIP Drives and/or Kinetix 5700 Drives User and Programming Manual.

Kinetix 5700 Interface Screen





This Screen is only applicable for machines equipped with the Allen Bradley Kinetix 5700 Family of Drives or certain Powerflex 755 Drives. For more information regarding the usage of CIP Axis controls, please see the Allen Bradley CIP Drives and/or Kinetix 5700 Drives User and Programming Manual.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Displays

- **Convertor – DC Power Supply**
  - The Convertor – DC Power Supply allows user the ability to monitor drives' Bus Voltage Output Power, Output Current, and Bus Reg. Capacity.
- **Pull Roll Axis**
  - The Pull Roll Servo Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

    Note: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.
- **Winder Axis**
  - The Winder Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

    NOTE: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.
- **Unwind Winder Axis**
  - The Unwind Winder Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

    NOTE: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.
- **Laminator #1 and #2 Pull Roll Axis**
  - The Laminator Pull Roll Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

    NOTE: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.
- **Corona Treater Pull Roll Axis**
  - The Corona Treater Pull Roll Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

NOTE: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.

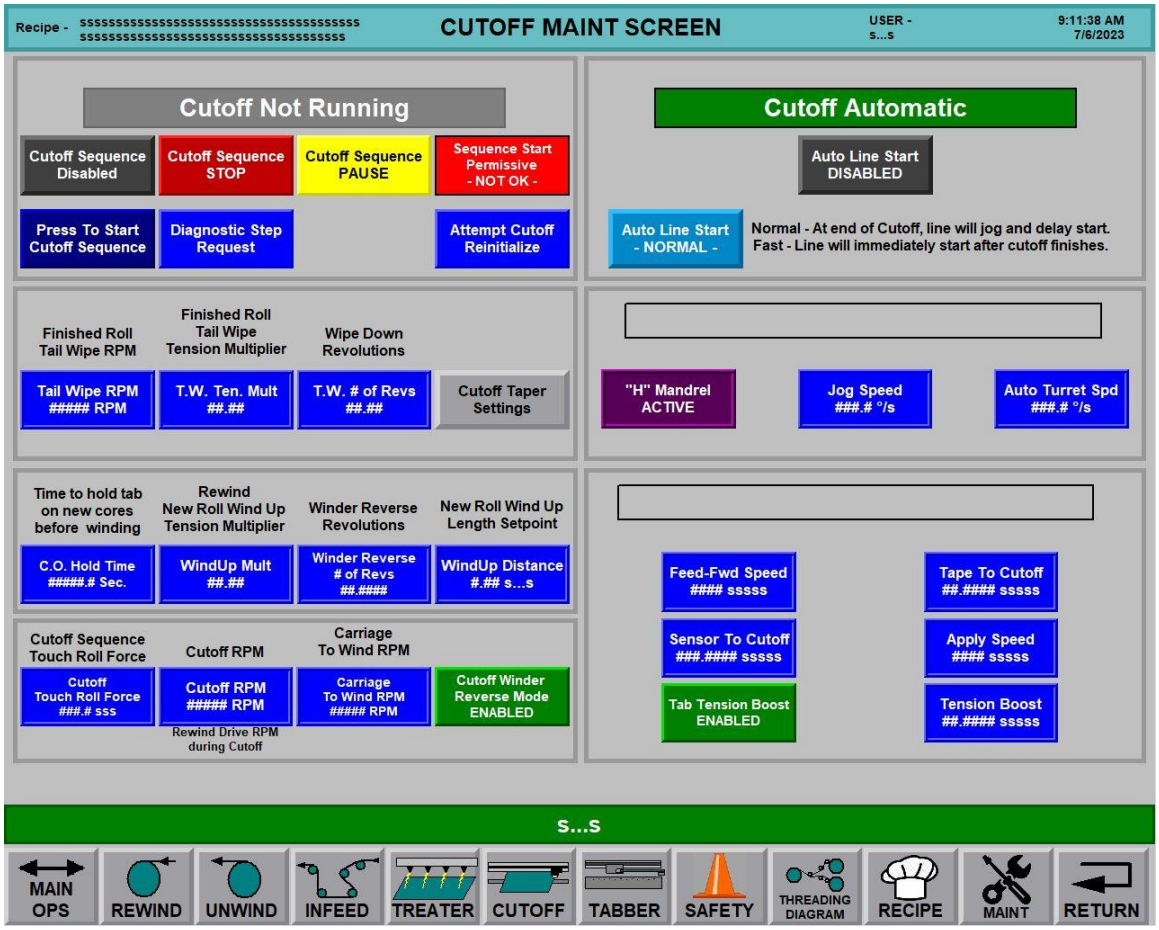
- **Unwind 2 Axis**
  - The Unwind 2 Axis allows user the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives.

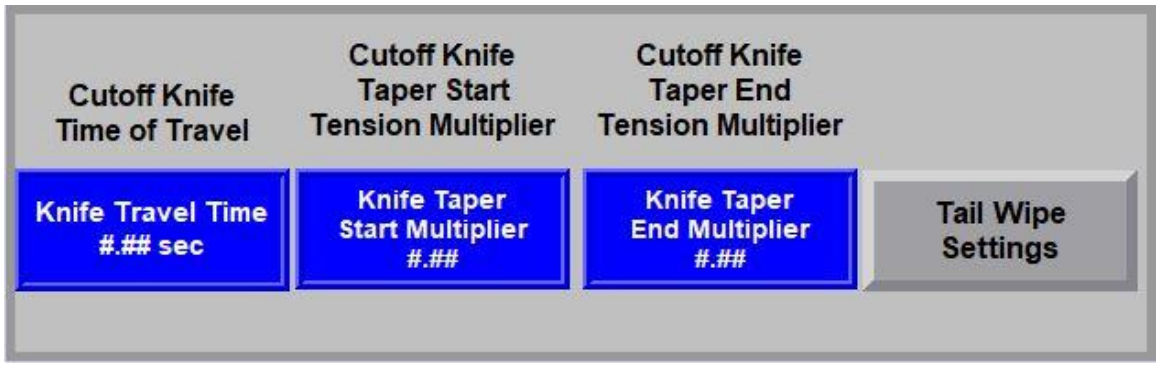
    NOTE: This is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.

Buttons

- **Press To Reset Shutdown**: To reset the servo axis after a shutdown.
- **Press to Reset Fault / No Active Faults Axis OK**: Allows the operator to toggle between Reset Fault and No Active Faults Axis OK.
- **Press to Enable/Disable**: To enable/disable the servo axis.
- **Press to Shut Down**: Shuts down the servo axis.

Cutoff Maintenance Screen





The settings for controlling the **Cutoff & Transfer Sequence** can be found on the **Cutoff & Transfer Maintenance Screen**. Tabber settings that correlate with the **Cutoff & Transfer Sequence** can also be accessed on the screen. For more information on the Turret or the Cutoff & Transfer Sequence, refer to **Section 4 – *System Concepts* – Cutoff & Transfer**.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set Points

- **Tail Wipe RPM:** Sets the RPM of the Rewind drive during the tail wipe after cutoff.

- **Tail Wipe Tension Multiplier:** Determines by how much the tension will increase or decrease by during the Tail Wipe of the Cutoff & Transfer Sequence. Setting this value to 1.1 will cause a 10% increase in tension while 0.9 will cause a 10% decrease in tension.
- **Tail Wipe Number Of Revs:** Determines the number of revolutions the Rewind mandrel(s) will spin for during the tail wipe phase of the **Cutoff & Transfer Sequence**.
- **Cutoff Knife Time of Travel:** The amount of time for the cutoff knife (knives) to cut the web during the cutoff sequence.

  Note: The time of travel is used in conjunction with the Start and End Tension Multipliers. As the cutoff knife travel across the web, the Tension Multiplier is changed proportionate to the amount of time that has passed.

- **Cutoff Knife Start/End Tension Multipliers:** Sets how much the tension will increase or decrease by while the cutoff knife is cutting the material. For reference, value of 0.5 is 50% of the tension setpoint.

  Note: As the cutoff knife begins to cut the material, the tension is relieved from the cut portions and is transferred to the pieces that are still attached. This causes higher tension across the smaller sections, leading to the material stretching and causing a bad cut.

- **Cutoff Hold Time:** Determines how long the machine will wait after the tails have been stuck to the new cores before jogging forward for the WindUp. This setpoint has no effect when Auto Line Start Mode is set to *Fast*.
- **Windup Tension Multiplier:** Determines by how much the tension will increase or decrease by during the Windup after the tails have been stuck to the new cores. Setting this value to 1.1 will cause a 10% increase in tension while 0.9 will cause a 10% decrease in tension.
- **Winder Reverse Revs:** Sets how much the rewind moves in reverse to make sure the tail sticks to the core.
- **Wind Up Distance:** Sets the distance the machine will jog to after the material has tacked onto the new cores. This setpoint has no effect when Auto Line Start Mode is set to *Fast*.
- **Cutoff Touch Roll Force:** Sets the Touch Roll force maintained during the **Cutoff & Transfer Sequence**. Useful when sticking tape to the core requires more force.

  Note: Setting touch force too high will cause carriage to stall.

- **Cutoff RPM:** Sets the RPM of the Rewind drive during the **Cutoff & Transfer Sequence** outside the Tail Wipe. This setting may need to be adjusted when the Carriage begins moving to the Rewind after Turreting on a material basis.
- **Carriage To Wind RPM:** Sets the RPM the mandrel(s) will rotate at while the Carriage is moving toward the Rewind to tack the material onto the new cores.
- **Feed-Forward Speed:** Determines the speed at which the line will feed the tape forward by after the tape is applied after the Automatic Film Tape Application Sequence has finished. If the *Line Speed* set point is less than the Feedforward speed, the line will feed the Tape forward at the line speed set point, NOT the Feedforward speed.
- **Tape To Cutoff:** Sets how far the tape will advance from apply to the cutoff point. A higher number will make the tape go closer to the winding roll – advance more. A lower number will make the web advance less.

- **Apply Speed:** Speed at which vacuum roll will apply tape to the web. When machine length reaches tape apply setpoint, line will slow down to apply speed.
- **Jog Speed:** Manual turret jog speed in degrees per second.
- **Auto Turret Speed:** Turret speed used during auto turret sequence.
- **Sensor to Cutoff:** Distance from where the sensor (used to sense the tap) mounted and to the cutoff. (If applicable)
- **Apply Speed:** Speed at which vacuum roll will apply tape to the web. When machine length reaches tape apply setpoint, line will slow down to apply speed.
- **Tension Boost:** When tension boost mode is selected, this setpoint is used to increase the tension between the tabber and rewind. (If applicable)

Displays

- **Cutoff Sequence Start Permissive Status:** Status of the Cutoff sequence safety permissions. **Green** indicates the permissive has been met. **Red** indicates there is a fault.
- **Active Mandrel ("O"/"X"/"H"):** The active mandrel. If indexing, the display will show "Indexing." Some machines only include "O" and "X" mandrels.

Buttons

- **Cutoff Sequence:** Toggles the Cutoff Sequence to one of four different modes: Disable, Automatic, Diagnostic Step, and Maintenance. This button is different from the one on the **Main Operating Screen** as it will toggle between all modes for Cutoff & Transfer. In Automatic mode, the Cutoff & Transfer Sequence will start automatically as the machine reaches the length of diameter set point. Diagnostic Step mode will go step by step through the Cutoff & Transfer Sequence, allowing the user to move to the next step when requested. Finally, Maintenance mode allows for manual control of each component without the use of the Auto sequence. Use the "Cutoff Sequence Status Indicator" as an indication of the Cutoff current mode.

Caution: In Automatic and Diagnostic Step modes, the machine will automatically begin the Cutoff & Transfer Sequence. Stand back from the machine during this process.

- **Cutoff Sequence Stop:** Stops the Cutoff & Transfer Sequence at the current step.

  Note: If the Cutoff Sequence is stopped, the Sequence may be restarted from the step it stopped at; however, restarting may not produce recoverable rolls.

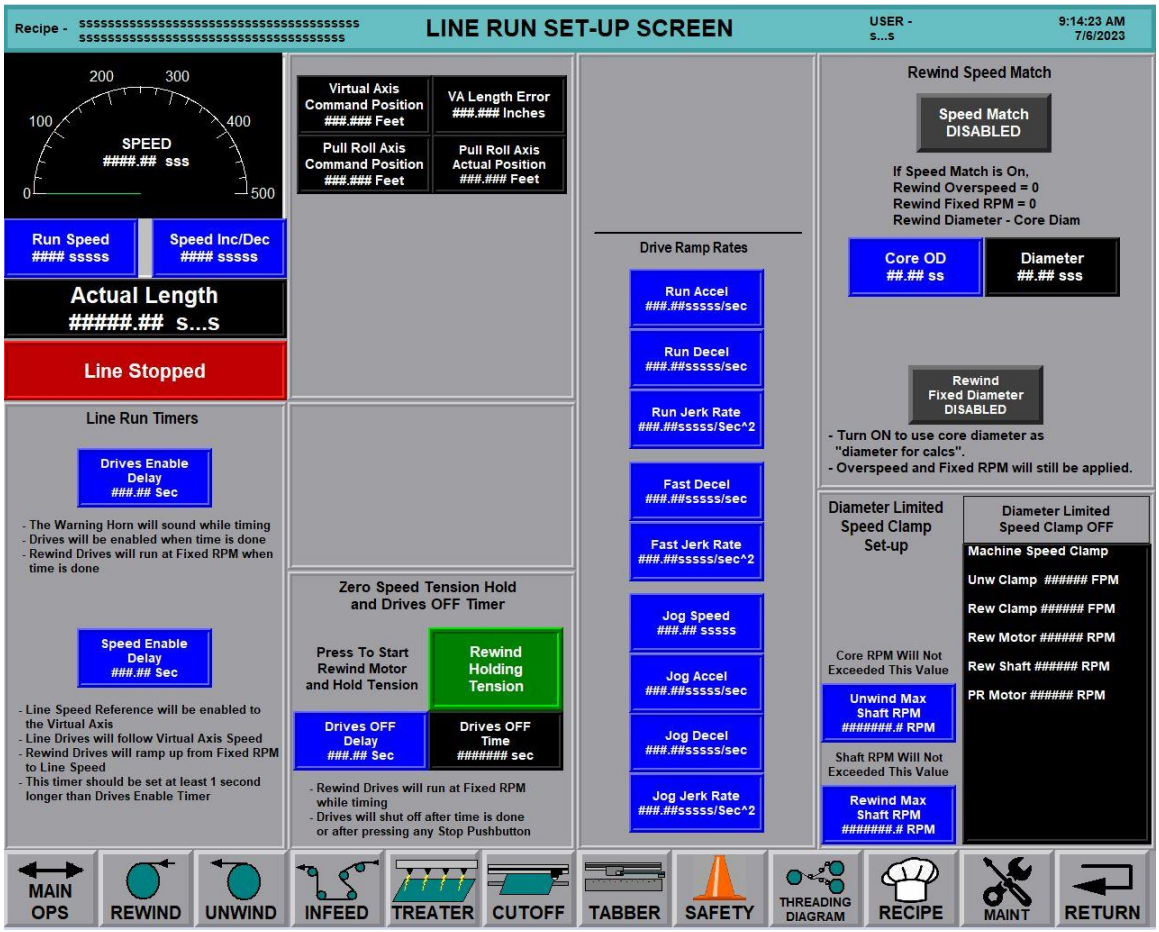
- **Cutoff Sequence Pause:** Pauses the Cutoff & Transfer Sequence at the current step. Pressing the button again while the sequence is paused will resume the sequence at the current step.

Caution: Resuming the Cutoff & Transfer Sequence will cause the machine to begin moving again. Clear the area before continuing to ensure personnel have breached any of the Safety Zones.

- **Press To Start Cutoff Sequence:** Immediately starts the cutoff sequence by moving the Carriage to the Clear Position and continuing from there.
- **Diagnostic Step Request:** Brings the Cutoff & Transfer Sequence to the next state then stops until the next step is requested, during "Diagnostic Step" mode. This is to help diagnose issues with the Cutoff & Transfer Sequence.

- **Attempt Cutoff Reinitialize:** Reinitializes the Cutoff & Transfer Sequence to clear bring the Cutoff Assemblies to their normal (line running) position. This button will only appear when the Cutoff & Transfer Sequence is started while the Cutoff Assemblies are not in the correct position.
- **Auto Line Start Enabled/Disabled:** Permits the operator to toggle between enabling and disabling the Auto Line Start feature.
- **Auto Line Start Mode:** Changes between *Normal* and *Fast* Auto Line Start Modes. In *Normal* Auto Line Start, the machine will perform a jog after the material is tacked onto the new cores and wait a moment before starting back up. In *Fast* Auto Line Start, the machine will immediately ramp up to running speed after tacking onto the new cores – no jog is performed.
- **Cutoff Taper Settings:** Allows ability to set the tension multiplier when knife is cutting the material.
- **Cutoff Reverse Mode Enabled/Disabled:** Enables/disables cutoff reverse mode. This mode is used to seal the tale to the core by moving the rewind in reverse.
- **Tab Tension Boost Enabled/Disabled:** Enables/disables tab tension boost mode. This mode is used to increase the tension between the tabber and rewind. (If applicable)

Line Run Set-Up Screen



The **Line Run Setup Screen** contains the ability to change drive speed references and other ramping parameters. The Line Run Virtual Axis controls the speed references and ramping rates of the drives, which can be customized using this screen. Speed Matching, Diameter based Speed Clamping, and Zero Speed Hold commands can all be accessed from here. **Note: These parameters should not be changed without consulting Catbridge Machinery.**

Note: Do NOT change these values without input from Catbridge Machinery. These values are factory set and changes can result in machine malfunction, inoperability, and/or damage.

Set points

- **Run Speed**: Allows the operator to set the speed at which the machine will run. The actual speed is indicated by the gauge above the setpoint.
- **Speed Increment / Dec**: Sets the increment and decrement speed. This setpoint is used to determine how much the machine will slow down or speed up when Green & Red arrows (located on the right and left side of Run Speed setpoint of the main operating screen) and speed Inc/Dec pushbuttons located on the unwind left back fence operating station are pressed.
- **Drives Enable Delay:** Enables the drives after an inputted delay when pressing the “Line Start Pushbutton”. A warning horn will sound as the timer is running. Once the timer has finished, the rewind drives will torque up.
- **Speed Enable Delay:** Enables the speed reference of the drives after an inputted delay when pressing and holding the “Line Start Pushbutton”. Once the Drive Enable Delay has

completed, the drives will run at a Fixed RPM until this timer is completed, in which case the drives will ramp up to Line Speed.

Note: This timer should be set for at least 1 second longer than the Drives Enable Delay in order for it to work properly.

- **Drives Off Delay:** Disables the drives after an inputted delay. While the timer is running, the drives will run at a Fixed RPM (Slack Take-Up), then will shut off after the timer has finished. Optionally, the operator may push any Stop Pushbutton to turn off the drives while the timer is running. This will mostly apply when Slack Take-Up is active. Optionally, the operator may push any Stop Button to turn off the drives while the timer is running.
- **Line Run Accel/Decel Rate:** Sets how quickly the machine will accelerate or decelerate to the Line Speed or Jog Speed set point. The Accel and Decel Rates are measured in FPM/s. Default value for Accel is 30 FPM/s. Default value for Decel is 30 FPM/s.
- **Line Run Jerk Rate:** Sets how quickly the machine will reach the desired acceleration or deceleration (how rapidly the machine will accel/decel). The Jerk Rate is measured in FPM/s^2. Default value is 20 FPM/s^2.
- **Fast Decel Rate:** Determines how quickly the machine will get to speed when collapsing the Accumulator. Default value is 500 FPM/s.
- **Fast Jerk Rate:** Determines how quickly the machine will accelerate and decelerate when collapsing the Accumulator. Default value is 1000 FPM/s^2.
- **Line Jog Speed:** Sets the speed the rewind will operate while jogging. Default value is 25 FPM.
- **Line Jog Accel/Decel Rate:** Sets how quickly the machine will accelerate or decelerate to the Jog Speed set point. The Accel and Decel Rates are measured in FPM/s. Default value for Accel is 20 FPM/s. Default value for Decel is 200 FPM/s.
- **Line Jog Jerk Rate:** Sets how quickly the machine will reach the desired acceleration or deceleration (how rapidly the machine will accel/decel) of Line Jog Accel or Decel. The Jerk Rate is measured in FPM/s^2. Default value is 300 FPM/s^2.
- **Core Outer Diameter:** Represents the outer diameter of the core mounted on the Rewind Shaft. If *Fixed Diameter* mode is enabled, the Rewind Diameter will remain at this value.
- **Unwind Shaft Max RPM:** Sets the Maximum achievable RPM by the Unwind. If the RPMs begin to exceed this value, the line will go into a "Speed Clamp" setting where the Line Speed will adjust itself to maintain the maximum RPMs of this set point.
- **Rewind Shaft Max RPM:** Sets the Maximum achievable RPM by the Rewind. If the RPMs exceed this value, the line will go into a "Speed Clamp" setting where the Line Speed will adjust itself to maintain the maximum RPMs of this set point.

Displays

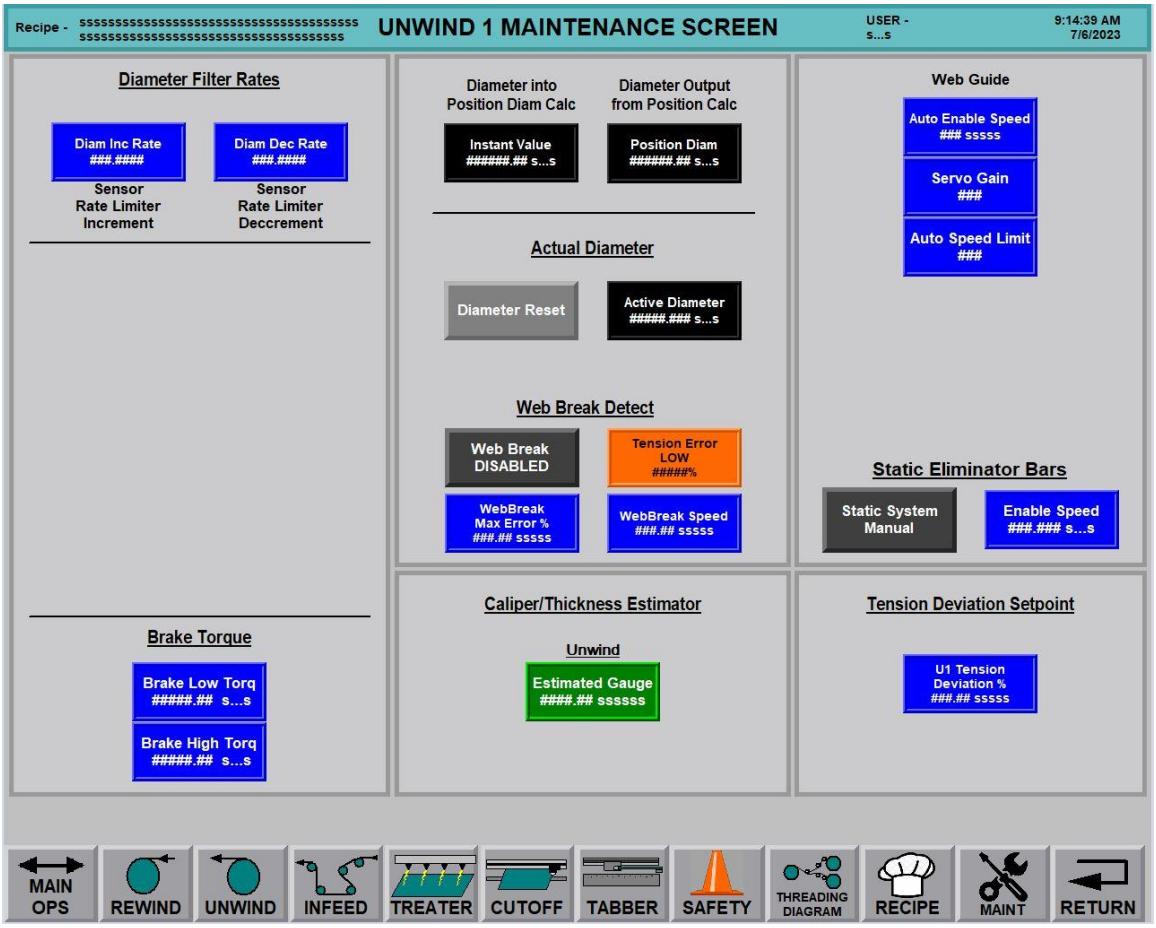
- **Line Speed Gauge:** Current Line Speed of the machine – not the set point.
- **Actual Length:** Accumulated length footage of the rewind rolls.
- **Line Run Status:** Status of the line – Stopped, Jogging, Running, Zero Speed Hold, etc.
- **Virtual Axis Commanded Position:** The commanded position input in to the Virtual Axis. This is the value that the Virtual Axis will follow.
- **Pull Roll Axis Commanded Position:** The commanded position of the Pull Roll to its CIP axis. This is the value that the Pull Roll Axis will try to follow.

- **Pull Roll Axis Actual Position:** The actual position that the Pull Roll is currently at.
- **Virtual Axis Length Error:** The length error seen by the Virtual Axis. The virtual axis will output this value and try to correct the error while the machine is running.
- **Rewind Calculated Diameter:** The current diameter of the rewind roll(s).
- **Drives OFF Time Left:** The time left before the drives shut off from the delay set by the operator.
- **Diameter Limited Speed Clamp Settings:** Shows the Calculated FPM of the Unwind and Rewind Speed Clamp. The current RPMs of the Pull Roll Motor and Rewind Motor are also displayed.

Buttons

- **Speed Match Enable/Disable:** Enables or Disables the Speed Match functionality. Speed matching is used to make sure the all the Drives are all running at the same speed. **Speed Matching is set at Catbridge and should not be adjusted. The only other circumstance for adjusting Speed Matching would be with a qualified Maintenance Member.**
- **Rewind Fixed Diameter Enable/Disable:** Fixes the Rewind Diameter calculator to the Core Diameter for any respective calculation in use. The Rewind Diameter will not change from Core Diameter until this feature becomes disabled again.

Unwind 1 Maintenance Screen



The **Unwind Maintenance Screen** gives the user advanced user control over the Unwind. All functions are centered on the Unwind such as web guiding, braking, and diameter control give the operator complete control over the behavior of the unwind. **Note: These parameters should not be changed without consulting Catbridge.**

Set points

- **Diameter Inc/Dec Rate:** Sets the increment or decrement rate for the Unwind diameter Rate Limiter. This represents how often the Diameter is updated. A higher value will cause the diameter to update too quickly and may over-calculate. A lower value will cause the diameter calculation to be choppy and update slower. Use these setpoints to limit the increase and/or decrease of diameter.
- **Web Guide Enable Speed:** Sets the speed reference at which the Web Guide goes into effect. This setpoint is only applicable when Web Guide is enabled.
- **Servo Gain:** How fast will the web guide respond.
- **Auto Speed Limit:** Determines the maximum speed the Web Guide will correct at.
- **Enable Speed (Static Eliminator Bars):** Sets the speed reference at which the Static Bars goes into effect. This setpoint is only applicable when static bar is enabled.
- **WebBreak Max Error%**: Web break is detected if the tension loop error exceeds web break max error %.

- **WebBreak Speed**: Speed set point used to activate web break function.
- **Brake Low/High Torque:** Unwind brake high/low torque scaling factor.
- **U1 Tension Deviation:** Used to alarm user when there is deviation between the unwind tension setpoint and load cell feedback.

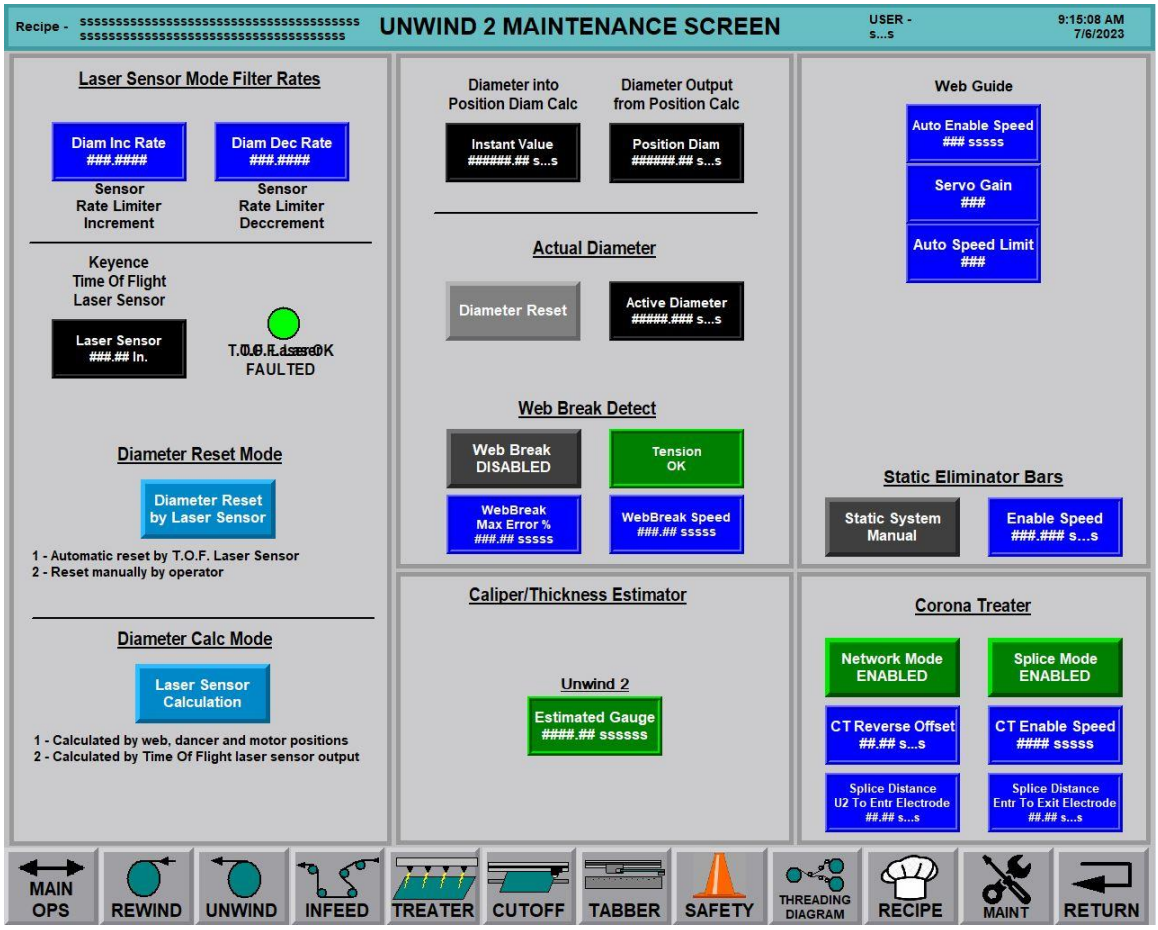
Displays

- **Instant Value:** The value that is input into the diameter calculator's rate limiter. This is the value captured at the time of the calculation and input into the rate limiter. This will be equal to any sensor's input at the time of capture.
- **Position Diameter:** Calculated diameter based upon the measured revolution of the Unwind. The estimated diameter is then sent through a rate limiter to output the final estimate.
- **Active Diameter:** The currently estimated unwind diameter as calculated by the PLC.
- **Estimated Caliper:** The estimated thickness of the material as per system calculations.
- **Web Break Tension Status:** "Tension OK" means machine is holding tension.

Buttons

- **Diameter Reset:** Resets the unwind master roll diameter to user inputted value.
- **Web Break Enabled/Disabled:** Enables or disabled the internal web break detection sensing algorithm in the PLC. The PLC monitors the mandrel torque and will stop the line if the torque feedback drops to a low value when running (indicating a web break at that mandrel).
- **Static Bars Enabled/Disabled:** Enables or disables the static bars on the machine.

Unwind 2 Maintenance Screen



The **Unwind Maintenance Screen** gives the user advanced user control over the Unwind. All functions are centered on the Unwind such as web guiding, braking, and diameter control give the operator complete control over the behavior of the unwind. **Note: These parameters should not be changed without consulting Catbridge.**

Set points

- **Diameter Inc/Dec Rate:** Sets the increment or decrement rate for the Unwind diameter Rate Limiter. This represents how often the Diameter is updated. A higher value will cause the diameter to update too quickly and may over-calculate. A lower value will cause the diameter calculation to be choppy and update slower. Use these setpoints to limit the increase and/or decrease of diameter.
- **Web Guide Auto Enable Speed:** Sets the speed reference at which the Web Guide goes into effect. This setpoint is only applicable when Web Guide is enabled.
- **Servo Gain:** How fast will the web guide respond.
- **Auto Speed Limit:** Determines the maximum speed the Web Guide will correct at.
- **Enable Speed (Static Eliminator Bars):** Sets the speed reference at which the Static Bars goes into effect. This setpoint is only applicable when static bar is enabled.
- **WebBreak Max Error%**: Web break is detected if the tension loop error exceeds web break max error %.

- **WebBreak Speed**: Speed set point used to activate web break function.
- **Splice Distance U2 to Entrance Electrode:** The distance it takes the splice to travel from the unwind 2 to the entrance electode.
- **Splice Distance Entrance to Exit Electrode:** The distance it takes the splice to travel from the entrance electrode to the exit electrode. When corona treater faults because of the splice, line will run until this distance, reset the fault, engage the electrodes, and start treating again.

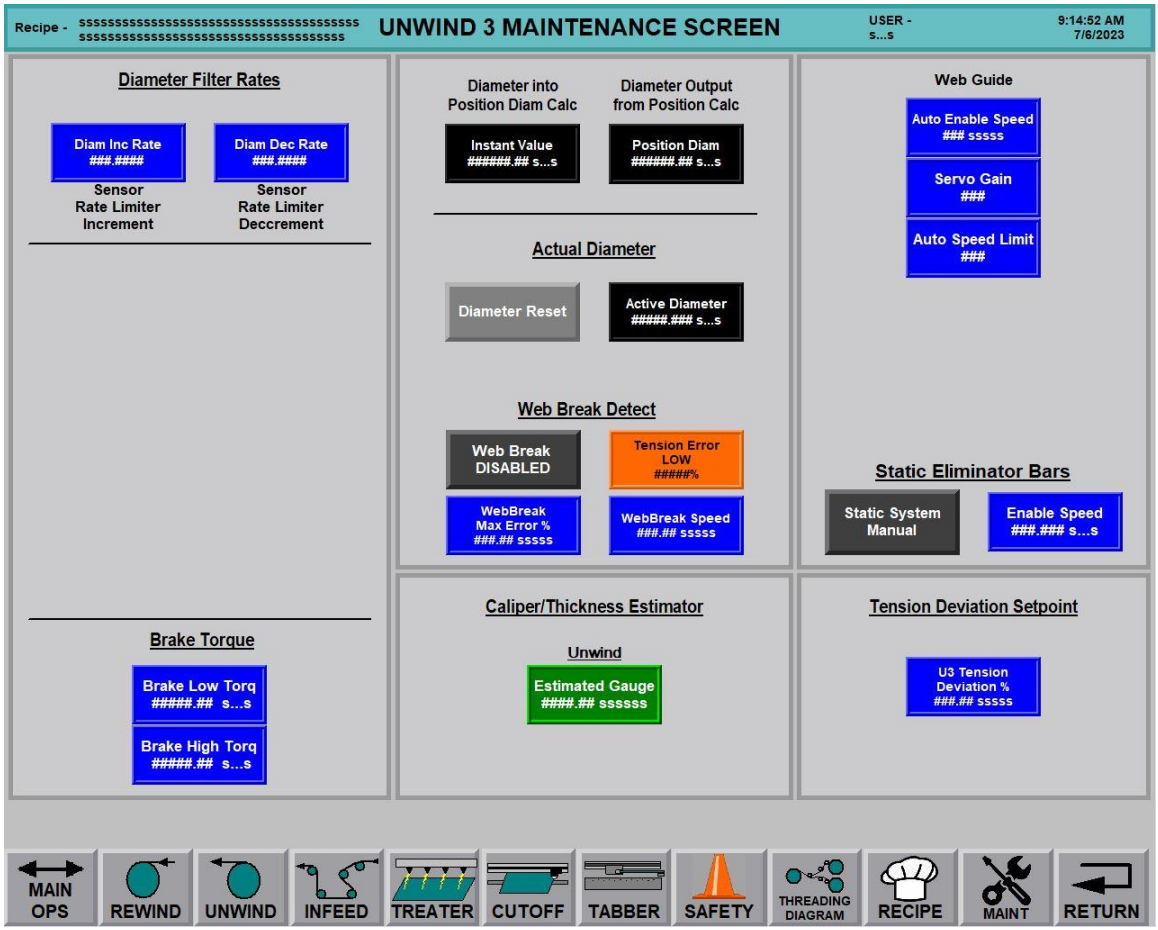
Displays

- **Laser Sensor:** Displays distance as measured by the Time of Flight laser sensor.
- **Instant Value:** The value that is input into the diameter calculator's rate limiter. This is the value captured at the time of the calculation and input into the rate limiter. This will be equal to any sensor's input at the time of capture.
- **Position Diameter:** Calculated diameter based upon the measured position of the Unwind. The estimated diameter is then sent through a rate limiter to output the final estimate.
- **Active Diameter:** The currently estimated unwind diameter as calculated by the PLC.
- **Web Break Tension Status:** "Tension OK" means machine is holding tension.
- **Estimated Gauge:** Displays material thickness as calculated by the machine.
- **TOF Laser OK/Faulted:** Displays fault status of the Time-of-Flight laser sensor

Buttons

- **Diameter Reset by Laser Sensor/Operator:** In the "Diameter Reset by Laser Sensor" mode, the unwind diameter is reset using the Time-of-Flight sensor. However, in the "Diameter Reset by Operator" mode, the user must manually reset and enter the unwind diameter.
- **Laser Sensor/Position Calculation:** In the "Laser Sensor Calculation Mode," the diameter changes based on the readings from the Time-of-Flight sensor. On the other hand, in the "Position Calculation Mode," when the line start, jog, or unwind jog buttons are pressed, a diameter snapshot is taken using the Time-of-Flight sensor. Then, the position calculator calculates the diameter.
- **Diameter Reset:** Resets the unwind master roll diameter to user inputted value.
- **Web Break Enabled/Disabled:** Enables or disabled the internal web break detection sensing algorithm in the PLC. The PLC monitors the mandrel torque and will stop the line if the torque feedback drops to a low value when running (indicating a web break at that mandrel).
- **Static System Manual/Automatic:** Toggles between auto enable and manual enable for the static bars.
- **Network Mode Enabled:** When enabled, communication is established between the PLC and the corona treater, allowing the PLC to control the corona treater. However, when disabled, the corona treater will not be controlled through the PLC.
- **Splice Mode Enabled:** When enabled, the line will continue to run even after the corona treater has encountered a fault due to the splice. After the line has run for the distance between the Splice Entrance and Exit Electrode, corona treating will resume again.

Unwind 3 Maintenance Screen



The **Unwind Maintenance Screen** gives the user advanced user control over the Unwind. All functions are centered on the Unwind such as web guiding, braking, and diameter control give the operator complete control over the behavior of the unwind. **Note: These parameters should not be changed without consulting Catbridge.**

Set points

- **Diameter Inc/Dec Rate:** Sets the increment or decrement rate for the Unwind diameter Rate Limiter. This represents how often the Diameter is updated. A higher value will cause the diameter to update too quickly and may over-calculate. A lower value will cause the diameter calculation to be choppy and update slower. Use these setpoints to limit the increase and/or decrease of diameter.
- **Web Guide Enable Speed:** Sets the speed reference at which the Web Guide goes into effect. This setpoint is only applicable when Web Guide is enabled.
- **Servo Gain:** How fast will the web guide respond.
- **Auto Speed Limit:** Determines the maximum speed the Web Guide will correct at.
- **Enable Speed (Static Eliminator Bars):** Sets the speed reference at which the Static Bars goes into effect. This setpoint is only applicable when static bar is enabled.
- **WebBreak Max Error%**: Web break is detected if the tension loop error exceeds web break max error %.

- **WebBreak Speed**: Speed set point used to activate web break function.
- **Brake Low/High Torque:** Unwind brake high/low torque scaling factor.
- **U3 Tension Deviation:** Used to alarm user when there is deviation between the unwind tension setpoint and load cell feedback.

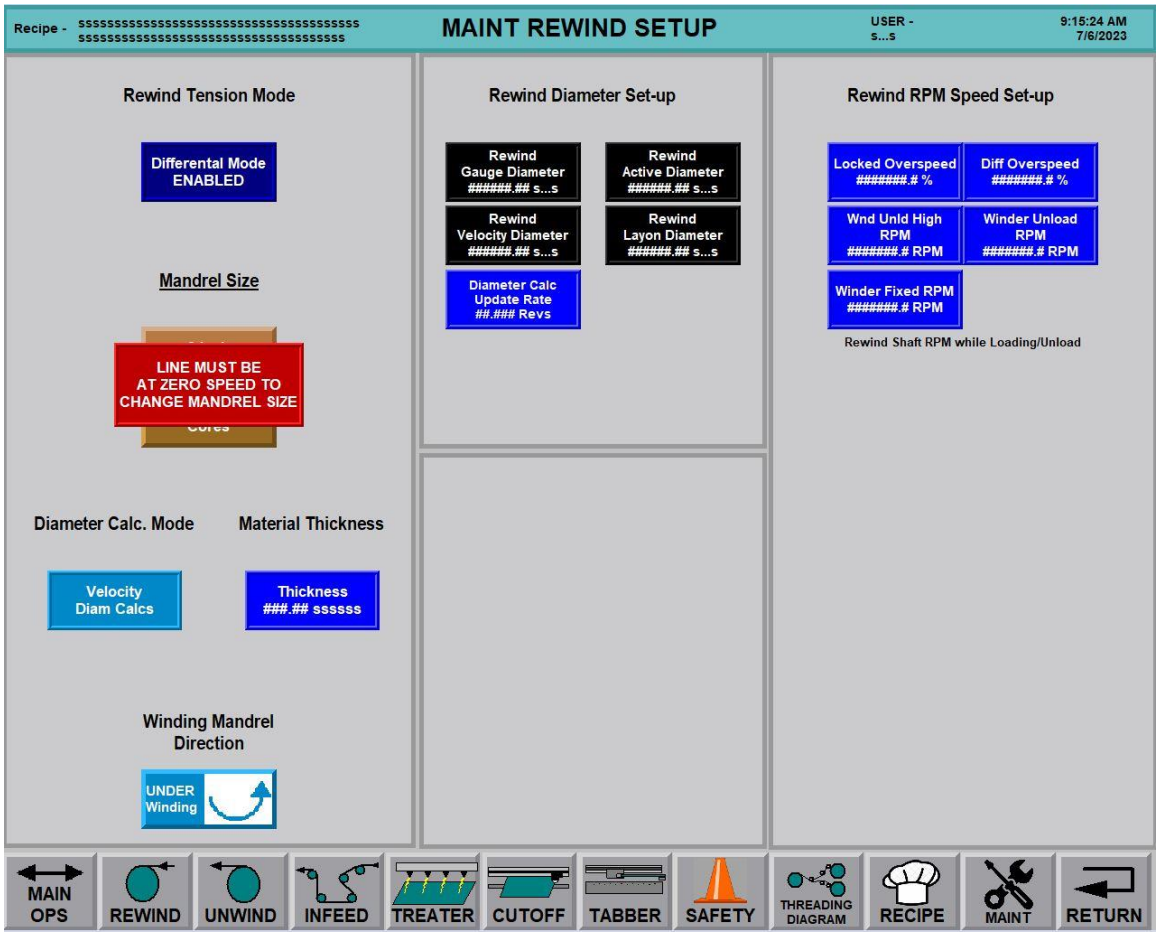
Displays

- **Instant Value:** The value that is input into the diameter calculator's rate limiter. This is the value captured at the time of the calculation and input into the rate limiter. This will be equal to any sensor's input at the time of capture.
- **Position Diameter:** Calculated diameter based upon the measured revolution of the Unwind. The estimated diameter is then sent through a rate limiter to output the final estimate.
- **Active Diameter:** The currently estimated unwind diameter as calculated by the PLC.
- **Estimated Caliper:** The estimated thickness of the material as per system calculations.
- **Web Break Tension Status:** "Tension OK" means machine is holding tension.

Buttons

- **Diameter Reset:** Resets the unwind master roll diameter to user inputted value.
- **Web Break Enabled/Disabled:** Enables or disabled the internal web break detection sensing algorithm in the PLC. The PLC monitors the mandrel torque and will stop the line if the torque feedback drops to a low value when running (indicating a web break at that mandrel).
- **Static Bars Enabled/Disabled:** Enables or disables the static bars on the machine.

Rewind Maintenance Screen



The **Rewind Maintenance Screen** gives the user advanced user control over the Rewind. All functions are centered on the rewind such as zero speed RPM, overspeed, and diameter control give the operator complete control over the behavior of the rewind. **Note: These parameters should not be changed without consulting Catbridge.**

Set points

- **Thickness:** The actual thickness of the material on the Rewind. This set point is important as it determines how the machine calculates the running diameter on the Rewind. Increasing the thickness causes the diameter to increase quicker, while decreasing the thickness will cause the diameter to increase slower. Diameter directly affects the amount of torque applied for maintaining tension and so if the diameter is incorrect the tension may be off causing issues with winding. For more information on diameter calculations and how it affects tension, refer to ***Section 4 – System Concepts – Basic Machine Operation*** of this manual.
- **Diameter Calc Update Rate:** Sets the update rate for the Diameter calculator in Position Mode in Revs. The Diameter calculation will update every time this number of revolutions are met.
- **Lock Core Mode Overspeed:** Increases the Rewind speed in Lock Core Mode by a percentage of the value input. Overspeed is important in order to maintain tension, as if the line speed is equal to the Rewind speed, tension cannot be achieved since no force is exerted on the web.

  Note: As an example, if the machine is running at 100 ft. /min and the percentage overspeed is set to 10%, the rewind mandrel will be rotating at 110 ft. /min.).

- **Differential Mode Overspeed:** Increases the Rewind speed in Differential Mode by a percentage of the value input. Overspeed is important in order to maintain tension, as if the line speed is equal to the Rewind speed, tension cannot be achieved since no force is exerted on the web. (If applicable)

  Note: As an example, if the machine is running at 100 ft. /min and the percentage overspeed is set to 10%, the rewind mandrel will be rotating at 110 ft. /min.).

- **Fixed RPM:** Sets the speed at which the Rewind will run during a Slack Take-Up. This helps to maintain tension without moving material through the machine. Default value is 20 RPM.
- **Winder Unload RPM:** Sets the speed at which the Rewind will run in Core Load Mode. Default value is 150 RPM. (Only used for none self-unlocking cams.) (If applicable)
- **Unload High RPM:** Sets the speed at which the Rewind will run for few seconds before it runs at winder unload RPM. (Only used for none self-unlocking cams.) (If applicable)

  Note: Winder Unld High RPM is greater than winder unload RPM.

Displays

- **Rewind Gauge Diameter:** Calculated diameter based on the length accumulated and gauge of the material. This Diameter is used when the *Rewind Finish Setpoint Type* is set to Diameter setpoint. The machine will stop when the calculated gauge diameter is at the *Rewind Diameter Stop* setpoint.

  Note: Length/Gauge MUST be used when running the machine in Differential or Mixed Mode Rewind Tension Modes. This is because the winding roll does not rotate at the same speed as the mandrel and so an RPM sensor will not fair.

- **Rewind Velocity Diameter:** Calculated Diameter based upon the current velocity line and RPM of rewind mandrel.
- **Rewind Active Diameter:** Displays the currently active diameter.
- **Rewind Layon Diameter:** Estimated diameter based on the position of the compressed Touch Roll while the line is running. Depending on the type of material, proneness to gauge, etc. the sensor diameter calculator may need to be filtered to prevent noise in the calculation.

  Note: The Touch Roll Sensor calculation will only work while the Touch Roll Mode is in "Touch Mode." This implies that this type of calculation is best suited for Lock Core tension control, not Differential or Mixed Mode.

- **Rewind Tension Mode:** Displays currently active rewind tension mode.

  Diameter Calc Mode: Displays the mode used to calculate the rewind diameter.

Buttons

- **Mandrel Size:** Selects the active mandrel size being used in the machine. The mandrel size can only be changed when line is not running and tension is off.

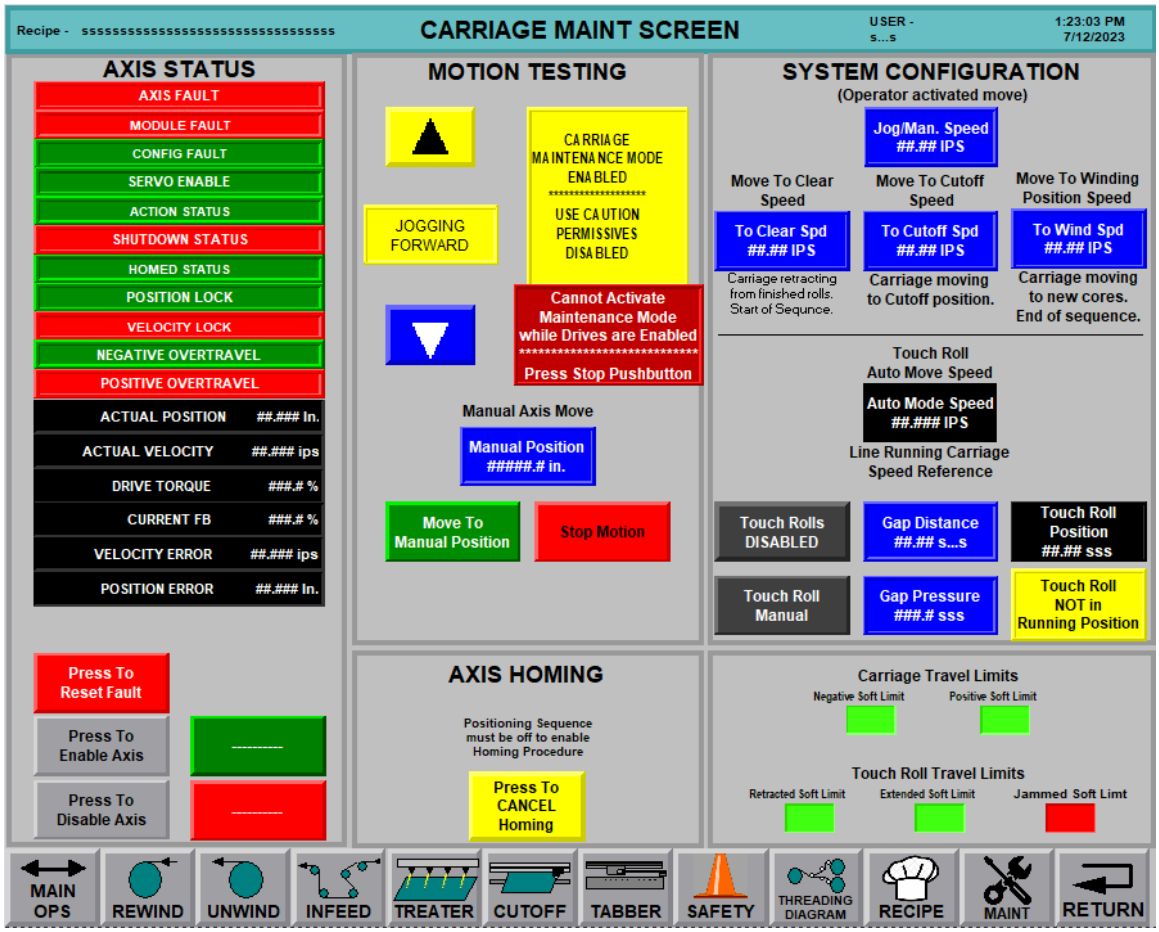
  Note: Changing the mandrel size will input new differential scaling values and minimum pressures into the PLC logic. Users may need to tune the mandrel if not already done. This can be done on the Rewind Mandrel Maintenance Screen.

- **Core Type Select:** Selects the current core type. Core types can be changed to Cardboard and Plastic. (If applicable)

Note: Changing the core type will input new differential scaling values into the PLC logic. Users may need to tune the differential friction if not already done. This can be done on the Rewind Mandrel Maintenance Screen.

- **Rewind Direction Over/Under:** Allows the operators to toggle between the rewind over/under mode. (If applicable, most of the machines with cutoff assemblies can only run in under mode.) (If applicable)

Carriage Maintenance Screen



The **Rewind Carriage Maintenance Screen** controls specific functions and speeds that the carriage will endure during run time and manual motion. Users can home the carriage, change speeds, view speed feedbacks, and check carriage statuses using the provided information. For more information on the Carriage, refer to **Section 4 – *System Concepts* – Mobile Carriage**.

Set points

- **Carriage Jog/Manual Speed:** Sets the Carriage jogging speed for manual Carriage movement.
- **Move-to-Clear Speed:** Sets the speed the Carriage will run at when the Carriage moves to the Clear position when the Cutoff & Transfer Sequence first begins.
- **Move-to-Cutoff Speed:** Sets the speed the carriage moves towards the Cutoff position.
- **Move-to-Winding-Position Speed:** Sets the speed the Carriage will run at when the Carriage moves to the Winding position after the machine has Turreted.
- **Manual Position:** Determines the position that the Carriage will move to. This location is based upon the distance from the Home Position. To move the Carriage to a manual position, the Axis must first be enabled using the *Press To Enable Axis* button then the user must press the *Move To Manual Position* button. The Carriage will then move to this position.
- **Gap Mode Distance:** Sets the Gap Mode distance that the Touch Rolls will maintain from the surface of the winding material. This set point is only available in Touch Roll – Gap Mode.
- **Gap Mode Pressure:** Sets the Pressure the Touch Rolls will retain in Gap Mode.

Displays

- **Auto Mode Speed:** The speed reference to the Carriage while the machine is running. This is the speed the Carriage will move at as the Rewind roll(s) are winding.
- **Carriage Servo Status Indicators:** Displays the various statuses associated with the Carriage Servo Axis. **Green** indicators show the particular status is healthy and operational. If an indicator is **Red**, there is fault present in the Axis. Contact Catbridge Machinery about details on the Carriage Statuses.
- **Actual Position:** The scaled position that the Carriage Axis is at with respect to the home position in inches. When measuring to the side frame, add the distance to the home position to determine the absolute position.
- **Actual Velocity:** The scaled velocity of the Carriage Axis in inches/second. When the Carriage is stationary, this value should be 0. This value can be negative if traveling from a high position to a lower position.
- **Drive Torque:** The torque output from the Carriage Axis.
- **Current Feedback:** The current feedback from the Carriage Axis.
- **Velocity Error:** The error in the commanded and feedback velocity from the Carriage Axis.
- **Position Error:** The error in the commanded and feedback position from the Carriage Axis.
- **Rewind Carriage Jog Positive/Negative Permissives:** The jog safety status of the Carriage. **Green** indicates the Carriage Jog Safety has been cleared. **Red** indicates the Carriage is either faulted, has reached an overtravel limit, or one of the Safety Devices or Safety Gates are tripped (or the Touch Rolls are in a fixed position).
- **Touch Roll Position:** The position of the Touch Rolls in length units.
- **Touch Roll Running Position Indicator:** Shows whether the Touch Rolls are in the correct running position according to the model determined by the machine.
- **Carriage Travel Limits Indicators:** Indicates whether or not the Carriage exceeds the software-based travel limits. If the indicator turns **Green**, the Carriage is within the limit, or if the indicator turns red, the Carriage has exceeded the soft limit and either must be homed or brought back within the limits.
- **Touch Roll Travel Limits Indicators:** Indicates if the Touch Rolls are in the farthest backward/forward position or at the collision limit. If the indicator turns **Green**, the Touch Rolls are within the limit, or if the indicator turns **Red**, the Touch Rolls have exceeded the soft limit.
- **Carriage Homing Instructions:** Displays a set of instructions on the Homing procedure for the Carriage.

Buttons

- **Carriage Jog IN/OUT Request:** Moves the Carriage forward or backward in position. Clear any obstructions and personnel around the machine before moving the Carriage.

Caution: Moving the Carriage while personnel are inside the Safety Zone can cause serious injury. Clear the area to prevent any inadvertent injury.

- **Manual Move:** Moves the Carriage to the Position defined by the *Manual Position* set point.

Note: To move the actuator to a user input position, the user must first define the position to move to using the *Manual Position* set point. The carriage Servo Axis

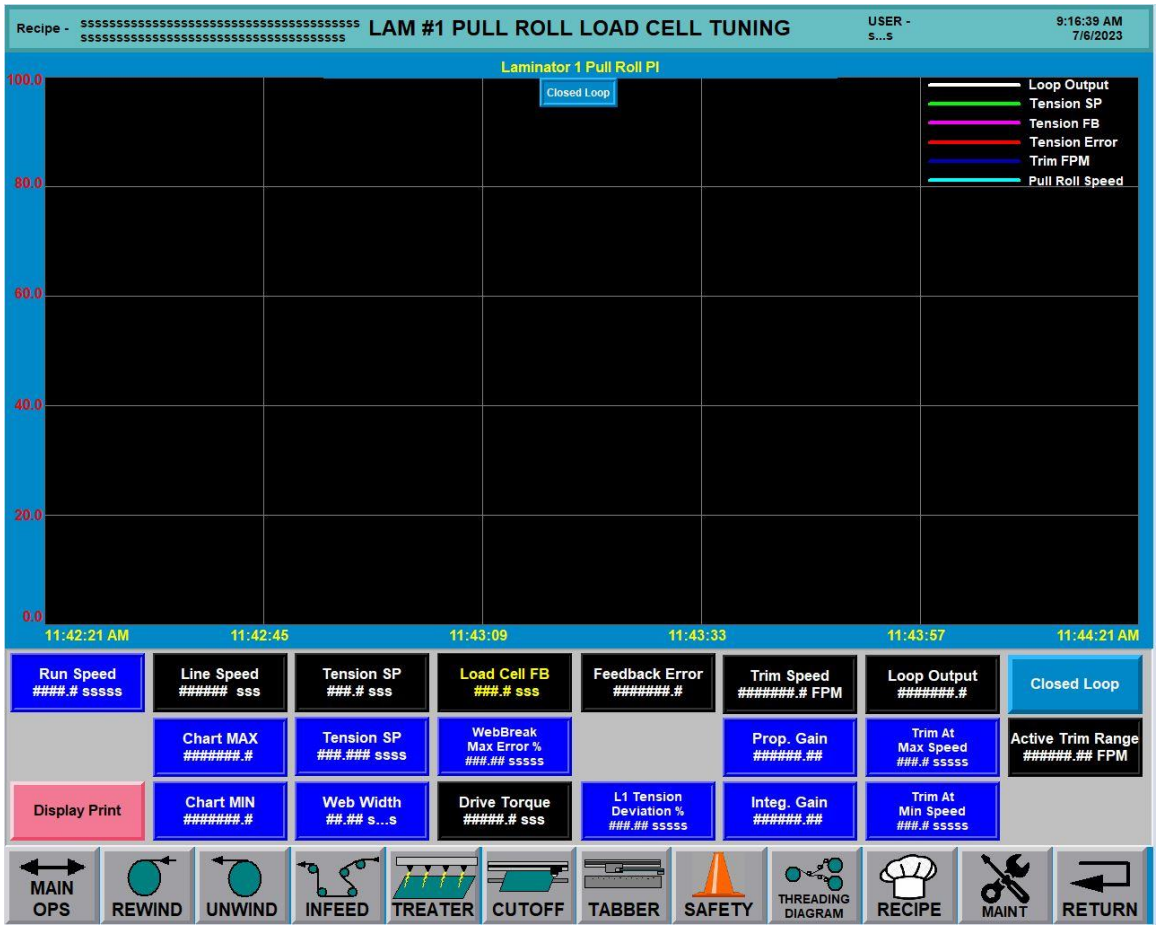
must then be enabled using the *Press To Enable Axis* button. Finally, pressing the *Manual Move* button will move the actuator to the defined position. The Axis will need to be disabled again if not in use.

- **Stop Motion:** Stops the axis in the current spot it is at during a move.
- **Homing Procedure Enable:** Enables the use of the Carriage Home button and displays *Carriage Homing Instructions*.
- **Start Homing:** Runs the Carriage homing procedure. If safety is reset, the Carriage will begin moving toward the home position proximity switch (backward; away from the mandrels). Upon reaching the home proximity switch, the Carriage will jog forward until the proximity switch turns off. It then stops and defines that location as home. The *Actual Position* will be displayed as 0.000.

Caution: Changing the Home Position will offset the Carriage from its predefined position. This may lead to inaccurate relative Carriage motion and/or overtravel faults.

- **Press To Enable/Disable Servo Axis:** Enables or Disabled the Carriage Axis. This is analogous to turning the Drives OFF and ON. The Axis must be enabled in order to move the actuator to a position.
- **Press To Shutdown/Reset Shutdown Axis:** The Axis can be completely enabled or disabled using these buttons. Shutting Down the Axis disables any and all calculations and movement.
- **Touch Roll Touch/Gap Mode/Disabled:** Selects between running the touch rolls in touch or gap mode or disabling the use of the touch rolls. In Touch mode, the operator will be able to enter a set point for the amount of force being applied to running roll. In Gap Mode, full air pressure will be applied to the Touch Roll and the operator must enter a value for amount of gap distance they want between the Touch Roll and the material. Disabling this feature will retract the Touch Rolls preventing them from manipulating the Rewind material. In machines that contain Carriages, the Carriage will move according to the current diameter of the winding roll. For more information on Touch Roll modes, refer to **Section 4 – *System Concepts* – Slitter/Rewinder** of this manual.
- **Touch Roll Control Mode:** Toggles between the Touch Roll Control Mode. If Automatic is selected, the Touch Rolls will automatically calculate the Nip force to maintain on the material; for manual, the Nip force must be set and will be maintained at that force.

Laminator # 1 Load Cell Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Tension:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the speed of the laminator 1 in order to achieve the desired tension level. Increasing this value will cause the material to be tighter between laminator 1 & 2.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output

change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

> **Note:** Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

  > **Note:** Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Trim at Min/Max Diameter:** Scaling for how much the PI loop output will be trimmed by the build-up of diameter. When set to the same number, the PI loop output % will be multiplied by the number in these fields. As diameter increases, the pressure required to maintain the same tension increases. This implies that the trim pressure also needs to be scaled appropriately.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.
- **Web Break Max Error %:** Web break is detected if the tension loop error exceeds web break max error %.
- **Web Width:** Allows the operator to enter material width.
- **L1 Tension Deviation %:** Used to alarm user when there is deviation between the laminator 1 tension setpoint and load cell feedback.

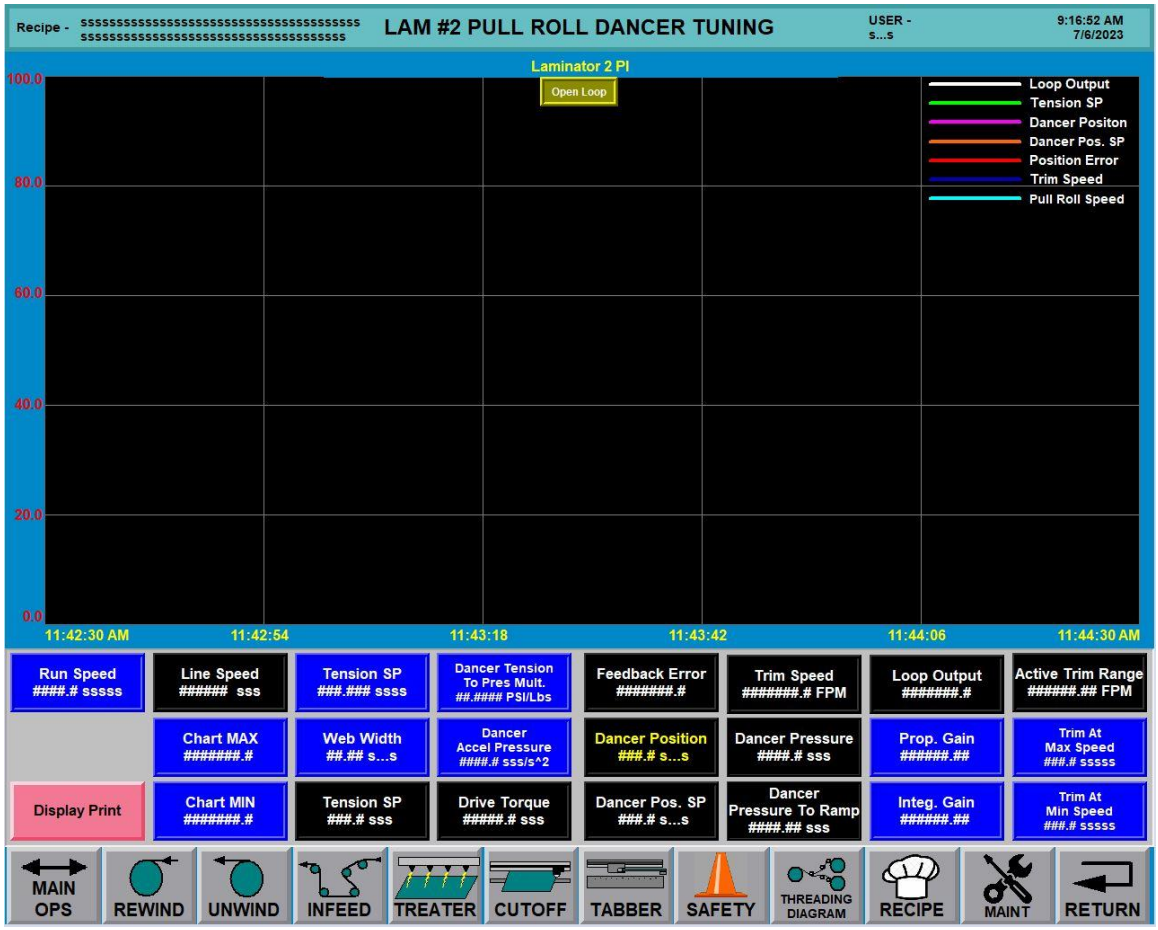
Displays

- **Real-time Tension Feedback Chart:** The chart will display five (5) trending data sets for the laminator 1: Loop Output (**white**), Tension setpoint (**green**), Load Cell Feedback (**cyan**), Tension Error (**red**), and Trim FPM Percentage (**dark blue**), Pull Roll Speed (light blue). Using the PI Gains, the desired effect is to have the Load Cell follow the Tension setpoint using the charts for the laminator 1.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension SP:** Displays the tension as set by the operator.
- **Load Cell Feedback:** The real-time load cell feedback.
- **Drive Torque:** The percent of total motor torque being output by the Winder motor.
- **Feedback Error:** The error between the Load Cell and Tension setpoint value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Trim.
- **Trim Speed:** The scaled trim speed output by the PI loop.

Buttons

- **Tension Loop Mode:** Toggles between OPEN and CLOSED Tension Loop Mode. CLOSED Loop will store the output and internal integrator to initialize the PI loop. OPEN Loop structure will ignore any feedback and disable any trimming.
- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Laminator # 2 Dancer Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.
- **Tension:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the speed of the laminator 2 in order to achieve the desired tension level. Increasing this value will cause the material to be tighter between laminator 2 & pull roll.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Web Width:** Allows operator to enter the web width.

- **Dancer Tension To Pres Mult:** Sets the conversion factor from Dancer Tension to Pressure.
- **Dancer Accel Pressure:** Sets the Dancer Pressure ramp acceleration.
- **Trim at Min/Max Speed:** Scaling for how much the PI loop output will be trimmed by the change in Speed. When set to the same number, the PI loop output % will be multiplied by the number in these fields.
- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

Displays

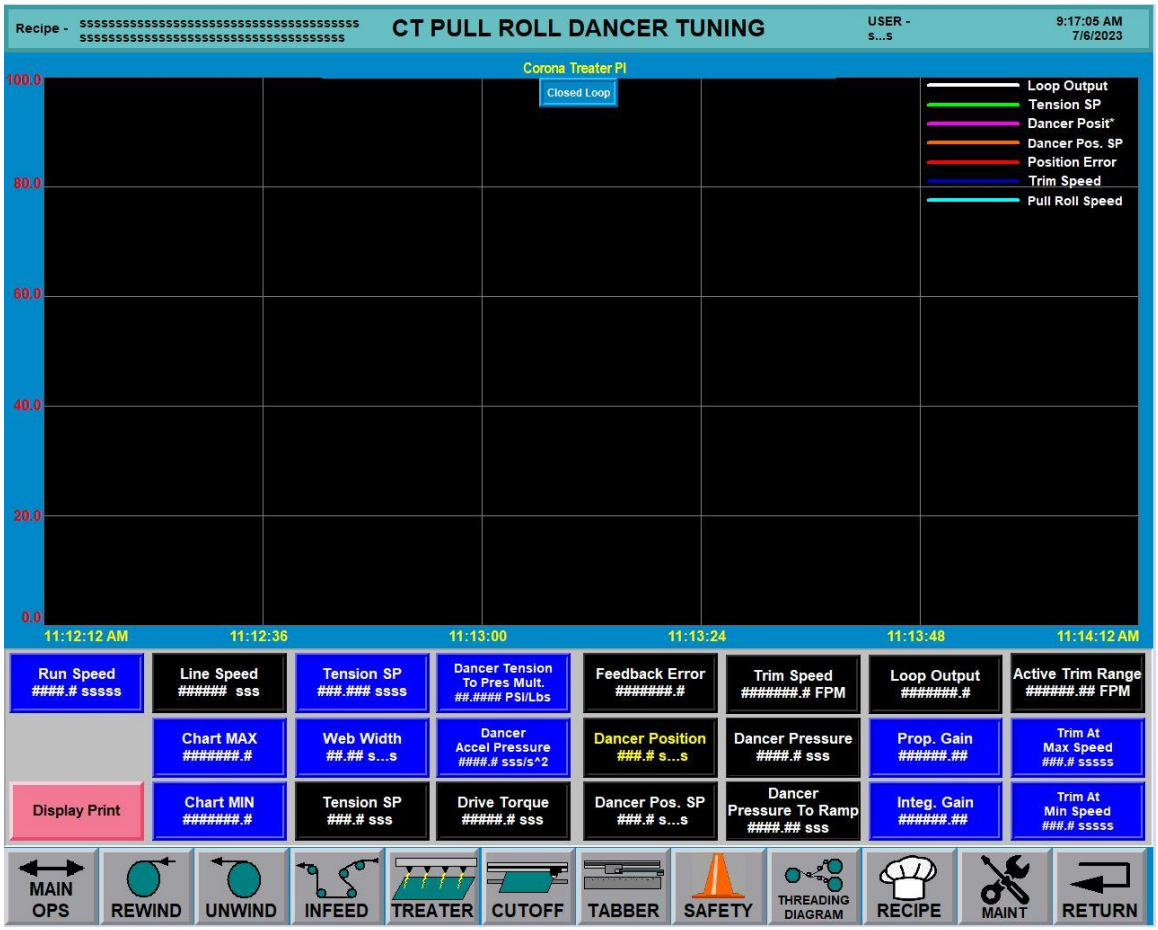
- **Real-time Tension Feedback Chart:** The chart will display five (7) trending data sets for the **Laminator 2 Pull Roll:** Loop Output [%] (**white**), Tension setpoint (**green**), Dancer Position (**magenta**), Dancer Position Set Point (**orange**), Error Value (**red**), Trim Speed (**dark blue**), and Laminator 2 Speed (**cyan**). Using the PI Gains, the desired effect is to have the dancer follow the dancer setpoint using the charts for the Laminator 2.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension Setpoint:** The Tension set by the operator.
- **Drive Torque FB:** Displays the actual motor Torque Feedback.
- **Feedback Error:** The error between the actual dancer position and dancer reference value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **Dancer Position:** Actual feedback of the dancer's position.
- **Dancer Position Set point:** The set point position that the Dancer will maintain while the machine is running.
- **Trim Speed:** The amount of speed calculated by the PI Loop that is to be trimmed.
- **Dancer Pressure:** The air pressure that is being applied automatically by the PLC in order to maintain the *Infeed Dancer* position setpoint.

- **Dancer Pressure To Ramp:** The air pressure set point prior to being ramped. The ramped pressure is based upon the "Dancer Pressure Ramp Rate" set point on the **Infeed Maintenance Screen**.
- **Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Motor Trim.
- **Active Trim Range:** The active Trim Speed Range. This value represents the Trim Speed the machine will apply when the loop output is at 100%.

Buttons

- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Corona Treater Dancer Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.
- **Tension:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the speed of the laminator 2 in order to achieve the desired tension level. Increasing this value will cause the material to be tighter between laminator 2 & pull roll.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Web Width:** Allows operator to enter the web width.

- **Dancer Tension To Pres Mult:** Sets the conversion factor from Dancer Tension to Pressure.
- **Dancer Accel Pressure:** Sets the Dancer Pressure ramp acceleration.
- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Trim at Min/Max Speed:** Scaling for how much the PI loop output will be trimmed by the change in Speed. When set to the same number, the PI loop output % will be multiplied by the number in these fields.

Displays

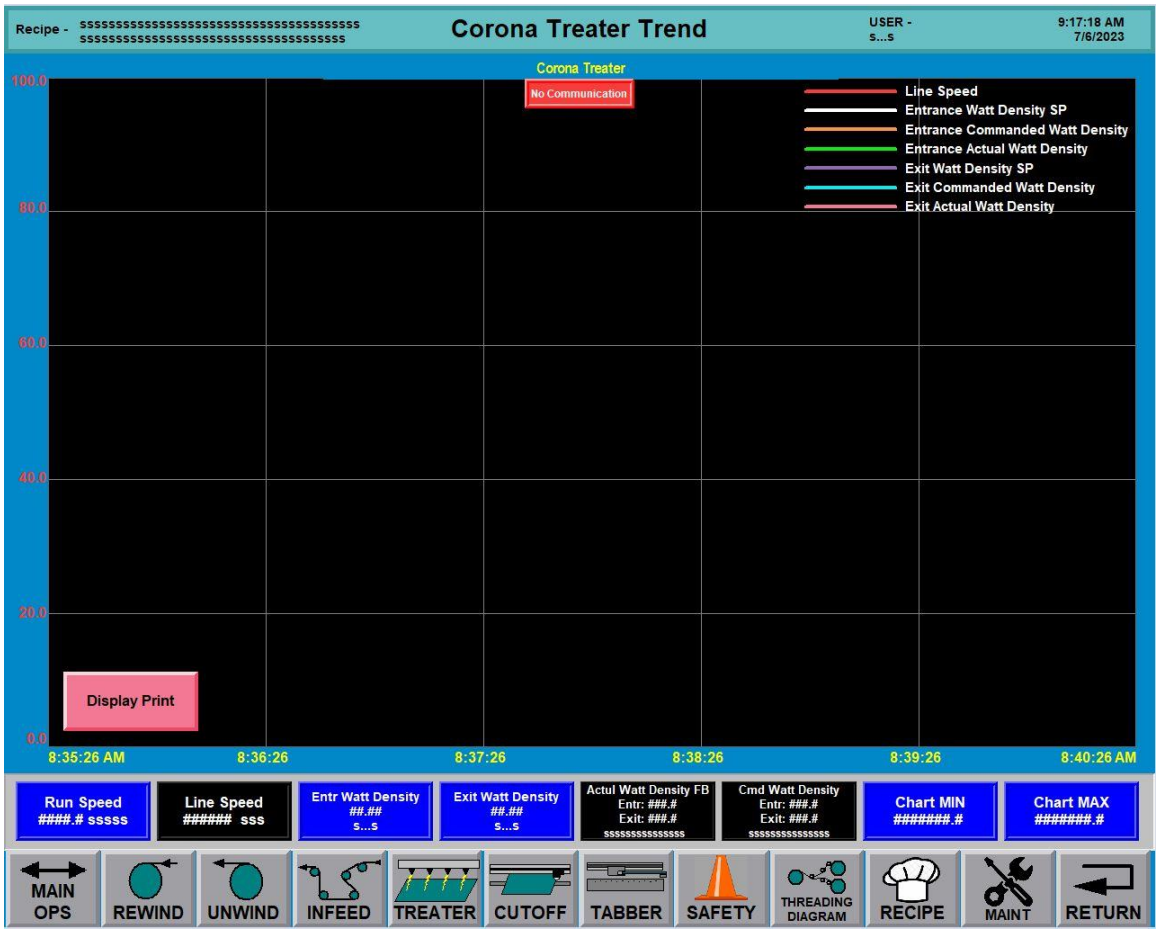
- **Real-time Tension Feedback Chart:** The chart will display five (7) trending data sets for the **corona treater Pull Roll:** Loop Output [%] (**white**), Tension set point (**green**), Dancer Position (**magenta**), Dancer Position Set Point (**orange**), Error Value (**red**), Trim Speed (**dark blue**), and Corona Treater Speed (**cyan**). Using the PI Gains, the desired effect is to have the dancer to follow the dancer set point using the charts for the corona treater Pull Roll.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension Set point:** The Tension set by the operator.
- **Drive Torque FB:** Displays the actual motor Torque Feedback.
- **Feedback Error:** The error between the actual dancer position and dancer reference value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **Dancer Position:** Actual feedback of the dancer's position.
- **Dancer Position Set point:** The set point position that the Dancer will maintain while the machine is running.
- **Trim Speed:** The amount of speed calculated by the PI Loop that is to be trimmed.
- **Dancer Air Pressure:** The air pressure that is being applied automatically by the PLC in order to maintain the *corona treater dancer* position.

- **Dancer Air Pressure To Ramp:** The air pressure set point prior to being ramped. The ramped pressure is based upon the "Dancer Pressure Ramp Rate" set point.
- **PI Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Motor Trim.
- **Active Trim Range:** The active Trim Speed Range. This value represents the Trim Speed the machine will apply when the loop output is at 100%.

Buttons

- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Corona Treater Watt Density Trend Screen



Corona Treater Trend allows the user ability to view data related to the watt density. As you make changes to these parameters you will be able to view the watt density feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.
- **Entrance/Exit Watt Density:** This set point is used to calculate the power required to achieve the desired treating. Watt Density is represented in watts per square foot/meter.

$$\text{Power} = [\text{Watt Density Number X Treat Width (Feet) X Current Line Speed (FPM) X Number of Sides Treated}]$$

> **Note:** It is always important to enter the correct watt density because Treat Width, along with Watt Density, will be used to calculate the power required. Using an incorrect value will result in undesired treatment.

Displays

- **Real-time Tension Feedback Chart:** The chart will display five (7) trending data sets for the **corona treater:** Line Speed (**red**), Entrance Watt Density SP (**white**), Entrance Commanded

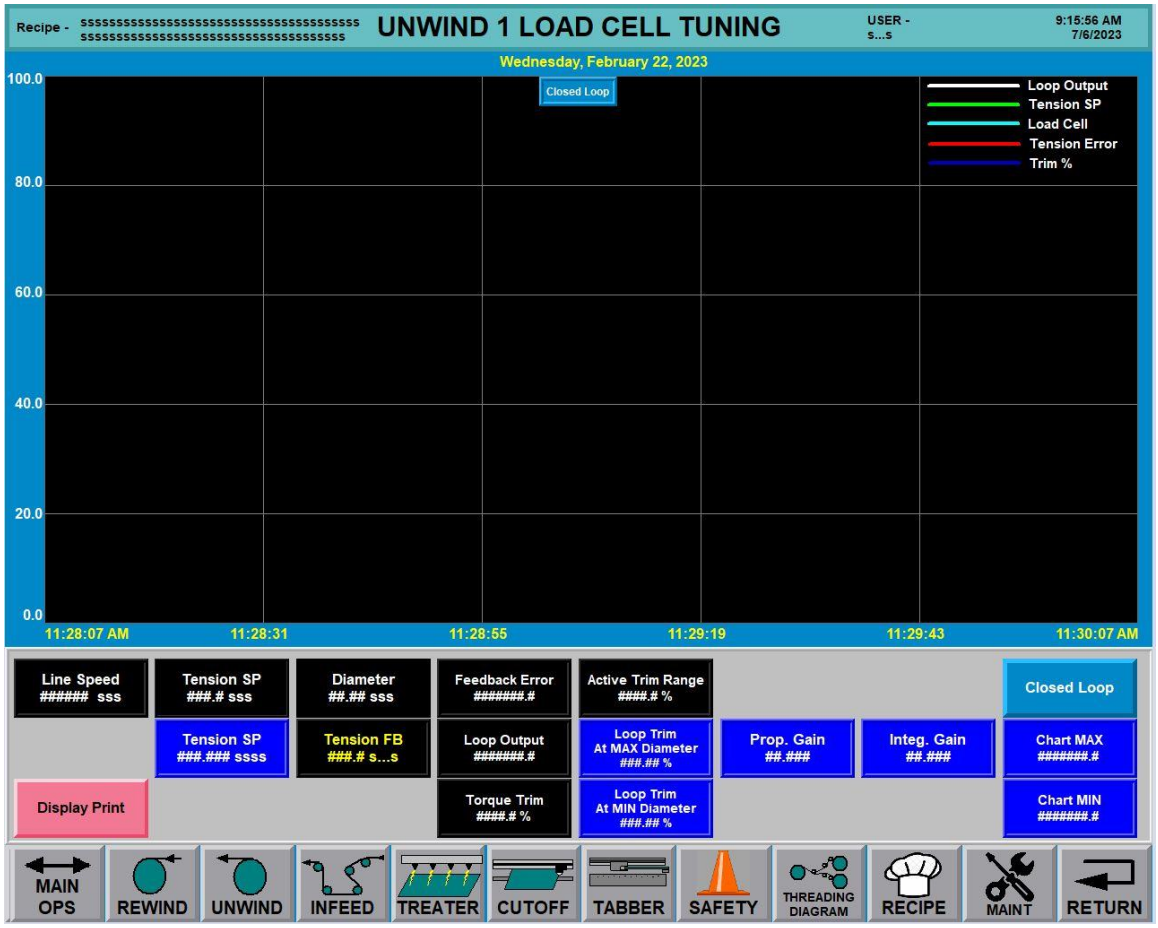
Watt Density (orange), Entrance Actual Watt Density (green), Exit Watt Density SP (purple), Exit Commanded Watt Density (cyan), and Exit Actual Wat Density (pink).

- **Communication Indicator:** Shows whether there is communication between the PLC and Corona Treater.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Actual Watt Density FB:** The actual watt density outputted by the Enercon units.
- **Command Watt Density FB:** The watt density commanded to the Enercon units.

Buttons

- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Unwind # 1 Load Cell Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Tension:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the air pressure of the unwind brakes in order to achieve the desired tension level. Increasing this value will cause the material to be tighter in the unwind section.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Trim at Min/Max Diameter:** Scaling for how much the PI loop output will be trimmed by the build-up of diameter. When set to the same number, the PI loop output % will be multiplied by the number in these fields. As diameter increases, the pressure required to maintain the same tension increases. This implies that the trim pressure also needs to be scaled appropriately.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.

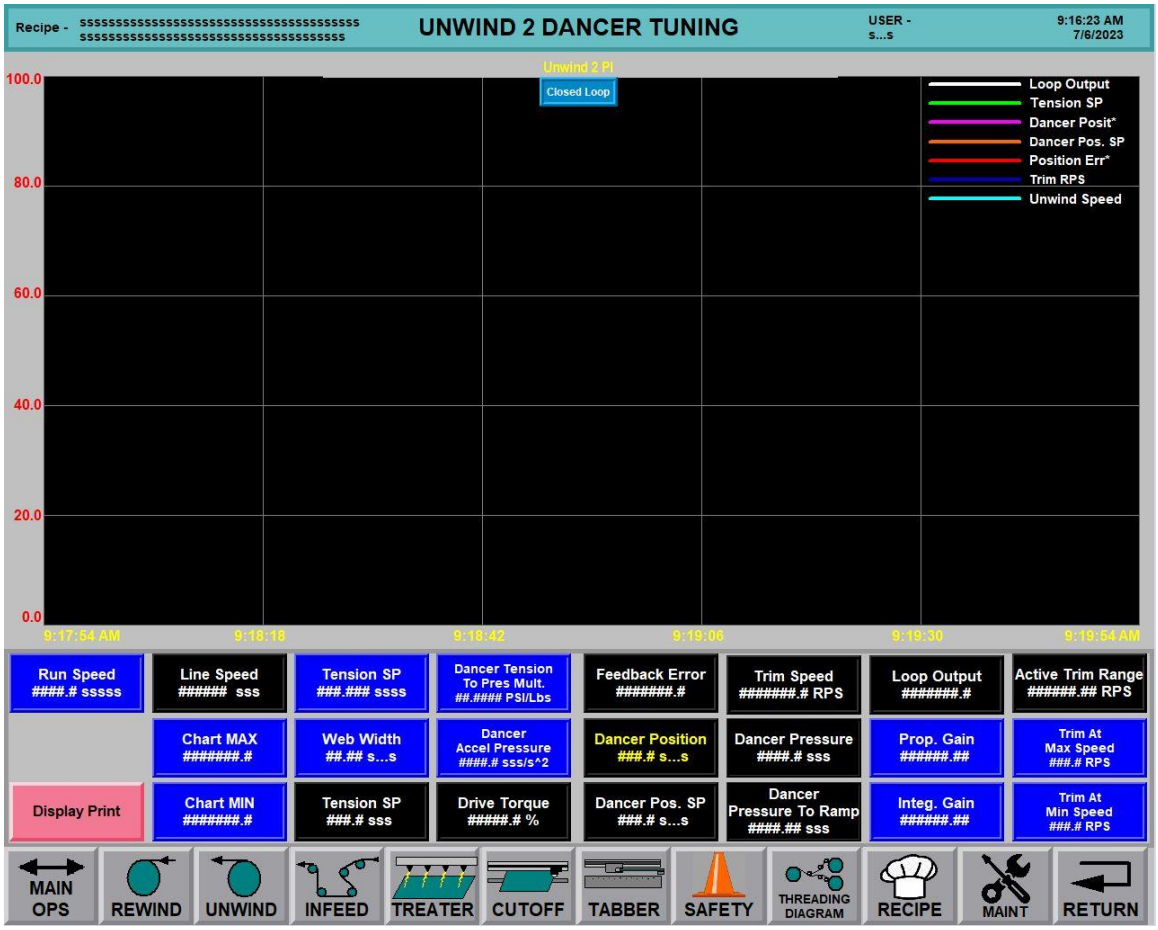
Displays

- **Real-time Tension Feedback Chart:** The chart will display five (5) trending data sets for the Rewind: Loop Output (white), Tension setpoint (green), Load Cell Feedback (cyan), Tension Error (red), and Trim Pressure Percentage (dark blue). Using the PI Gains, the desired effect is to have the Load Cell follow the Tension setpoint using the charts for the Unwind.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension SP:** The Unwind Tension set by the operator.
- **Diameter:** The current diameter of the unwind roll.
- **Tension Feedback:** The real-time load cell feedback.
- **Feedback Error:** The error between the Load Cell and Tension setpoint value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **PI Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Trim.
- **Pressure Trim:** The scaled pressure trim percentage output by the PI loop.
- **Active Trim Range:** The current trim range used by the PLC when the *PI Loop Output* is at 100%.

Buttons

- **Tension Loop Mode:** Toggles between OPEN and CLOSED Tension Loop Mode. CLOSED Loop will store the output and internal integrator to initialize the PI loop. OPEN Loop structure will ignore any feedback and disable any trimming.
- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Unwind # 2 Dancer Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Run Speed:** Allows the operator to set the speed of the line in the machine. Changing the set point while the machine is running will change the speed of the line. Line Speed is limited by the specifications made when the machine was first ordered.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.
- **Tension SP:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the air pressure of the unwind dancer in order to achieve the desired tension level. Increasing this value will cause the material to be tighter in the unwind 2 section.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Web Width:** Allows the operator to input the width of the material on the unwind 2.

- **Dancer Tension To Pres Mult:** Sets the conversion factor from Dancer Tension to Pressure.
- **Dancer Accel Pressure:** Sets the Dancer Pressure ramp acceleration.
- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

  Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

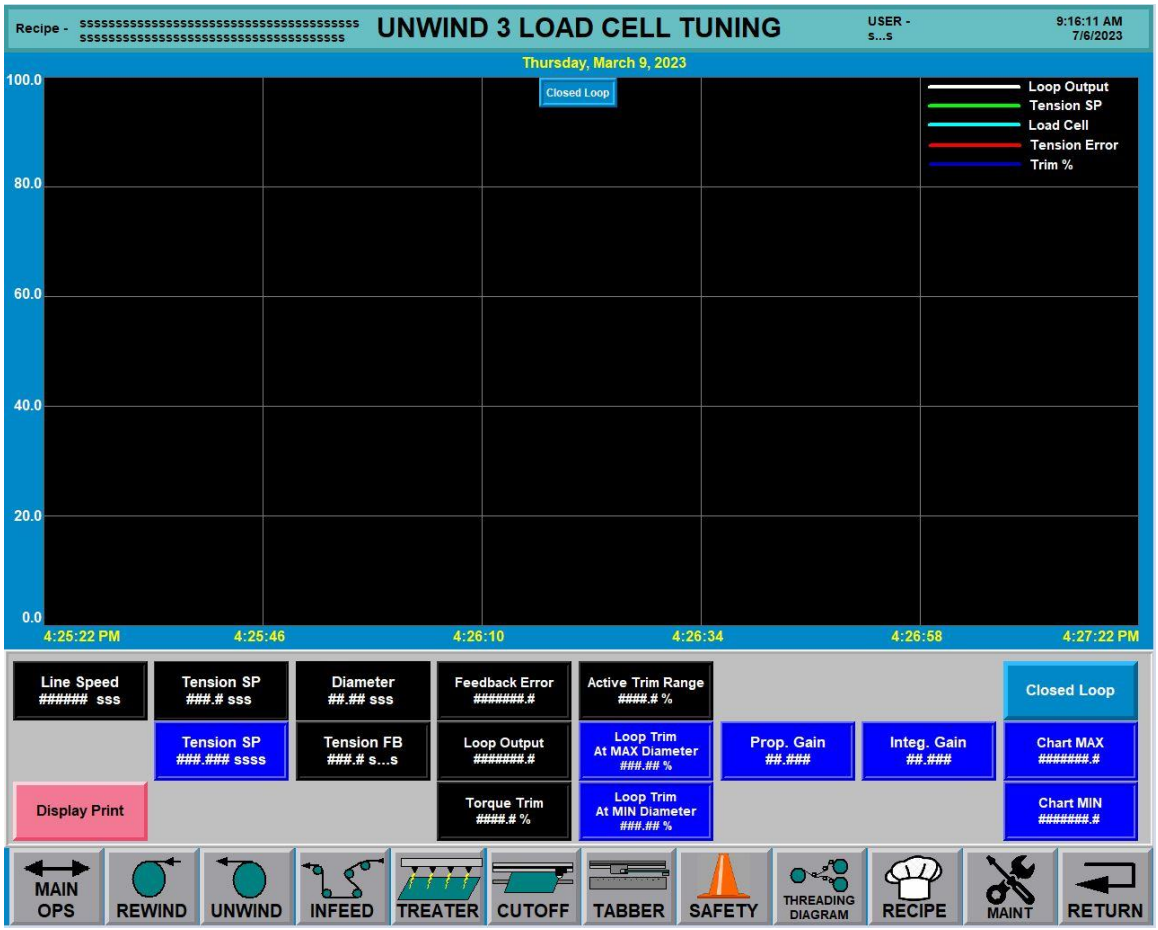
- **Trim at Min/Max Speed:** Scaling for how much the PI loop output will be trimmed by the change in Speed. When set to the same number, the PI loop output % will be multiplied by the number in these fields.

Displays

- **Real-time Tension Feedback Chart:** The chart will display five (7) trending data sets for the **Infeed Pull Roll:** Loop Output [%] (white), Tension set point (green), Dancer Position (magenta), Dancer Position Set Point (orange), Position Error (red), Trim Speed (dark blue), and Unwind Speed (cyan). Using the PI Gains, the desired effect is to have the unwind 1 dancer follow the unwind 2 set point using the charts for the unwind 2.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension Set point:** The Tension set by the operator.
- **Drive Torque FB:** Displays the actual motor Torque Feedback.
- **Feedback Error:** The error between the actual dancer position and dancer reference value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **Dancer Position:** Actual feedback of the dancer's position.
- **Dancer Position Set point:** The set point position that the Dancer will maintain while the machine is running.
- **Trim Speed:** The amount of speed calculated by the PI Loop that is to be trimmed.
- **Dancer Air Pressure:** The air pressure that is being applied automatically by the PLC in order to maintain the *unwind 2 Tension* setpoint.

- **Dancer Air Pressure To Ramp:** The air pressure set point prior to being ramped. The ramped pressure is based upon the “Dancer Pressure Ramp Rate”.
- **PI Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Motor Trim.
- **Active Trim Range:** The active Trim Speed Range. This value represents the Trim Speed the machine will apply when the loop output is at 100%.

Unwind # 3 Load Cell Tuning Screen



When running under closed loop conditions this screen will allow you to view and tune the PI loop. This graph will display the Set point and Feedback values. The tension can also be changed on this screen. The tuning parameters consist of the Proportional, Integral and % Trim. As you make changes to these parameters you will be able to view the tension feedback on the graph screen.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Tension:** Entered in PLI (Pounds per Linear Inch) or pounds by the operator, Tension is used by the PLC to continuously adjust the air pressure of the unwind brakes in order to achieve the desired tension level. Increasing this value will cause the material to be tighter in the unwind section.

  Note: It is always important to balance the Tension setpoints for the entire machine. Setting too high of a tension differential between sections may cause issues during processing.

- **Proportional Gain:** P coefficient to the PI loop tension calculations. The Proportional gain sets the proportionality to the **Error** correction. Setting this too high will result in an unstable system (high oscillation, rapid movement, etc.). Setting this too small will produce a small output change and, therefore, a less responsive system (large tension **Error** <-> small adjustments, slow approach to tension setpoint).

Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Integral Gain:** I coefficient to the PI loop tension calculations. The Integral gain sets the proportionality of the accumulation of past **Error**; it is simply meant to eliminate offsets that the P gain will cause due to oscillation, even at small **Error**. Setting this too high results in low frequency oscillations but large **Error** (Tension sways back and forth slowly around setpoint). Setting this too low will result in slow approaching to the setpoint (P gain causes rapid oscillation but the deceleration of that oscillation is slow).

Note: Misuse of adjusting the gains may cause damage to the equipment. Only authorized personnel should change the gains.

- **Trim at Min/Max Diameter:** Scaling for how much the PI loop output will be trimmed by the build-up of diameter. When set to the same number, the PI loop output % will be multiplied by the number in these fields. As diameter increases, the pressure required to maintain the same tension increases. This implies that the trim pressure also needs to be scaled appropriately.
- **Chart MIN/MAX:** Sets the maximum and minimum limits observed on the PI loop charts.

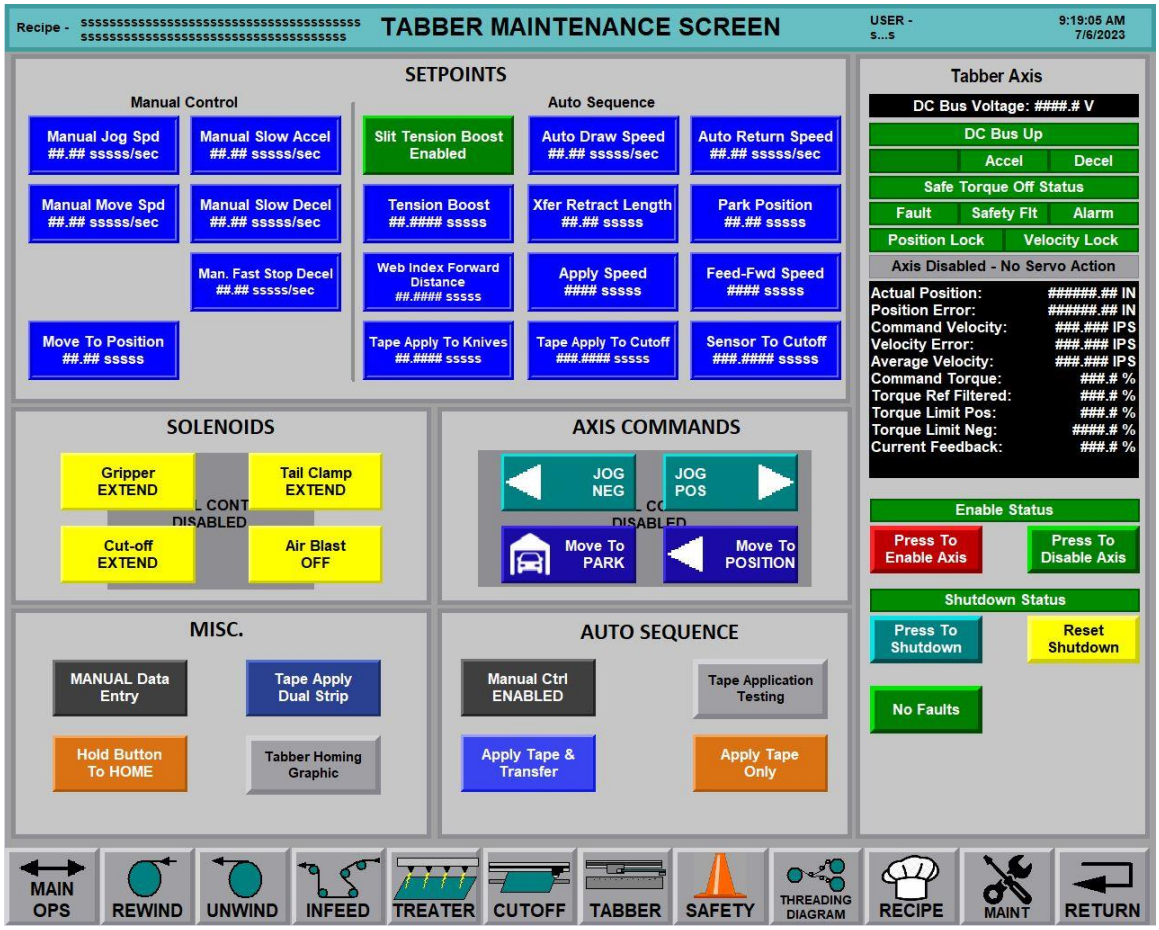
Displays

- **Real-time Tension Feedback Chart:** The chart will display five (5) trending data sets for the Rewind: Loop Output (**white**), Tension setpoint (**green**), Load Cell Feedback (**cyan**), Tension Error (**red**), and Trim Pressure Percentage (**dark blue**). Using the PI Gains, the desired effect is to have the Load Cell follow the Tension setpoint using the charts for the Unwind.
- **Open/Closed Loop Indicator:** Shows whether or not the machine is currently in open or closed loop. Open loop means the section is not currently using feedback to adjust for tension or position. Close loop means the section is actively measuring the feedback from the device and trimming for maintain set point.
- **Line Speed:** The actual speed of the web travelling through the machine.
- **Tension SP:** The Unwind Tension set by the operator.
- **Diameter:** The current diameter of the unwind roll.
- **Tension Feedback:** The real-time load cell feedback.
- **Feedback Error:** The error between the Load Cell and Tension setpoint value. Ideally, this value should be as close to zero as possible. It may go negative, which is normal.
- **PI Loop Output:** The output from the PI loop. Adjusting the gains will change the behavior of the loop output. The output is trimmed (scaled) to generate the Trim.
- **Pressure Trim:** The scaled pressure trim percentage output by the PI loop.
- **Active Trim Range:** The current trim range used by the PLC when the *PI Loop Output* is at 100%.

Buttons

- **Tension Loop Mode:** Toggles between OPEN and CLOSED Tension Loop Mode. CLOSED Loop will store the output and internal integrator to initialize the PI loop. OPEN Loop structure will ignore any feedback and disable any trimming.
- **Display Print:** Allows the printing of the screen to the printer connected. Customer has to configure the printer to be able to print.

Tabber Maintenance Screen



The **Tabber Maintenance Screen** contains the ability to monitor drives' speed and other ramping parameters. The actual (CIP motion) axis controls the speed references and ramping rates of the drives. This screen is used for clearing drive faults and for diagnostic purposes only. In case of reoccurring problems/faults please contact Catbridge service for assistance.

This screen is to be used only by Catbridge Engineers. Any possible changes made here should only be made after consultation with Catbridge Service.

Set points

- **Manual Jog Speed:** Sets the Jog Speed for the Tabber in Manual Mode in Inches Per Second.
- **Manual Move Speed:** Sets the Move Speed for the Tabber in Manual Mode in Inches Per Second.
- **Manual Slow Acceleration:** Sets the Slow Acceleration for the Tabber in Manual Mode.
- **Manual Slow Deceleration:** Sets the Slow Deceleration for the Tabber in Manual Mode.
- **Min Fast Stop Deceleration:** Sets the Fast Deceleration for the Tabber in Manual Mode for when the machine is in Fast Stop Mode.
- **Move To Position:** Sets the distance that the Tabber will travel per setpoint. Note it will move to that position setpoint not an interval of the setpoint.
- **Auto Return Speed:** Sets the speed at which the tabber will return to the home or park position.

- **Park Position:** Sets the tabber park position.
- **Feed-Fwd Speed:** Sets the Speed at which the line will run to bring the tape from the tabber transfer roll apply point to the center of the cutoff knife anvil.
- **Sensor To Cutoff:** Distance from sensor to cutoff. (If applicable)
- **Auto Draw Speed:** Sets the speed at which the tabber will draw the tape on top of the vacuum roll.
- **Xfer Retract Length:** Xfer roll (vacuum roll) will stay in contact with the idler for specified distance.
- **Apply Speed:** Line will slow down to apply speed before vacuum roll makes contact with the idler and transfer the tape on to the material, after which line speed will be changed to feed-fwd speed.
- **Tape Apply To Cutoff:** Sets how far the tape will advance from apply to the cutoff point. A higher number will make the tape go closer to the winding roll – advance more. A lower number will make the web advance less.
- **Tension Boost:** Multiplies the rewind tension by the tab tension boost multiplier when tape is going through knives. (If applicable)
- **Web Index Forward Distance:** Used to calculate distance reference to apply second tape after the web has indexed forward. (If applicable)
- **Tape Apply To Knives:** Rewind tension will be boosted when tape is passing through the knives, tension will stay boosted for "Tape Apply To Knives" distance.

Displays

- **Tabber Servo Status Indicators:** Displays the various statuses associated with the Tabber Servo Axis. **Green** indicators show the particular status is healthy and operational. If an indicator is **Red**, there is fault present in the Axis. Contact Catbridge Machinery about details on the Carriage Statuses.
- **Actual Position:** The scaled position that the Tabber Axis is at with respect to the home position in inches. When measuring to the side frame, add the distance to the home position to determine the absolute position.
- **Actual Velocity:** The scaled velocity of the Tabber Axis in inches/second. When the Tabber is stationary, this value should be 0. This value can be negative is traveling from a high position to a lower position.
- **Command Velocity:** Velocity being commanded to the tabber.
- **Average Velocity:** Average of the actual velocity.
- **Command Torque:** The torque output from the Tabber Axis.
- **Current Feedback:** The current feedback from the Tabber Axis.
- **Velocity Error:** The error in the commanded and feedback velocity from the Tabber Axis.
- **Position Error:** The error in the commanded and feedback position from the Tabber Axis.
- **Torque Ref Filtered:** It applies a time constant to the torque reference signal, determining how quickly it responds to changes.
- **Torque Limit Pos:** Tabber positive torque limit.

- **Torque Limit Neg:** Tabber negative torque limit.

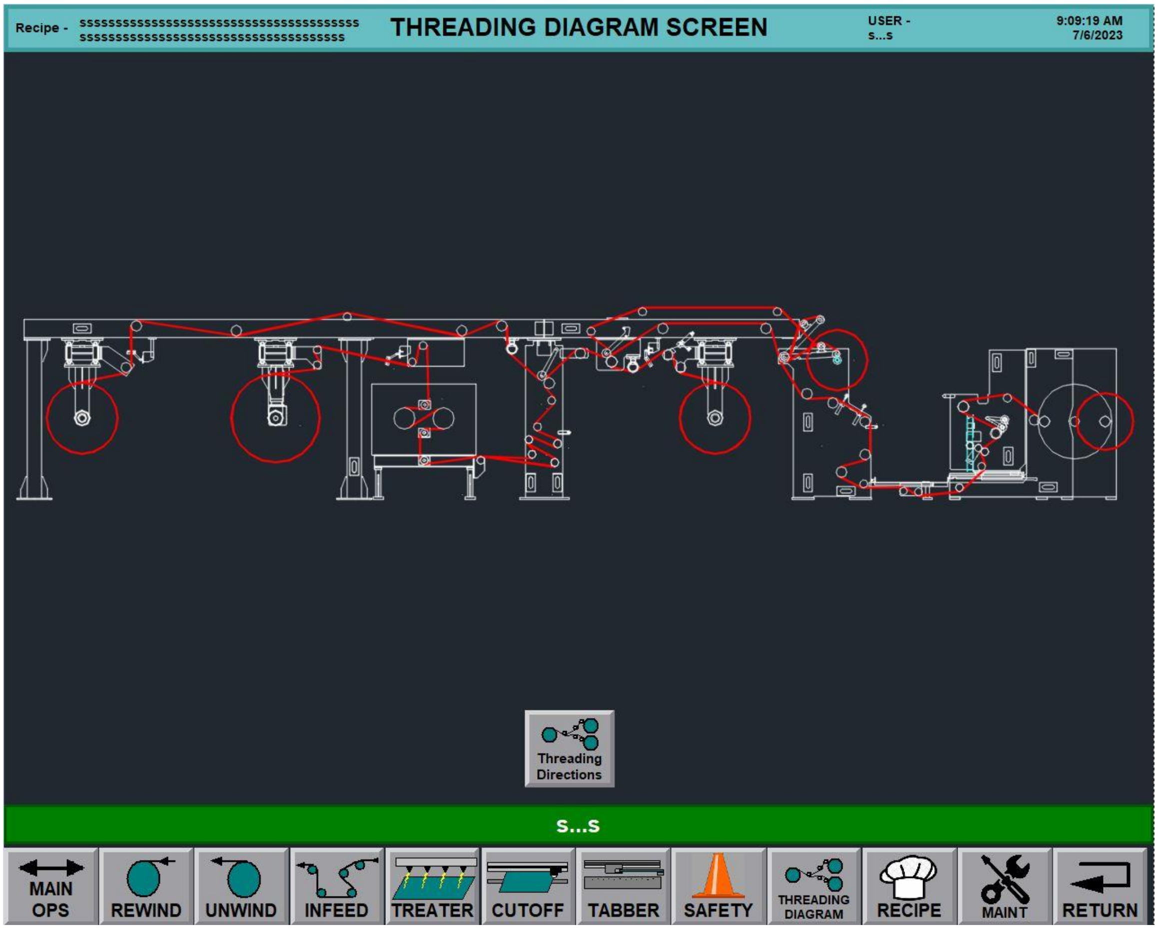
Buttons

- **Slit Tension Boost Enabled/Disabled:** When enabled tension is boosted while tape is traveling to the slitting section. (If applicable)
- **Tabber Sequence Auto/Manual Ctrl:** Toggles between the Manual Control and the Automatic Tabber Sequence.
- **Apply Tape Only:** Applies tape strips to the web according to the current configuration without advancing the tape to the cutoff.
- **Apply Tape & Transfer:** Applies tape strips to the web according to the current configuration and start the Cutoff Sequence.
- **Tape Application Testing:** Bring up a pop-up which allows user to test tabber repeatability.
- **Tail Clamp Extend/Retract:** Extends and retracts the tail clamp. Tail clamp holds the tape in place, so tabber is able to grip the tape from the same position each time. This also helps knife cut the tape after required amount of tape has been pull.
- **Gripper Extend:** Extends the gripper to hold the tape while tabber actuator moves back.
- **Cut-off Extend:** Extends the Cut-off razor to cut the tape off.

Caution: Toggling the Cut-off Extend/Retract will cause the knife to move. Keep hands clear of Tabber when extending or retracting the tabber knife.

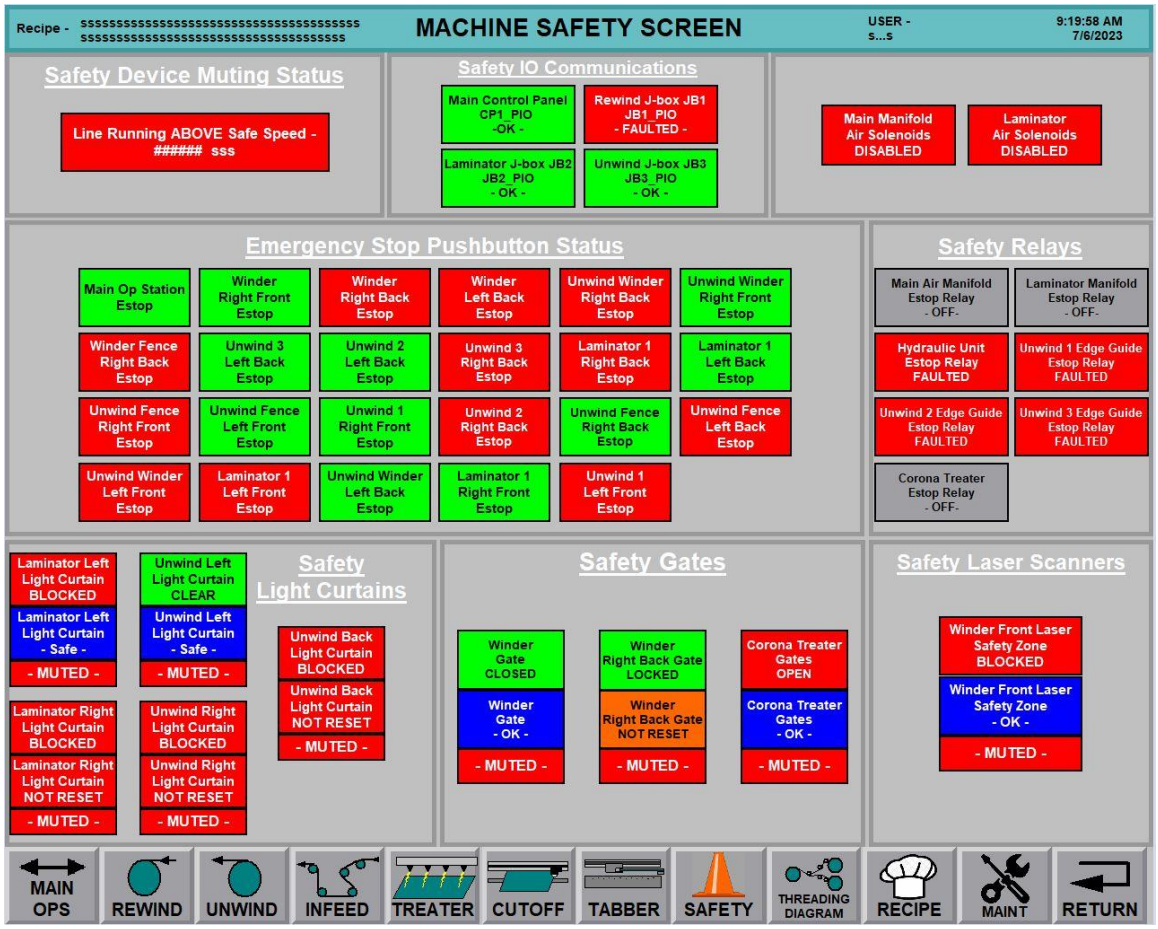
- **Air Blast On/Off:** Turns on and off the use of the air blast.
- **Move to Home:** Moves the Tabber to the Home Position.
- **Manual Data Entry**: Toggles Between Manual Data Entry and Knife Positioner Data. (If applicable)
- **Hold Button to Home:** Allows the operator to home the tabber when tabber needs to be rehomed.
- **Move to Position:** Moves the Tabber to the Position set by the operator.
- **Move to Park:** Moves the tabber to the pre-specified park position.
- **Jog Pos/Negative:** Jogs the Tabber to the left or the right.
- **Tabber Homing Graphic:** Brings up pop-up with tabber home diagram.
- **Tape Apply Dual Strip:** Used to apply tape on the web, index the web forward and apply second strip of the tape. (If applicable)
- **Press To Enable Axis:** when pressed, it enables the axis and turn on the motor wired to it.
- **Press To Disable Axis**: Disables the axis and turn off the motor wired to it.
- **Press To Shut Down**: when pressed, it shuts down the converter unit which removes the power coming from the DC bus output.
- **Press To Reset Shutdown**: Resets the converter after a shutdown to enable the DC bus output.
- **Press To clear faults**: Clears any generated fault coming from the drive axis.

Web Flow Screen



The **Web Flow Screen** depicts the threading diagrams for operator convenience. Threading directions can be found on this screen for Type MC machines.

Machine Safety Screen

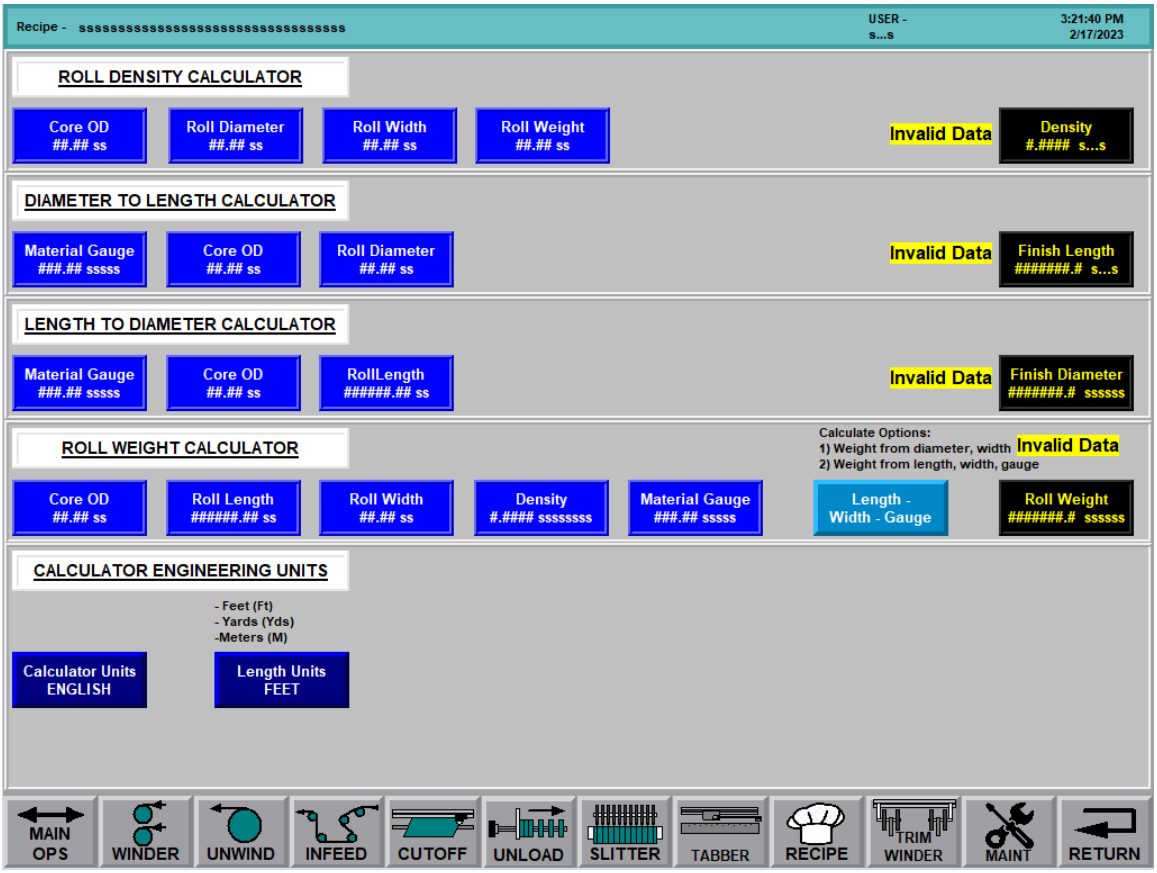


The **Machine Safety Screen** gives an overview of the overall machine safety status. This screen also allows the user to control and view the safety zones remotely from the HMI.

Displays

- **Safety Device Muting Status:** Status of Safe Speed Mode.
- **Safety IO Communication Status:** Status of the Safety IO module(s) on the machine. It also displays a diagnostic counter for the number of times a particular module has faulted.
- **Safety Laser Status:** Statuses of the Safety Laser Scanner Zone.
- **Light Curtain Status:** Status of the light curtain.
- **Safety Gate Statuses:** Statuses of the safety gates.
- **Festo Air Solenoids Status:** Status of the Machine Festo Air Solenoids.
- **E-STOP Pushbutton Statuses:** Status of all 23 Emergency Stop Pushbuttons on the machine.
- **E-STOP Safety Relay Statuses:** Status of the tripped Safety Relays. Relays will become tripped when an Estop occurs, shutting down power to the device. If there is a “FAULTED” status on the relay indicator, this means the relay did not properly switch states when required.

Roll and Material Calculators



The **Roll and Material Calculators Screen** allows the operator to input line material properties and compute quantities of interest. The following computations are available: Density, Finish Length, Finish Diameter, and Roll Weight.

Set points

- **Core Outer Diameter:** Represents the outer diameter of the core mounted on the Rewind/Unwind shaft.
- **Roll Diameter:** The measured diameter of the roll.
- **Roll Width:** The total width of the material on the web.
- **Roll Weight:** The total weight of the roll. To be more accurate, do not include the weight of the core.
- **Material Gauge:** The thickness of the material.
- **Density:** The density of the material. This can be found from the very top calculator it is unknown.

Displays

- **Density:** The calculated density of the material.
- **Finish Length:** The calculated final footage of the roll.
- **Finish Diameter:** The calculated diameter of the finished roll.
- **Roll Weight:** The calculated weight of the roll.

Buttons

- **Weight Calculation Select:** Toggles between calculating the roll weight using two methods: Diameter – Width or Length – Width – Gauge.
- **Calculator Units:** Toggles between English or Metric Units for the calculator.
- **Length Units:** Toggles between Feet, Yards, or Meters as a length unit for the calculator.

Alarm Banner

The **Alarm Banner** will be displayed on all screens when an Alarm has been activated and displays an Alarm message. Only ACTIVE Alarms are displayed here.

The Alarm Banner will pop-up and display Alarms one at a time as they are triggered. The Alarm will remain displayed on the banner until it is "ACKed" (Acknowledged), a new Alarm is triggered, or the CLOSE button is pressed. Once the Alarm is ACKed, the next Alarm in the buffer will be displayed on the Alarm Banner. Alarms will also be displayed on the **Alarm History** and **Status Screens**.

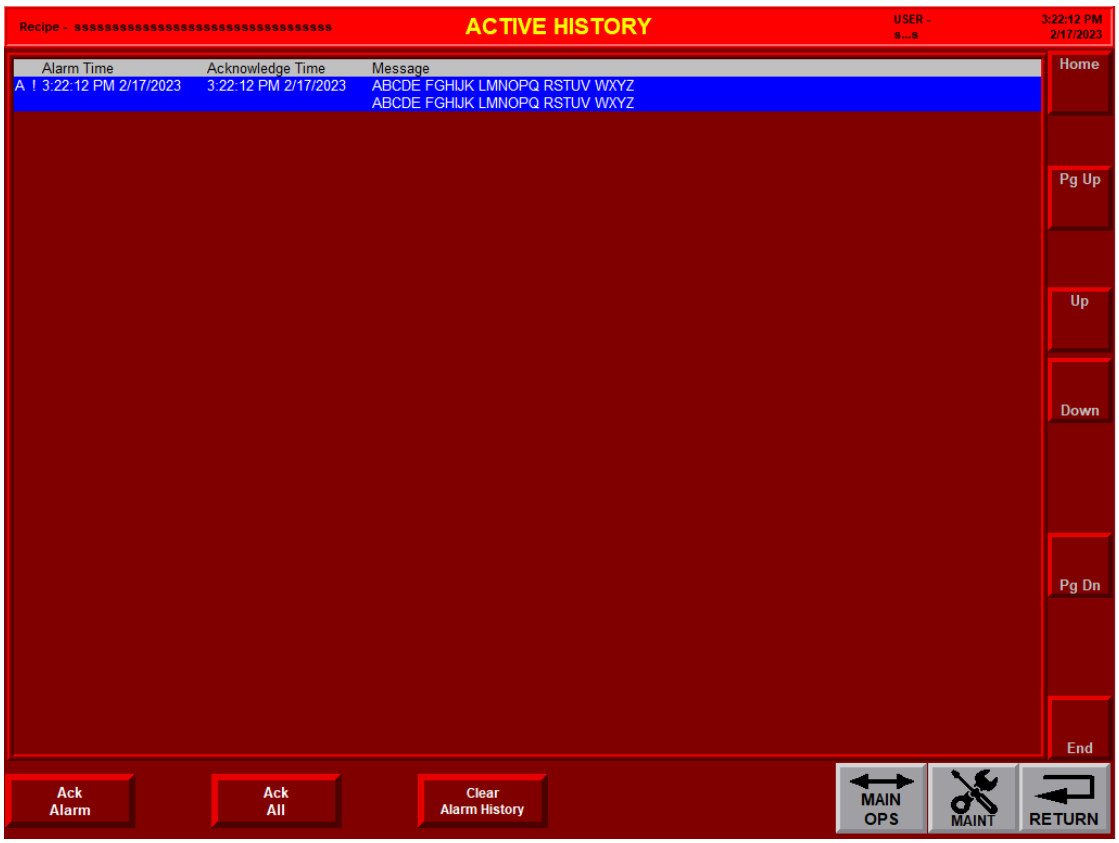
Displays

- **Active Alarm Display:** Displays the most recent Active Alarm including the time and date the Alarm was triggered and a description of the Alarm that was triggered.

Buttons

- **Ack Alarm:** Acknowledges the alarm and allows other alarms to be displayed in the banner.
- **Close:** Closes the **Alarm Banner Screen** and returns the user to the previous screen without acknowledging the alarm.
- **Alarm Status:** Brings the user to the **Alarm Status Screen**. The Alarm Banner will close.
- **Alarm History:** Brings the user to the **Alarm History Screen**. The Alarm Banner will close.

Alarm History Screen



The **Alarm History Screen** will display up to 100 alarm messages, along with the time it was triggered and when the alarm was acknowledged by an operator.

Displays

- **Alarm History Display Field:** Displays up to 100 alarm messages and details pertaining to the alarms. Active Alarms display a "!" next to the Alarm Time Field. Alarms that have been acknowledge by the operator display an "A" next to the Alarm Time Field.

Buttons

- **Ack Alarm:** Acknowledges the alarm. An "A" will display next to the Alarm Time field to signify the Alarm has been acknowledged.
- **Display Active UnAcked:** Displays all currently active alarms in the Alarm History Display Field.
- **Ack All:** Acknowledges ALL alarms that have been triggered. It is recommended to carefully identify each alarm before pressing this button.
- **Clear Alarm History:** Deletes all alarms from the Alarm History Display Field.
- **Alarm Banner:** Displays the Alarm Banner Popup.
- **Alarm Status:** Brings the user to the **Alarm Status Screen**.
- **Page Up/Down Select:** Advances the alarm list in increments of 25 (e.g., if recipe number 10 is highlighted, press the Page Up Button and the next recipe displayed will be recipe number 35).
- **Up/Down Select:** Increases or Decreases the position of the highlighted alarm by one, respectively.
- **Top/End Select:** Advances the alarm list to the Top or End of the recipe list.

Screen Security Setup

The **Screen Security Setup** allows the login credentials for each user level to be changed individually. Any login functions can be done from here except actually logging in, which can be done from the **Login Screen.**

This screen is only accessible to users who have Level 4 access or higher and, in so, can only be modified by those users or a Catbridge user.

Set points

- **Auto Logout Time:** Sets the Login Timeout for the currently logged in user on the machine. After the time set has been accumulated, the user will be logged out automatically and need to log back in.
- **Level # User Name Input:** Brings up an alphanumeric keyboard for the advanced user to modify the assigned user name.
- **Level # Password Input:** Brings up an alphanumeric keyboard for the advanced user to modify the assigned user password.

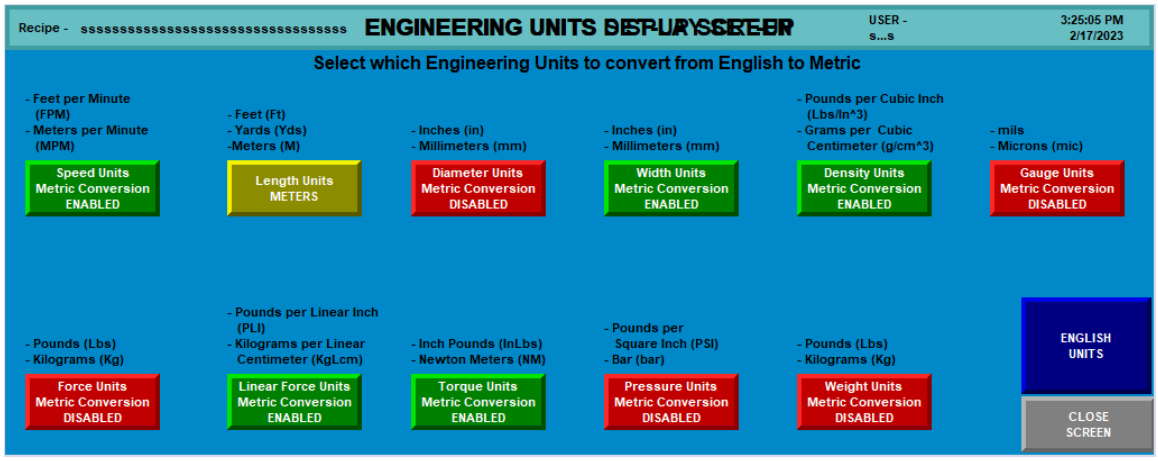
Displays

- **Logged In User Display:** Shows the current User Level Status.
- Logout Timer: The time remaining before the active user is automatically logged out.

Buttons

- **User Login Screen:** Brings the user to the **User Login Screen** where they may login as a user or change user levels.
- **Logout User:** Immediately logs out the current user and sets the user level to 0.

Engineering Units Display Popup



The **Engineering Units Display Popup** allows the operator to manually select which units the machine will display. The units may be a mix of Metric and English Units, if desired.

Buttons

- **Speed:** Toggles between using:
  - **English:** Feet Per Minute (FPM)
  - **Metric:** Meters Per Minute (MPM)

- **Length:** Toggles between using:
  - **English:** Feet (Ft)
  - **English:** Yards (Yds)
  - **Metric:** Meters (M)

- **Diameter:** Toggles between using:
  - **English:** Inches (in)
  - **Metric:** Millimeters (mm)

- **Width:** Toggles between using:
  - **English:** Inches (in)
  - **Metric:** Millimeters (mm)

- **Density:** Toggles between using:
  - **English:** Pounds Per Cubic Inch (Lbs/in^3)
  - **Metric:** Grams Per Cubic Centimeter (g/cm^3)

- **Gauge:** Toggles between using:
  - **English:** Mils (1/1000 of an inch)
  - **Metric:** Microns (mic)

- **Force:** Toggles between using:
    - **English:** Pounds (Lbs)
    - **Metric:** Kilograms (Kg)

- **Linear Force:** Toggles between using:
    - **English:** Pounds Per Linear Inch (PLI)
    - **Metric:** Kilograms Per Linear Centimeter (KgLcm)

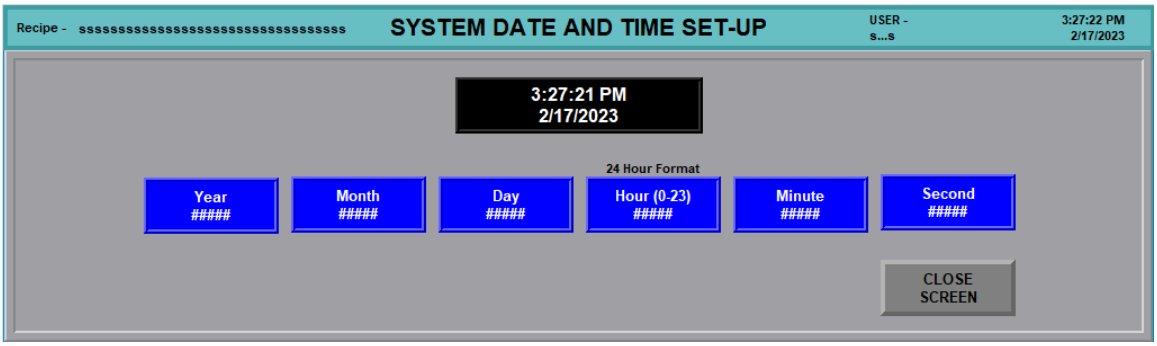
- **Torque:** Toggles between using:
    - **English:** Inch Pounds (InLb)
    - **Metric:** Newton Meters (NM)

- **Pressure:** Toggles between using:
    - **English:** Pounds Per Square Inch (PSI)
    - **Metric:** Bar (bar)

- **Weight:** Toggles between using:
    - **English:** Pounds (Lbs)
    - **Metric:** Kilograms (Kg)

- **Metric/English Units:** Toggles between English and Metric Units as the display units for the machine. The individual buttons will be toggled to the respective unit conversion.

System Date and Time Popup



The **System Date and Time Popup** permits the operator to modify the internal date and time of the PLC. The date and time will display in the U.S. standard date and time format and cannot be modified without a Catbridge Engineer.

Set points

- **Year:** Sets the year the PLC will start from.
- **Month:** Sets the Month the PLC will start from.
- **Day:** Sets the Day the PLC will start from.
- **Hour:** Sets the Hour the PLC will start from.
- **Minute:** Sets the Minute the PLC will start from.

  Note: The Minute set point is set in 24-hour time format (i.e., 8 o'clock A.M. would be set as 8 and 2 o'clock P.M. would be set as 14).

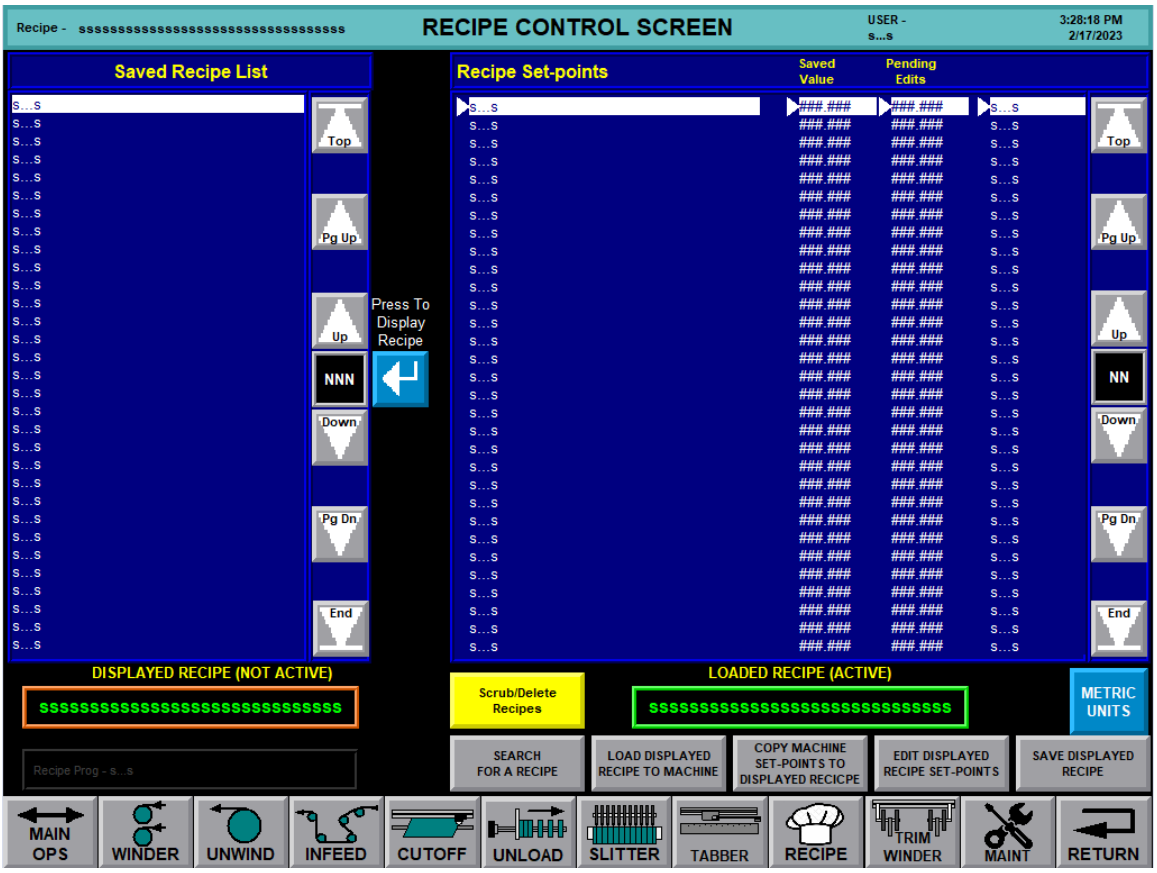
- **Second:** Sets the Second the PLC will start from.

Displays

- **System Date and Time:** Shows the Current Date and Time that the PLC has stored in its memory.

Section
6

RECIPE CONTROL



Pressing the **Recipe Control Screen Pushbutton** on the HMI causes the **Main Recipe Control Screen** to be displayed. At a quick glance, it may seem that there is a lot of activity on the screen; however, once understood, the following screens will save a great deal of time during operations. The specific tensions and set points will be stored in a recipe. The saved recipe list is located on the left side of the screen. No longer will it be necessary to search through handwritten notes to set tensions for certain materials.

Recipes listed on the left side of the screen **(Saved Recipe List)** can be selected/loaded when the machine is **NOT** running.

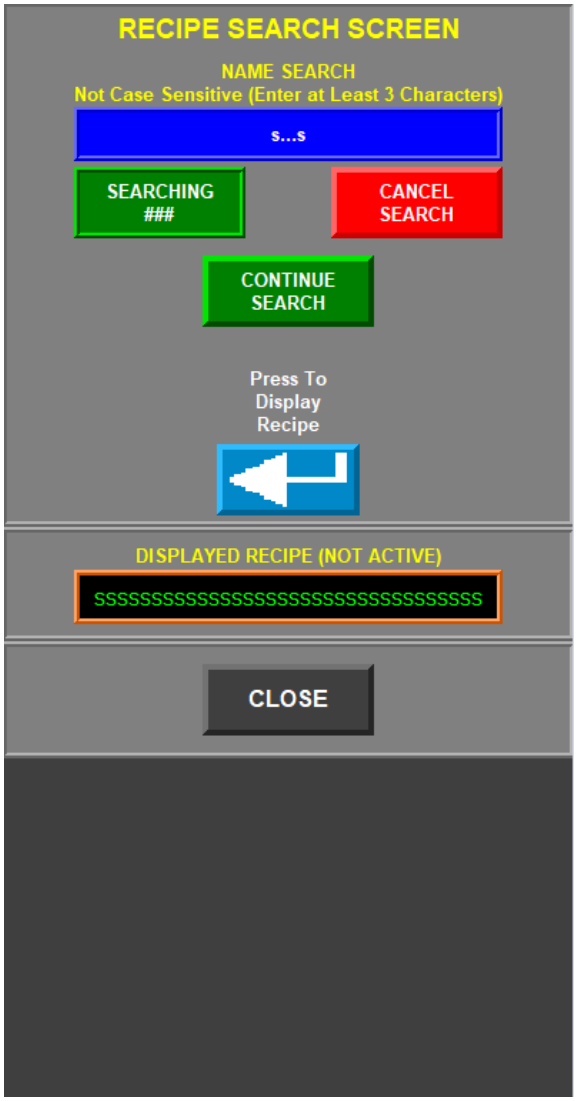
Up to 100 recipes can be stored. If additional recipe storage is desired, contact **CATBRIDGE MACHINERY** for more recipe slots.

To navigate the list of saved recipes,

- Use the **UP/DOWN PB** arrows, to scroll through them one at a time.
- Use the **PAGE UP/DOWN PB** arrow to move through the recipes one page at a time
- Press the **TOP** or **END PBs** to go directly to the top or bottom of the list

There are five gray pushbuttons on the bottom of the **Recipe Set point Display** portion of the screen (right side). Each of the functions will be addressed in the following pages and step-by-step instructions are outlined for each as well.

Search for a Recipe



1) Press the first gray pushbutton on the lower right side of the **Recipe Set points Screen**.

2) Using the navigation pushbuttons (described above), locate the desired recipe.

3) When the desired recipe has been located, press the **Press to Display Recipe PB.**

4) The recipe number will now be displayed next to the PB and a box labeled **Display Recipe (NOT ACTIVE)**, informs the operator that the recipe has been selected but **NOT** loaded.

    a. A search can also be performed to locate a recipe. Enter the first three characters of the saved recipe and press the **Search PB.**

    b. The program will begin to search for the saved recipe associated with the entry.

    c. When the recipe(s) matching the search string are located, the green pop-up box will display the associated number(s).

    d. If multiple recipes are found, the operator may press the green **Continue Search PB** and additional recipe locations will be listed, one at a time.

e. Once the correct recipe location has been found, press the **Press to Display Recipe PB.**

5) The right side of the screen will now display the recipe set points associated with the selection.

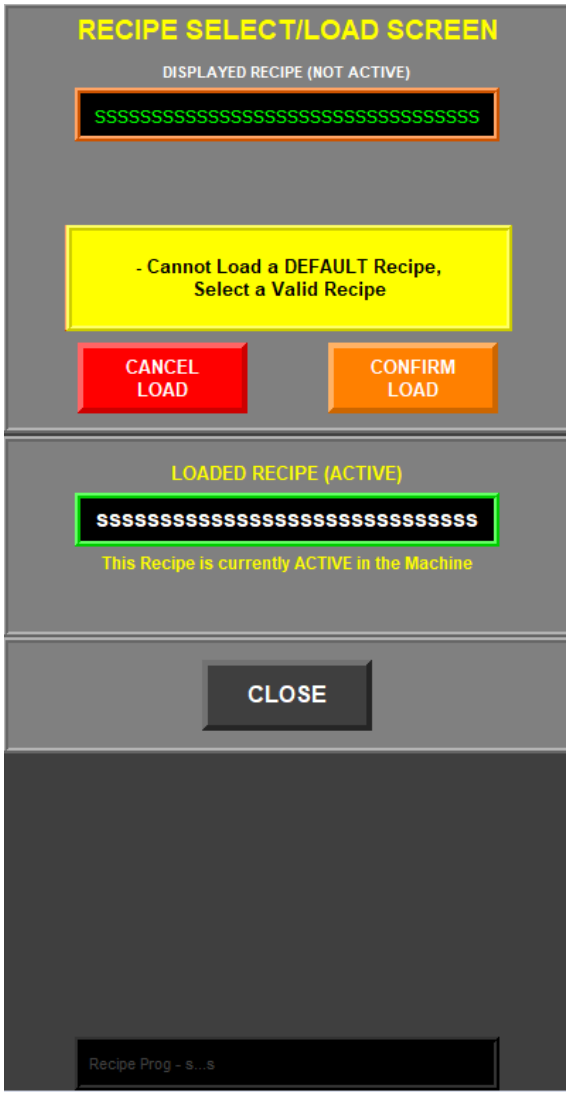
   a. Set point names are in the first column.
   b. Saved Values, which are the actual set points, are stored in the recipe
   c. Pending Edits, that have been added or are pending, are also listed.

NOTE: All recipe set points should be reviewed and confirmed **prior** to recipe change execution.

6) Press the **Close PB** at the bottom of the pop-up box.

7) The recipe will **NOT** be loaded into the program until the operator returns to the **Main Recipe Control Screen** and presses the fifth gray pushbutton on the lower right side of the screen (**Save Displayed Recipe)**.

Load Displayed Recipe to Machine



1) Locate and press the gray **Load Displayed Recipe to Machine PB** at the bottom of the **Recipe Set points** side of the **Recipe Control Screen**.

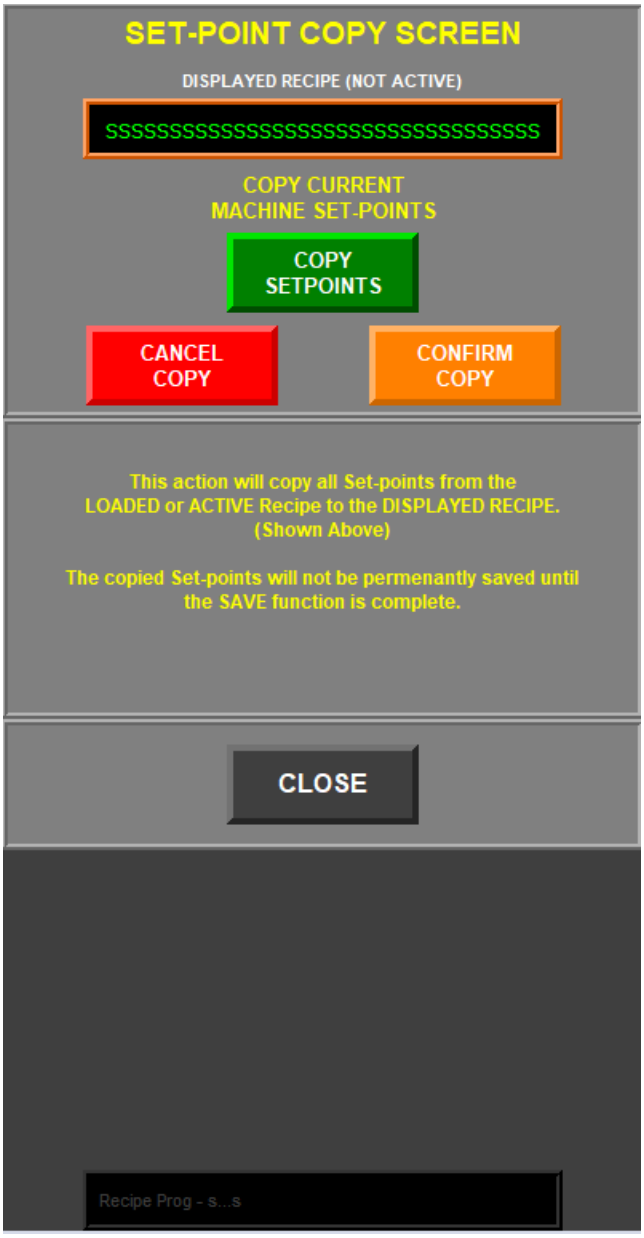
2) If the correct recipe has been chosen, press the **Load Recipe to Machine PB.**

3) To accept the selection, press the **Confirm PB.** Notice the **Loaded Recipe (ACTIVE)** now has the chosen recipe loaded into the program.

    a. At this point, there is still an opportunity to cancel the selection by pressing the **Cancel PB.**

4) Once verified, the active recipe now displays as the current recipe. The pop-up can be closed and the material can be run.

Copy Machine Set points to Displayed Recipe



1) To create a new recipe, select an unused name to edit from the **Saved Recipe List** on the left side of **Main Recipe Control Screen**. (Default 1, Default 2, …)

2) Press the third gray pushbutton (**Copy Machine Set points to Displayed Recipe)** on the lower right side of the **Recipe Set points Screen.**

3) Enter all of the desired set points.

4) Press the **Copy PB** to accept the recipe name (Default 1, Default 2, …)

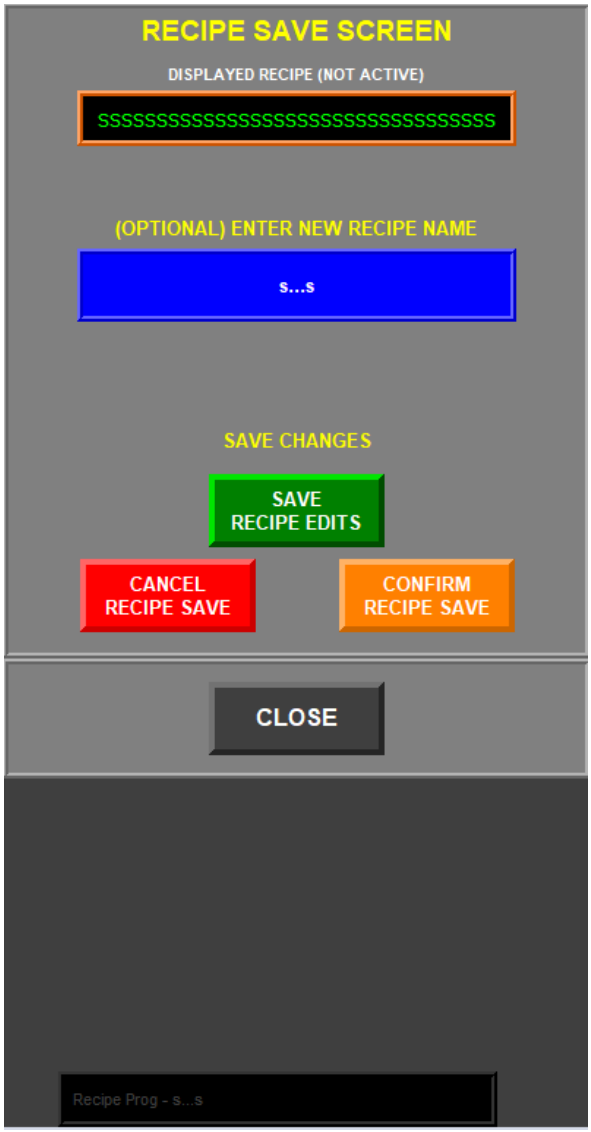
5) Confirm all set points on the various **Rewind and Unwind Operating Screens** are correctly entered **before** saving the recipe.

a. If a stored set point in a recipe needs to be changed in the future, use the Edit the Recipe feature describe in the next section.

6) Return to the **Main Recipe Control Screen**. Under the **Recipe Set points Display List**, in the **Pending Edits** column, the values that the machine will copy will be stored here.

7) To Edit these values, see **Edit Displayed Recipe Set points**.

Save Recipe to Machine



1) Complete the steps in **Copy Machine Set points to Displayed Recipe** above.

2) Locate and press the gray **Save Displayed Recipe PB** at the bottom of the **Recipe Set points** side of the **Recipe Control Screen**.

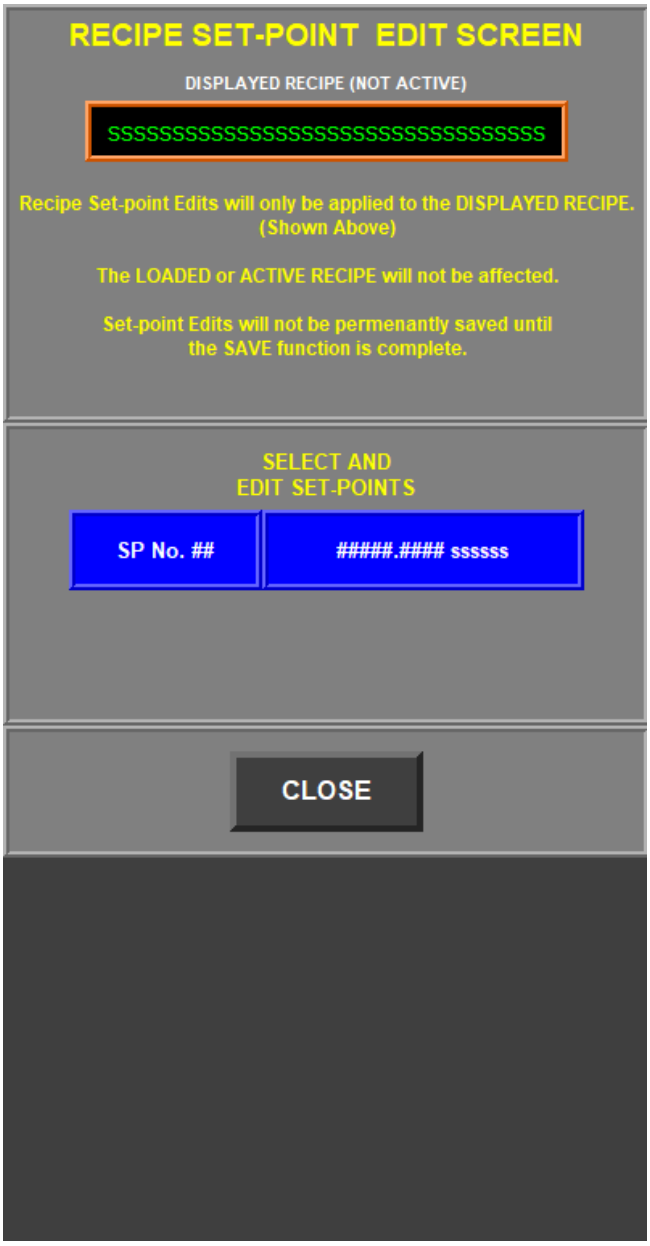
3) When the pop-up screen displays, enter the new name of the recipe that has been created.

4) Once you have entered the new recipe name, press the **Save Recipe Edits** button.

5) Press the **Confirm PB** to finalize**.**

6) Return to the **Main Recipe Control Screen**. The new recipe will be listed on the left side of the screen in the **Saved Recipe List.**

Edit Displayed Recipe Set points



From this screen, the operator can make edits to any of recipe set points in the **Saved Recipe List** on the left side of the **Main Recipe Control Screen**.

1. Press the fourth gray button on the lower right side of the **Recipe Set points** display of the **Main Recipe Control Screen.**

2. When the above pop-up appears, enter the number of the saved recipe to which edits will be changed.

3. Enter the new set point values. Confirm the entry for all the **Rewind and Unwind Operating Screens.**

4. Press the **Accept New Value PB.** The new set points now appear under **Pending Edits.**

5. Once all set points have been edited and confirmed for accuracy, remember the accepted the values will not be changed in the recipe until the operator returns to the **Main Recipe Screen** and presses the **Save Displayed Recipe PB.**

    a. At this point, there is still an opportunity to cancel the selection by pressing the **Cancel PB.**

6. To accept the changes, press the **Confirm PB.**

Section
7

TYPICAL SYSTEM OPERATION

Field Sensing Devices

Inductive Proximity Switch: These are used to sense the unwind diameter rotation, positions of the Rewind mandrels, Rewind shaft supports, Rewind mandrel locks, cutoff assembly, Turret Sequence, Carriage assembly, Cart locations, etc. The devices work by sensing the close proximity of metal at the sensor face using induction.

Limit Switch: Similar to an inductive proximity switch, Limit Switches give feedback on position. Unlike an inductive proximity switch which is non-intrusive, a limit switch is device that when mechanically pushed, pulled, rotated, etc. will physically close (or open) an electrical contact. Limit switches can mostly be found on Carts to determine if a Roll is present or if a Cart is in a particular position.

Edge Guide Detector: A C-shaped bracket with the web positioned between its mouths is used to detect the edge of the web as it passes through the center of the mouth. Ultrasonic sound waves rebound off the web detecting whether its edge is between the plates. A **red** or **green** LED on the face of the detector illuminates to show whether or not the web is too far in to or out of the detector's mouth. The Web Guide then pushes the Unwind laterally to compensate. Ideally, the LED should be off or rapidly swapping between **red** and **green** to indicate the correct web position.

Load Cell: Load Cells are a key part in measuring tension feedback from the web. The Load Cells use a field sensing device on an idler roll and an amplifier to receive the returning signal. The Load Cells devices use a constant electrical potential (voltage) that, when under a load, change the resistance of the sensing device changing the voltage coming in to the Amplifier. This voltage is then scaled by the Amplifier and sent to the PLC where it is read to give an accurate estimate of the tension in the web. Load cells sensors must be mounted halfway between the wrap angles of the roll it is mounted on. See the "*Care and Maintenance Manual*" for information about calibration and mounting.

Ultrasonic Range Finder: An Ultrasonic Range Finder is a device that uses high frequency sound waves to measure distances. The sensor is generally used in Roll Diameter sensing to "snapshot" a starting diameter. It is important that the sensor is mounted in such a way that it lines up straight with the center of the Roll. When changing materials, the sensor may need to be recalibrated. Non-woven materials tend to absorb some of the sound wave energy giving inaccurate feedback if not calibrated correctly. See the "*Care and Maintenance Manual*" for information about calibration and mounting. (If applicable)

Infrared "Time of Flight" Laser Distance Sensor: Sensing distance using a laser can be one of the more accurate methods of obtaining crucial operating information. These sensors use Infrared light (a red-light dot) to measure distance by measuring the time difference between when the light is first emitted from the sensor to the time the light is bounced off the object and received at the sensor. These sensors can be used for a variety of functions such as sensing Roll Diameter, distance travelled of carts, sensing position of operator adjustable features, and many more. These sensors are best used for materials that are not transparent, specifically for the reason that light will not reflect well off of those materials. Similar to the **Ultrasonic Range Finder**, when setting up the sensor for diameter sensing, the sensor must be mounted so the sensing position is measured at

the center of the roll. See the "*Care and Maintenance Manual*" for information about calibration and mounting.

Photoelectric Sensor: A Light emitting sensor that senses a fixed distance. This sensor uses the photoelectric effect to detect the fixed distance of an object in front of its emitting light beam. When the detector senses a loss in photoelectric flux beyond its internal threshold, the sensor outputs a signal to the PLC.

Rotary Encoders: Similar to potentiometers, rotary encoders are objects that output an analog signal based on the rotation of its shaft. The sensors can be used to detect angles of arms or dancers. The signal is read by the PLC and scaled to the appropriate value where it can then be used in other calculations for pressure, location, or diameters.

Power Up

The system has a main disconnect switch located at the upper-right corner of the control cabinet. This switch is the only source of power and will power up or shut down the entire system.

Caution: It is not recommended to cut or apply power from the cabinet while the electrical cabinet is open. Equipment is grounded but there is still a potential for injury or death if the control cabinet is open.

Before power-up, it is recommended that the equipment be briefly inspected.

- Be sure all personnel are clear of the equipment

  Make sure equipment is cleared of any debris

  Briefly inspect all sections visually for any loose components

  Check to see if system has required air supply (if applicable)

  Ensure no personnel are in or around the equipment

The Power Up process for the PLC and electrical components may take anywhere from 2 to 5 minutes depending on the size of the machine and the number of components. The PLC, once powered up, will go through a preliminary check, preventing movement or resetting the Safety.

After power has been applied initially, it will be necessary to reset the E-STOP circuit. Check all E-STOP interlocks and then press the E-STOP Reset Pushbutton – the white light should now be illuminated. This procedure inhibits motion until the operator is ready to run.

Note: For Type MC machines, it may be necessary to rehome the Cutoff Carriage as it may not retain its location on power down. For older machines without servo control, operators will need to rehome the Cutoff Carriage if the Carriage is not stored at the rear proximity sensor on startup. For more information on homing the Carriage, refer to **Section 4 – *System Concepts* Mobile Carriage (MC)**, where applicable.

To Properly Power Up the Machine

1) Verify that the machine can be powered up with whomever is responsible for production or an available supervisor.
2) Clear any debris around the machine.
3) Inspect for loose components.
4) Close and lock any and all Electrical Cabinets or Junction boxes.
5) Clear the area of any personnel around the machine.
6) Remove any lock out/tag out hasps and locks from the air supplies around the machine.
7) Rotate the blue 90-degree valve on the air block to apply air to the machine.
8) Read the pressure gage on the main air supply valve. The air supply should read greater than 80 PSI for optimal performance.
9) Locate the external electrical disconnect to the machine.
10) Obtain the proper personnel or permission to power up the machine using the external electrical disconnect.
11) Remove the lock out/tag out hasp and lock on the external electrical disconnect.
12) Apply power using the external electrical disconnect.

Caution: DO NOT OPEN THE ELECTRICAL PANEL! There is now potential inside the cabinet.

13) Remove the lock out/tag out hasp and lock on the electrical cabinet's electrical disconnect. For information on lock out/tag out, refer to **Section 3 – *Safety Features* Lock Out/Tag Out**.
14) Apply power to the electrical cabinet by turning the **red** electrical disconnect clockwise to power the machine up.
15) Allow the machine to power up for 2 – 5 minutes.
16) While the machine is powering up, go to each operator pushbutton station and reset each Emergency stop pushbutton. Twist the head to reset the pushbutton. For information on Operator Stations, refer to **Section 4 – *Description of Controls* Operator Stations**.
17) Once the HMI display fully powers up, it will display the **Catbridge Main Screen**. At the bottom of this screen is the status indicator. Wait for the status indicator to no longer say "- - - > Powering Up - - - > Please Wait - - - >" in **orange**.
18) Verify that there are no personnel in and/or around the machine.
19) Press the "E-Stop Reset" pushbutton on the Main Operator Station's pushbutton box below the HMI.

Threading the Equipment

To thread the material from the Unwind to the Rewind, make sure the E-Stop circuit is reset and the Brake is off.

Refer to **Section 4 – *System Concepts* – Web Flow** for a graphic displaying the correct web path.

To load a roll of material on the Unwind, open the Unwind Chucks, using the selector switch located on unwind operator station. Load the Unwind Jumbo then begin threading the machine through the correct web path.

Caution: Please ensure that the roll is adequately supported by the cart before opening the unwind chucks, as failure to do so may result in serious injury.

The material should be secured to a Rewind core and several wraps made onto this core before engaging any cutting functions. Doing this will help to align and properly tension the web. At this point, it may be desirable to set the edge guide sensor to the required position.

Core the Rewind shaft with the proper size cores and load the Rewind shaft. Check all parameters related to tension control and winding tension.

As a summary of the required steps, make sure:

1. All guards are in place
2. You have threaded the material in the proper **Web Path**
3. Correct Unwind/s has been activated.
4. The Unwind **Brake is ON** and the correct unwind tension was set on the Unwind **Screen**
5. The web passes through the **Edge Guide Sensor** at the exit of the Unwind and the Edge Guide is in **Automatic Mode**
6. The rest of the required settings are made at the corresponding **SETUP** (**Unwind**, **Rewind**, etc.) screen for the production line. (Refer to **Section 5 – *Description of Controls)***

Recovery from an E-Stop

When an E-Stop is initiated, the machine will come to a complete stop very rapidly, all accessible nip points will open up, and all other peripheral components will be shut down (i.e., edge guide etc.). It is important that the operator has a full understanding of what each component does to prevent injury or lessen the impact of an injury.

Reset the tripped device and Press the E-STOP RESET Pushbutton located at the Main Operator Station. Using the E-STOP Reset pushbutton will ensure a quick and efficient recovery from any type of emergency or previous threat to safety.

Shutting Down

When the power switch is opened, all components will be de-activated. The drives will stay on for a few seconds before faulting and turning off. This is meant to prevent damage to the drives and stop any

motion as the internal capacitors discharge. Pneumatic components will remain in the same position they were previously.

Pneumatic and hydraulic components will not move from their position during a shut down. All pneumatic and hydraulic devices are either held in position using Pilot Operated check valves, an all ports blocked valve, or predefined to a specific position by the type of valve used. Due to the nature of using highly pressurized fluids, pneumatic and hydraulic devices can cause serious damage and injury. By mechanically locking these components to a specific position, this alleviates the need for operator intervention, potentially reducing the risk of injury or death.

Additionally, when the PLC powers down, all the information is by the PLC (excluding any communications information from drives, Inputs and Outputs [I/O], etc.). All set point values, internal scaling values, modes, etc. are stored inside the PLCs Nonvolatile Memory. On startup, the PLC gathers the information stored inside the Nonvolatile Memory and inputs it into the correct fields. No manual inputting is necessary.

Note: For Type MC machines, it may be necessary to rehome the Cutoff Carriage as it may not retain its location on power down. For older machines without servo control, operators will need to rehome the Cutoff Carriage if the Carriage is not stored at the rear proximity sensor on startup. For more information on homing the Carriage, refer to **Section 4 – *System Concepts* Mobile Carriage (MC)**, where applicable.

Caution: The operator should be completely aware of the current state of the machine before removing air pressure and electrical power. A visual inspection should be done to ensure safety of any personnel. Failure to do so may result in injury or death.

To Properly Shut Down the Machine

1) Verify that the machine can be shutdown with whomever is responsible for production or an available supervisor.
2) Clear the area of any personnel around the machine.
3) Turn the electrical disconnect downwards to shut down the power from the machine.

Caution: Some machines may contain more than one electrical disconnect. Be sure to repeat the above for each electrical disconnect on the machine.

Caution: Even though the main electrical connection to the electrical panel may be disconnected, there is still voltage inside the panel. DO NOT OPEN THE ELECTRICAL PANEL YET!

4) Locate the external electrical disconnect to the machine.
5) Obtain the proper personnel or permission to shut down the power to the machine using the external electrical disconnect.
6) Shut down the power from the external disconnect.
7) Place a lock out/tag out hasp and lock on the external electrical disconnect to signify that the machine will be powered down until further notice.
8) Locate any other external electrical disconnects and repeat steps 5 – 7.

9) Place another lock out/tag out hasp and lock on the machine's electrical disconnect. For information on lock out/tag out, refer to **Section 3 – *Safety Features* – Lock Out/Tag Out**.

10) Once the electrical connection has been disconnected from the machine, if applicable, go to the main air supply valve.

11) Push the **red** hinge to exhaust the air from the machine.

Caution: Some machines may contain more than one air supply valve. Disconnect the rest of the machine's air supply valves as needed to fully shut down.

12) Place lock out/tag out hasps and locks on any air supply valves to signify that the machine will be powered down until further notice. For information on lock out/tag out, refer to **Section 3 – *Safety Features* – Lock Out/Tag Out**.

Note: It is good practice to always press an Emergency Stop pushbutton during power down. This forces the next power up procedure to reset all Emergency Stops and view the area around the machine.

To safely power up or power down Corona Treater units, always refer to the Enercon's user manual or documentation. The manual will contain detailed, step-by-step instructions on how to perform these actions correctly, along with any essential precautions that should be followed.

At this point, the machine is fully powered down. The electrical cabinet may be opened and airlines may be disconnected.

Note: After the machine has been fully powered down, DO NOT MOVE ANY ACTUATORS FROM THEIR CURRENT POSITION. If any actuators are moved while the machine is powered down, they may potentially lose their position reference and need to be rehomed.

Caution: HYDRAULIC COMPONENTS CONTAIN HIGHLY PRESSURIZED FLUID. DO NOT ATTEMPT TO DISCONNECT ANY HYDRAULIC LINES WITHOUT PROPER TRAINING AND KNOWLEDGE OF THE CIRCUIT. Refer to the *Catbridge Care and Maintenance Manual for All Catbridge Machines* for information on hydraulics.

Section
8

TROUBLESHOOTING

General

The following pages contain information on the troubleshooting of machine equipment malfunctions and failures that may occur during normal operation. For each problematic occurrence, there is a list of probable causes and corrective measure(s) to help aid in solving the underlying issue. The operator should be completely aware of the machine's current state before investigating any components, especially pinch points. Before inspecting, be sure to E-STOP the machine to prevent accidental motion of mechanisms.

This troubleshooting table covers some of the most common issues. For specific components (i.e., drives, printer, sensors, etc.), please see the components respective manual for troubleshooting or contact your maintenance personnel.

Procedures

PROBLEM	PROBABLE CAUSE	CORRECTIVE MEASURE
Machine will not start with Line Start Pushbutton.	E-STOP Circuit is tripped.	Reset E-STOP Pushbutton. Press E-STOP Reset Pushbutton
		Reset Safety Zone Interlocks. Press E-STOP Reset Pushbutton.
	A Drive is faulted.	Reset drive fault. If not fixed, inquire within Drive Manual Troubleshooting Section.
Tension too high/low during operation.	Rewind Drive is faulted.	Reset drive fault. If not fixed, inquire within Drive Manual Troubleshooting section.
	Material Properties incorrectly input.	Verify the web properties in the Unwind **Screen**.
	Unwind Brake not engaged.	Turn on the Unwind Tension Brake.
	Rewind Diameter is incorrect.	Enter the correct rewind diameter and thickness.
Error(s) display PanelView HMI (If applicable).	PLC is faulted.	Check PLC processor for fault light; Reset PLC fault.
	Communications problem to PLC.	Check cabling for frayed wire or improper terminal contact. Verify I/O LEDs are correct color.

PROBLEM	PROBABLE CAUSE	CORRECTIVE MEASURE
PLC is faulted (if applicable).	Math Error/Overflow.	Check for math overflows or undefined values in program (beyond operator). Clear related value and reset PLC.
	Memory is corrupted.	Reload PLC from memory module (beyond operator).
Hydraulic Arms are not moving (if applicable).	Pump not turned on.	Check motor contactor in Main Electrical Enclosure. Reset contactor.
	Electrical wire not making contact.	Check wiring for the hydraulic unit, especially bypass valve.
	Enable button not being held. (If applicable)	As a safety measure, certain unwind arm models are equipped with an Enable button. This button must be held when operating the Arms.
Slits are dancing, not piercing material, overlapping, etc. (If applicable).	Tension may be too high or too low.	Change tension set point(s) on HMI.
	Razor knives may be dull (If applicable)	Replace knives.
	Web is slipping on Pull Roll or Drum.	Low/High Tension – adjust set points.
		Incorrect diameter – verify initial web parameters (thickness, width, etc.).
Machinery will not move back into place (Trim Winder, Carriage, Tabber, etc., if applicable).	Component has travelled over the limits of proximity sensor (Overtravel).	Remove any debris and clear of personnel. Jog the component back within the bounds of the sensors. If jogging does not work, the component may need to be manually moved.
The Trim Winder components move in the wrong direction (If applicable)	Motor leads are backwards	For the DC motors, swap the wires going to A+ and A- on the DC drive. For AC motor, swap any TWO wires from U/T1, V/T2, or W/T3.

Detailed information for maintaining and troubleshooting guidelines can be found in the *Catbridge Care and Maintenance Manual for All Catbridge Machines*.

Report Problems to Maintenance

If persistent faults occur report these problems to maintenance.

Some problems, such as speed control on the Rewind or Unwind drive may require re-calibration of diameter sensors and dancer encoder by maintenance.

It is recommended that all problems are recorded and logged.

Assembly Drawings and Parts List

Included (within this manual or enclosed CD/Flash Drive) are the assembly drawings with bill of material listing to identify parts for future ordering of parts and maintenance.

Contact Catbridge Machinery

For an explanation of the troubleshooting procedures listed above or to get help with a problem not listed, contact Catbridge Machinery at:

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REVISION HISTORY

VERSION	CHANGES	DATE
1.0	Initial Draft	07/30/2023