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USER GUIDE

UGE064-0217

MedLine® Combination Puller/Cutter

(Shown with some optional equipment)

Corporate Office: 724.584.5500 | Instant Access 24/7 (Parts and Service): 800.458.1960 | Parts and Service: 814.437.6861

Please record your equipment's model and serial number(s) and the date you received it in the spaces provided.

It's a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints, and parts lists together for documentation of your equipment.

Date:

Manual Number: UGE064-0217

Serial Number(s):

Model Number(s):

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Introduction

Purpose of the User Guide

This user guide describes the Conair MedLine Combination Puller / Cutter and explains step-by-step how to install, operate, maintain and repair this equipment.

Before installing this product, please take a few moments to read the user guide and review the diagrams and safety information in the instruction packet. You should also review manuals covering associated equipment in your system. This review won't take long, and it could save you valuable installation and operating time later.

How the Guide is Organized

Symbols have been used to help organize the User Guide and call your attention to important information regarding safe installation and operation.

 Symbols within triangles warn of conditions that could be hazardous to users or could damage equipment. Read and take precautions before proceeding.

1 Numbers indicate tasks or steps to be performed by the user.

◆ A diamond indicates the equipment's response to an action performed by the user or a situation.

❒ An open box marks items in a checklist.

- A circle marks items in a list.

Indicates a tip. A tip is used to provide you with a suggestion that will help you with the maintenance and the operation of this equipment.

 Indicates a note. A note is used to provide additional information about the steps you are following throughout the manual.

Your Responsibility as a User

You must be familiar with all safety procedures concerning installation, operation, and maintenance of this equipment. Responsible safety procedures include:

- Thorough view of this User Guide, paying particular attention to hazard warnings, appendices, and related diagrams.
- Thorough review of the equipment itself, with careful attention to voltage sources, intended use, and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.

ATTENTION:
Read This So No One Gets Hurt

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

⚠ WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

⚠ WARNING: Voltage hazard

This equipment is powered by alternating current, as specified on the machine serial tag and data plate.

A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in severe personal injury and erratic machine operation.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as routine maintenance. Only qualified personnel should perform troubleshooting procedures that require access to the electrical enclosure while power is on.

⚠ DANGER: Moving Parts

Emergency stop (E-stop) buttons are located at several accessible points on the operator side of the machine on top of the main plate at the upstream end. When pressed, it will disconnect power to the machine drives. The E-stop must be physically pulled out to reset the switch. To start the machine drives again after an E-stop has been pressed, any fault message seen in the control system must be cleared. The machine must be reset by using the blue reset button (hold in for 2 seconds to reset) before the machine drives can be restarted.

(Continued)

ATTENTION:
Read This So No One Gets Hurt (continued)

⚠ WARNING: Pinch hazard

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury.

- Walk-through style belt guards which protect from injury, but also, allow side entry for ease of operation. Upper and lower belt guards independently protect the operator from being caught in the belts or associated driven sheaves.
- The power cord is attached to the upper guard by a receptacle on the rear side of the guard. You must disconnect this power cord to remove the upper belt guard, ensuring that the puller will not start if the upper guard is not in place.
- The flip up safety switch on the discharge end of the upper belt guard allows operation only when in the down position. If anything is caught on the upper belt and drawn in, the guard flips up and immediately shuts off the power to the entire combination Puller / Cutter.
- The Emergency Stop button is located on the control panel and on top of the upper belt guard at the upstream end. Pressing either of these disconnects power to the entire unit. The Emergency Stop must be physically pulled out to reset the switch and be able to restart and start the combination Puller / Cutter again.
- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity safety switches prevent cutter operation unless the cutter bushings are in place.
- The Stop button on the cutter control activates a circuit that stops the cut to length action of the knife.

⚠ DANGER: Sharp Blades

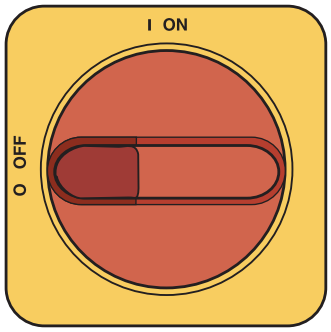
Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

Conair cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter Stop button activates a circuit that stops the knife.

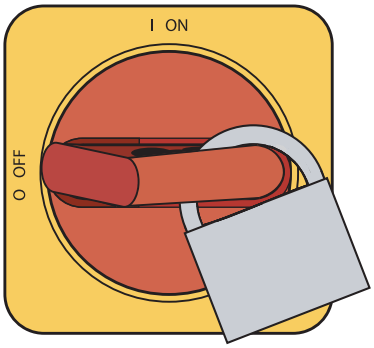
How to Use the Lockout Device



⚠ **CAUTION**: Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

⚠ **WARNING**: Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards reinstalled.

Lockout is the preferred method of isolating machines or equipment from energy sources. Your Conair product is equipped with the lockout device pictured below. To use the lockout device:

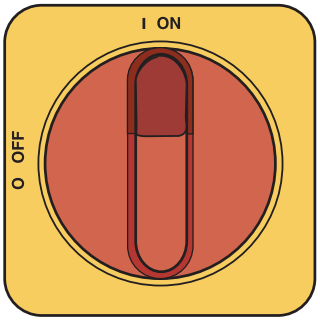


1. **Stop or turn off the equipment.**
2. **Isolate the equipment from the electric power.** Turn the rotary disconnect switch to the OFF, or "O" position.
3. **Secure the device with an assigned lock or tag.** Insert a lock or tag in the holes to prevent movement.
4. **The equipment is now locked out.**

⚠ **WARNING:** Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards reinstalled.

To restore power to the device, turn the rotary disconnect back to the ON position:

1. **Remove the lock or tag.**
2. **Turn the rotary disconnect switch to the ON or "I" position.**



✎ **NOTE:** Your lockout device may not look identical to this one. The illustration is for reference only.

Description

What is the MedLine® Combination Puller / Cutter?

The Conair MedLine® Combination Puller / Cutter pulls small extruded tubing through sizing and/or cooling tanks and cuts the product to lengths. Since the puller and cutter are mounted on the same chassis, alignment problems are minimized.

The puller portion's dual servo drive system offers extremely accurate speed control. Different puller belt materials optimize performance with different types of extruded materials, or applications.

The cutter portion utilizes a position-controlled servo motor. MedLine units achieve cut length accuracy better than 0.1 milliseconds.

Typical Applications

Conair MedLine Combination Puller / Cutters process extrudable plastics on-line.

While the standard orientation is right-to-left, combination puller cutters can also be made with a left-to-right orientation. *See Description Section entitled, Specifications: MedLine Combination Puller / Cutter.* (The illustrations in this User Guide represent the standard right-to left configuration.)

MedLine Puller / Cutters are limited to a specific range of product sizes based on each unit's cutting capacity. MedLine cutters can operate over a range of speeds (depending on which options are included.) *See Description Section entitled, Specifications: MedLine Combination Puller / Cutter.*

Profile/Bubble/Taper tubing can be processed with the optional touchscreen and Profile/Bubble/Taper software. With this option, it is recommended to use sponge belts.

Limitations

- Because the maximum distance between the puller and cutter is only 6 inches {152.4 mm}, the combination Puller / Cutter is not suitable for larger rigid extruded parts.
- The unit is limited by the traction length (the length over which the extrudate is in contact with the puller belts), which is fixed for particular models.
- The outer surface of the puller belt material will affect performance. Softer (low durometer) materials provide good "grab", but will wear more quickly, and may tear if the belt jams. Harder (high durometer) materials last longer, but may not grab the extrudate properly.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

Contact Conair for specific belt material recommendations for your product.

How the MedLine Combination Puller / Cutter Works

First, the extruded material that has been sized and cooled enters the combination Puller / Cutter from the upstream side. The extrudate passes through and is positioned by guide rollers.

Then, the two opposing belts move the extrudate through the puller. These belts have grooves that fit the teeth on the puller's sheaves (sprockets), preventing side-to-side movement. Belt coverings are available in a variety of materials for specific applications. Walkthrough style belt guards ensure operator safety while allowing access to the belts. The belt speed is controlled by eye-level controls.

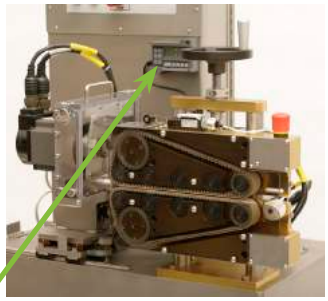
A threaded rod controls the distance between the upper and lower belts. The top and bottom belts open from a common, fixed center. Rubber grommets, on the CPC 1-12, allow the upper belt to 'give' slightly, preventing the puller from being damaged by small lumps of extrudate or other foreign objects.

NOTE: Depending on your model and options, your machine may vary from the one shown here.

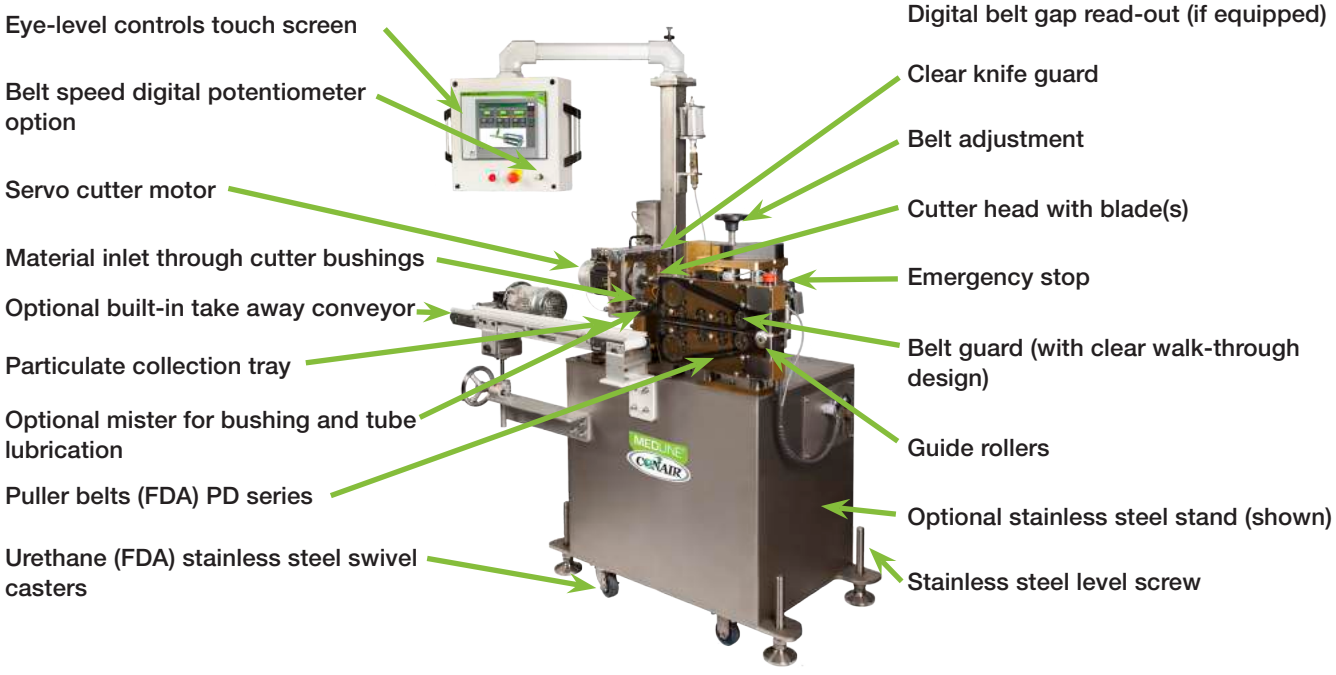
After passing through the belts, the extrudated material continues on to the cutter. The cutter is mounted on linear slides that allow as much as 6 inches {152.4 mm} of movement. The cutter can be moved away from the puller for startup, then moved close to the puller to enhance delivery to the cutter bushings.

Next, the cutter's servo motor, which is positionally controlled, operates the cutter head and knife that is attached directly to the servo motor using a Trantorque coupling device. Two cutter bushings guide and support both the extrudate and the cutting knife. The extrudate passes through the cutter bushings and is cut by the rotating cutter head.

The cut pieces are collected or carried on to further processing by an optional conveyor. (Take Away/Blow Off Conveyor)



Rear View



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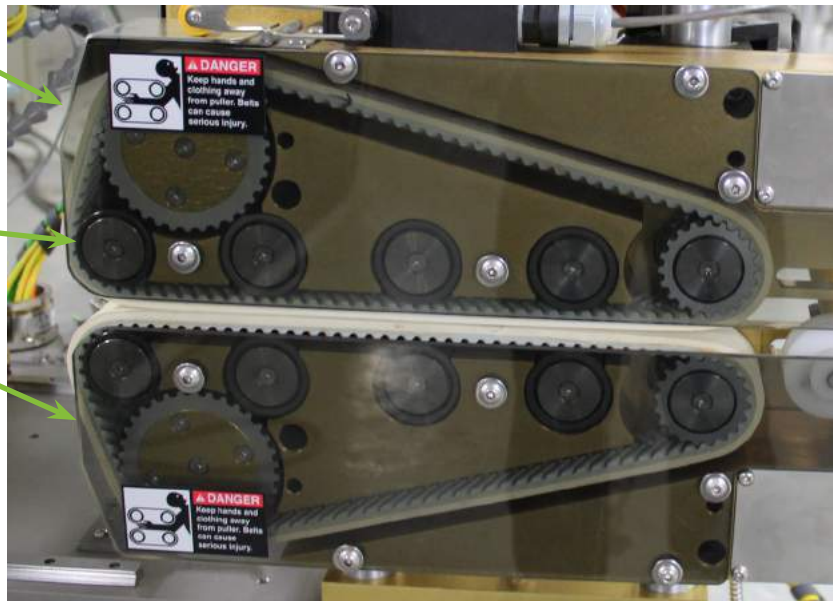
How the MedLine Combination Puller / Cutter Works (continued)

PD series self-tracking FDA sheaves (sprockets)

Precision idler rolls

Puller Belt 50 Duro white (FDA) natural rubber or white (FDA) closed face sponge



Dual Servo/Single Servo

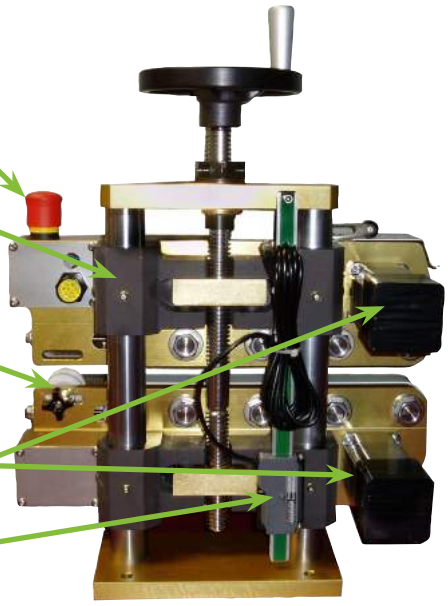
Emergency Stop

Grease fittings (4)

Product guide roll

Dual servo puller motors with precision planetary gearheads

Digital belt gap (optional)



Specifications: MedLine Combination Puller / Cutter

Features

01

Simple Conveyor Setup
Cutting from above the conveyor improves discharge interface.

02

Visible Cutter Head
Clear knife guard lets you view the rotating cutter head and blade(s) during operation. Designed for easy access!

03

Built-in Stainless Steel Particulate/ Overflow Tray
Collects waste lubricant and material with each pass of the cutter blades. A fitting is provided for ease of draining.

04

Stainless Steel Cabinet
An optional stainless steel cabinet is available for medical applications.

Safety features include:

- Easy-to-reach emergency stop buttons*
- Polycarbonate knife guard
- Upper and lower clear polycarbonate belt guards.
- Heavy-duty lockdown screws.

* The MedLine models include two independent emergency shutdown switches that, once pressed, will disconnect power to the entire unit and must be reset to restart the puller/cutter.

05

Optimum Eye-level Monitoring
Controls are at eye-level and within easy reach.

06

Precisely Control Belt Tension
Adjust puller belts and control tension on your material by opening or closing the belts with an easy turn or servo boom. Wheel or servo control. Digital belt gap sensor also available.

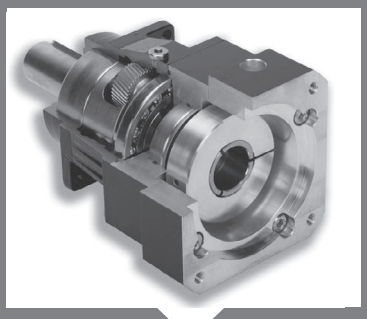
07

Centered, Guided Material
An adjustable roller guides material onto the puller belts.

08

Precise Pulling
Opposing belts uniformly draw material through to the cutter.

Puller Features / Options



Keep your process running smooth with independent precision planetary gearhead reducers. The MedLine pullers feature helical gearing and gear tooth microgeometry reducers that allow you to produce flaw-free product.

Independent servo puller motors with low backlash planetary gearheads.

Choice of in-line planetary gear reducer ratios
Reducer ratios can be selected to optimize puller performance based on your application.

Remote belt speed control option
Exclusive remote control digital potentiometer eases start-up by allowing you to conveniently adjust your belt puller speed while making extruder adjustments. You can dial in your precise speed with the 36 position rotary control knob; virtually eliminating variations due to voltage/noise fluctuations associated with analog controls.

Optional intuitive taper/bump/bubble software.
A digital, positional control is added to the puller servo drive along with a programmable controller (PLC) enabling you to program up to 32 speed variations and 32 analog air pressure adjustments that can be stored for repeatable tube profiling. This combination of air pressure and speed control allow you to produce a high quality, consistent end-product.

Digital belt gap sensor and readout option
Allows you to set and measure belt gap, to three decimal places, for consistent belt traction.

3 inch {76 mm}, 4 inch {102 mm}, or 6 inch {152 mm} dual servo driven pinch rolls.

32 speed points and up to 8-channels of synchronized analog outputs each with 32 x, y points

(Continued)

Specifications: MedLine Combination Puller / Cutter (continued)

Configuration and Naming

The MedLine Series can be configured in many different ways to suit your application perfectly. All MedLine models have the same cabinet design. The MedLine can be a medical application puller/cutter combination, a medical puller, or a medical cutter.

The model name/number is determined by the configuration that is desired.

Pulling information
The first digit in the model name following the MDL (MedLine) distinguishes the difference between a belt puller and a pinch roll.

If the first digit is a number, the number represents the width of the puller belt. The second number represents the length of the belt.

If the third digit is the letter R, the puller utilizes a pinch roll puller. The first and second digits represent the pinch roll diameter and width, respectively.

If the unit is a cutter-only MedLine, this first number will be 0-00.

Single or Dual Servo pulling. This spot in the model will be S for single servo pullers, and D for dual servo pullers.

The colon in the model name separates the puller information and the cutter information.

Cutting information
The second number represents the diameter capacity of the cutter. If the unit is a puller only MedLine, this second number will be 0.00.

Light or Heavy Duty. An L will appear in this space if this is a light-weight model. The H will appear if this is Heavy Duty.

MDL □ - □ □ □ : □.□ □ □

For example, a MDL1-12S:0.25 is a MedLine that has a puller with 1 inch wide belt, 12 inches long, driven by a single servo. It has a cutter capable of cutting 0.25 inch diameter material.

A MDL6-3RD:0.00 is a MedLine that has a pinch roll 6 inches in diameter, 3 inches wide, driven by dual servos. It has a no cutting head.

The MedLine is used in-line, downstream from the extruder and tank, to pull, cut, or pull and cut product which can then be transferred to a Medical Take Away Conveyor or coiled onto a Conair ATC coiler.

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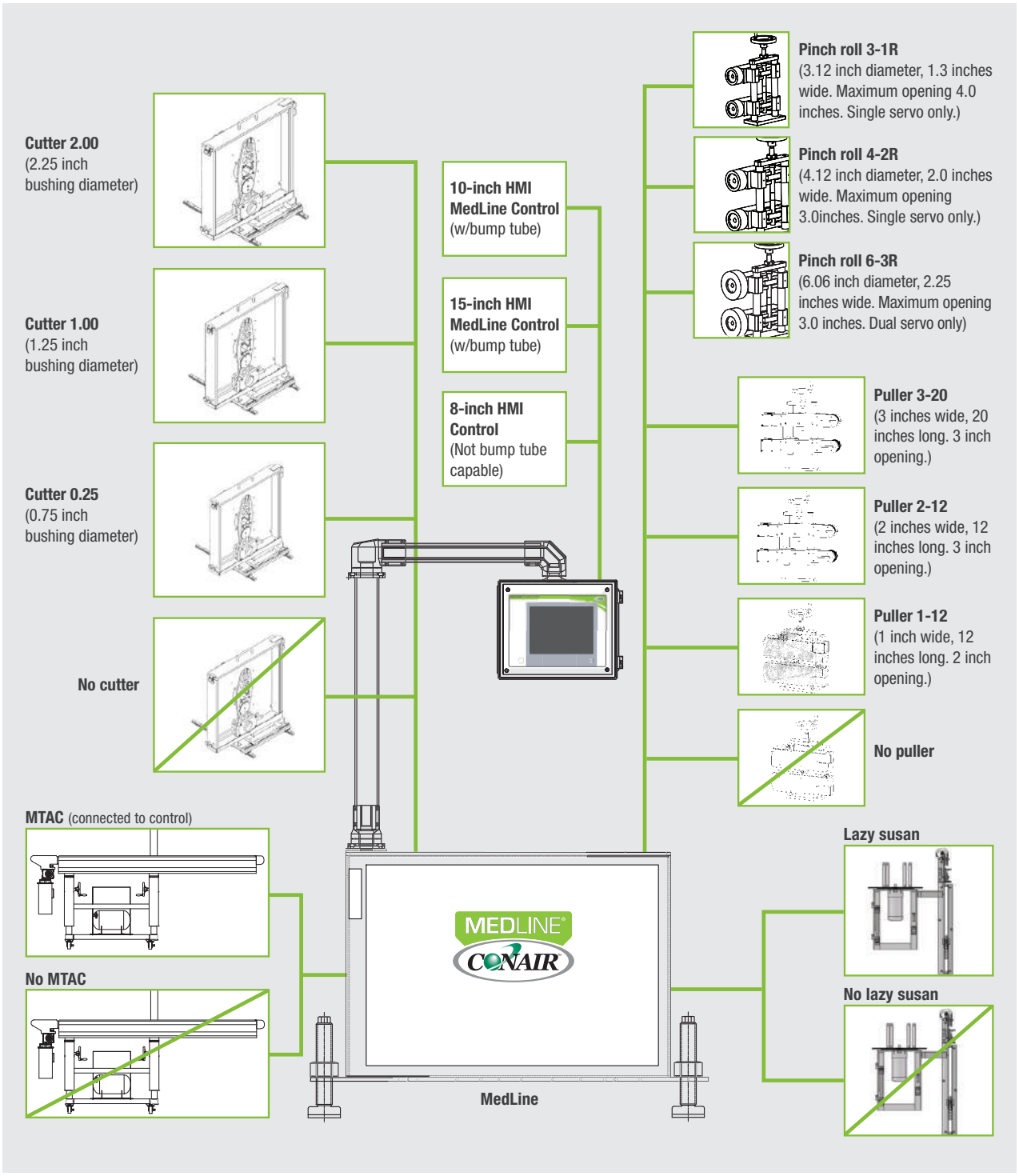
Specifications: MedLine Combination Puller / Cutter (continued)

Configuring the Right MedLine for you



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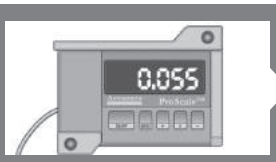
Specifications: MedLine Combination Puller / Cutter (continued)

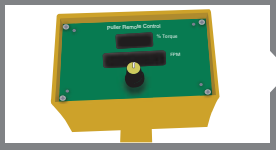
Control

Touchscreen control features include:

- Large, easy-to-read display
- Total access to servo drives for tuning and serviceability
- Upload and down- load capabilities
- Ethernet communications
- Optional bubble / taper tube mode

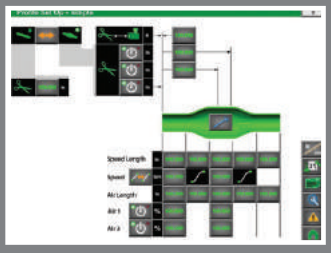


Digital Belt Gap Sensor
This option allows you to set the zero point for the belt gap, and then set and measure belt gap to three decimal places.



Digital Remote Control
has a 36 detent digital potentiometer. Operator may define the amount of speed change that each step of this pot provides.

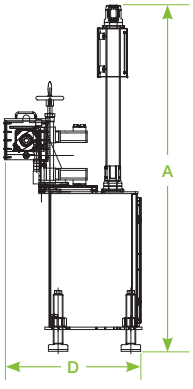
Options

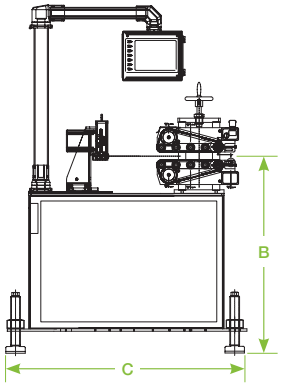


- Stainless steel cabinet
- Left-to-right puller motion
- Variable blade speed in both demand and flywheel cutting modes
- Bushing lubrication system
- Scrap mode
- Scrap separation
- 2-inch cut capacity
- Bushing sizes to 2.25 inch {57mm}
- Multiple length and batch counts
- Pinch roll puller units
- Follower cutting mode May add blade arm synchronized to Puller as an electronic gear lock.
- Digital belt gap sensor
- Tapered/bubble control tube / profile software
- Gauging interface

Dimensional Specifications

Models	MedLine*			
Performance characteristics				
Extrudate capacity inches {mm} dia.	0.25 - 2.00 {6.4 - 50.8}			
Blade drive motor (3000 rpm) cutter Hp {kW}	3.25 - 4.4 {2.4 - 3.3}			
Servo puller drive motor Hp {kW}	1.5 - 2.0 {38 - 51}			
Dimensions inches {mm}				
A - Height	71.0 {1803.4}			
B - Height to centerline, ±2 {±50.8}	42.0 {1067.0}			
C - Width	40.0 {1016.0}			
D - Depth	27.0 - 36.0 {685.8 - 914.4}			
Belt width ±3/8 {±9.5}	1.0 - 3.0 {25.4 - 76.2}			
Belt traction length	12.0 - 20.0 {304.8 - 508.0}			
Reducer ratio/belt speed				
	28:1	16:1	7:1	5:1
Available speeds† ft/min	to 140	to 250	to 550	to 700
Weight lb {kg}				
Installed	715.0 - 790.0 {324.0 - 358.4}			
Shipping	700.0 - 800.0 {317.5 - 363.0}			
Electrical requirements full load amps ‡				
Drive type (Puller)	Single or dual servo with precision planetary gearhead			
	1 - 3.25 Hp {0.75 - 2.4 kW}			
	Single servo	Dual servo		
230V/3 phase/60Hz	13 - 20	16 - 30		
460V/3 phase/60Hz	7.5 - 12	9.5 - 16.5		
HMI control	Touch screen			





Specification Notes

* Specifications will vary based upon configuration selected. See the next page for specifications for individual components.

† Examples of possible speeds are shown. Belt speeds will vary depending on drive type (single or dual).

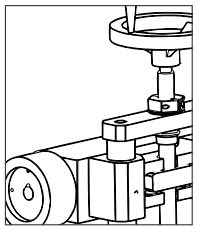
‡ FLA data for reference purposes only. Does not include any options or accessories on equipment. For full FLA detail for power circuit design of specific machines and systems, refer to the electrical diagrams of the equipment order and the nameplate applied to the machine. Specifications may change without notice Consult with a Conair representative for the most current information.

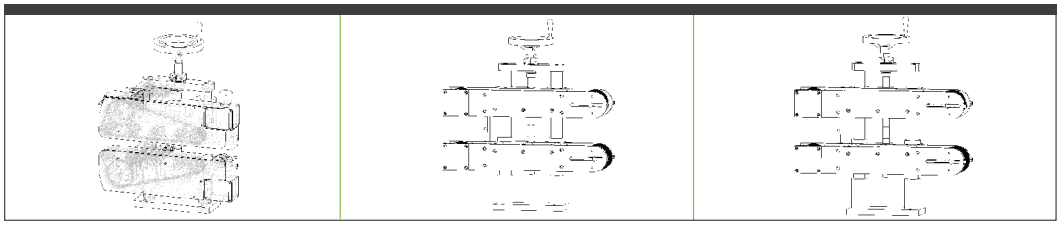
(Continued)

Specifications: MedLine Combination Puller / Cutter (continued)

Pulling Component Specification

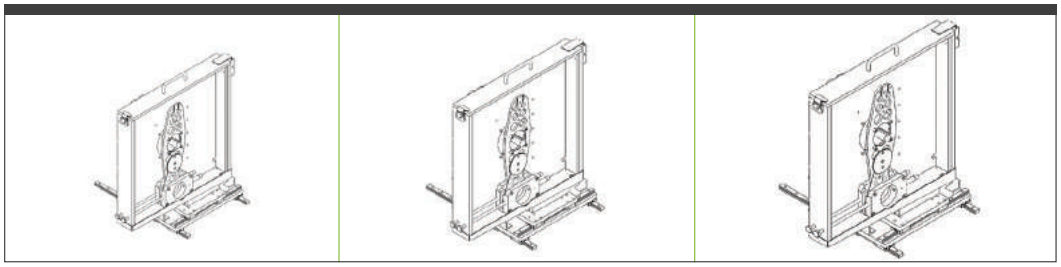
Pinch Roll Puller Models	3-1	4-2	6-3
Performance characteristics			
Roller width inches {mm}	1.30 {33}	2.00 {51}	2.26 {57}
Roller diameter inches {mm}	3.20 {81}	4.12 {105}	6.06 {154}
Feed opening inches {mm}	4 {102}	3 {76}	3 {76}
Drive type	servo (single)	servo (single)	servo (dual)
Roller drive motor Hp {kW}	2 {1.5}	2 {1.5}	3.25 {2.4}
Roller speed* ft/min {m/min}	up to 250 {76}	up to 500 {152}	up to 1200 {366}





Belt Puller Models	1-12	2-12	3-20
Performance characteristics			
Belt width inches {mm}	1.0 {25.4}	2.00 {51}	3.0 {76}
Belt traction length inches {mm}	12.0 {305}	12.0 {305}	20.0 {508.0}
Feed opening inches {mm}	2.0 {50.8}	3.0 {76}	4.0 {102}
Drive type	servo (single or dual)		servo (single)
Belt drive motor Hp {kW}	(2) 1.0 Hp {0.75 kW}	(2) 2.0 Hp {1.5 kW}	
Belt speed ranges* ft/min {m/min}	1.4 - 140 {36 - 3600}	1.4 - 150 {36 - 3810}	
	2.5 - 250 {64 - 6350}		
	5.5 - 550 {140 - 13970}		
	10 - 750 {254 - 19050}	10 - 700 {254 - 17780}	

Cutting Component Specifications



Cutter Models	0.25L	1.00L	2.0L	2.0H
Performance characteristics				
Extrudate capacity inches {mm} diameter	0.25 {6.35}	1.00 {25.4}†	2.00 {50.8}†	2.00 {50.8}
Bushing inches {mm} diameter	0.75	1.25	2.25	2.25
Blade drive motor Hp {kW}	3.25 {2.4}	3.25 {2.4}	4.4 {3.3}	4.4 {3.3}
High torque motor‡	N/A	4.4 {3.3}	STD	STD
Feed direction	right-to-left	right-to-left	right-to-left	right-to-left
Cutter head				
Aluminum 2-position	Yes	Yes	NA	NA
Stainless steel 2-position‡	NA	Yes	STD	STD
Roller speed* ft/min {m/min}	Yes‡	Yes‡	Yes‡	Yes‡

Specification Notes

* Examples of possible speeds are shown. Belt speeds will vary depending on drive type (single or dual).

† Dependent on material and wall thickness.

‡ Optional.

Specifications may change without notice Consult with a Conair representative for the most current information.

Puller Optional Equipment

- **Digital belt gap sensor and readout**
  Allows the operator to set a zero point, then measure belt gap (in thousandths of an inch or mm) relative to this setpoint.
- **Remote belt speed control**
  Allows the puller speed to be controlled by an external source. (Remote Digital Potentiometer)
- **In-line planetary gear reducer ratios**
  A particular reducer ratio is selected at the time of purchase to optimize puller performance in a particular speed range. Contact a Conair Representative for application specific gear reducers.
- **Servo-driven Boom Adjustment**
- **Manual mode**
  Adjusts the boom with digital potentiometer.
- **Automatic Boom Grip mode**
  Follows an inline OD gauge to automatically adjust the boom to maintain a preset crush-force on the product. Automatic mode aids validation and eliminates operator variability.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

Cutter Optional Equipment

- **Cutter bushing lubrication**
  A self-contained spray system, which includes a reservoir and an air inlet for operation at 20-30 psig (air source not included). A flexible nozzle directs lubricant onto the extrudate as it enters the cutter bushings. This decreases bushing drag and helps lubricate the blade. This option is recommended for processing sticky/soft (low durometer) materials.
- **Cutter blade wipe**
  Keeps the cutting blade clean by removing lubricant and particles. A reservoir chamber with a flexible drip tube feeds lubricant to a felt pad sandwiched between two pieces of stainless steel in the particulate tray. The pad wipes and lubricates the knife before each cut as the blade passes through.
- **Profile/Bubble/Taper software upgrade package**
  The standard operator interfaces are replaced with a single color touchscreen operator interface. A positional control unit is added to the puller servo drive, along with a PLC (Programmable Logic Controller) enabling positional moves needed for Profile/Bubble/Taper processing. The basic output package enables operation for up to two lumens with 32 points of analog outputs each. Specialized software for processing Profile/Bubble/Taper tubing includes: up to 32 preset positional moves for input speed and distance, 24 VDC digital output for blow off, four digital powered outputs - 24 VDC transistorized 0.25 amps each and two 0 to 10 VDC analog outputs.
- **Main cabinet housing**
  Stainless steel in place of standard white painted carbon steel cabinet.
- **Bushing**
  1 1/4” and 2 1/4” bushings available for larger tubing. Consult factory for application.

(Continued)

Cutter Optional Equipment (continued)

- **Follower cutting Mode**
  Follower Mode allows the operator to enter the desired cut length and the number of blades. The controller then automatically follows the puller and adjusts the speed of the flywheel to maintain cut length accuracy. This is known as an electronic gear lock system. The cut length accuracy is maintained even if the puller changes speed.

Common Optional Equipment

Discharge Conveyor
A discharge conveyor offers support before, during, and after cutting, and facilitates the removal of cut parts. Discharge conveyors are available in the following sizes:

- 6 inches wide by 6 feet long
- 6 inches wide by 12 feet long
- 6 inches wide by 16 feet long
- Other sizes are available. Please consult your Conair representative.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

Isolation Transformer
The isolation transformer protects sensitive electronics from incoming power, which helps prevent errors caused by electrical noise. It also protects equipment from electrical noise generated by the servo motor and associated amplifiers.

✎ **NOTE:** An isolation transformer will not compensate for a ground that does not meet code requirements.

✎ **NOTE:** Conair strongly recommends using an isolation transformer. Ensuring clean and proper power can help avoid the need for costly service calls.

Left to Right Machine Operation
This option changes the machine direction from the standard right-to-left extrusion flow to left-to-right.

Your Conair sales representative can analyze your needs and recommend the options that are right for your system.

SECTION
3

Installation

Unpacking the Boxes

The Conair MedLine Combination Puller / Cutter comes fully assembled in a single crate.

⚠ WARNING: Lifting

To avoid personal injury or damage to the Puller / Cutter, lift the Puller / Cutter using a forklift or hoist with straps that have been positioned at the Puller / Cutter's center of gravity.

1. **Carefully uncrate the Puller / Cutter and its components.**
2. **Remove all packing material, protective paper, tape, and plastic.** Compare contents to the shipping papers to ensure that you have all the parts.
3. **Carefully inspect all components** to make sure no damage occurred during shipping. Check all wire terminal connections, bolts, and any other electrical connections, which may have come loose during shipping.
4. **Record serial numbers and specifications** in the blanks provided on the back of the User Guide's title page. This information will be helpful if you ever need service or parts.
5. **You are now ready to begin installation.** *See Installation Section entitled, Preparing for Installation.*

Preparing for Installation

1 **You will need these tools for installation:**

- ❒ **wire strain relief**
- ❒ **16 or 18 inch adjustable wrench**
- ❒ **set of Allen wrenches**
- ❒ **set of Feeler gauges**
- ❒ **1/2 inch open or box end wrench**
- ❒ **flashlight.**

2 **Plan the location.** Make sure the area where the MedLine Combination Puller / Cutter is installed has the following:

- ❒ **A grounded power source.**
  Check the puller / cutter's serial tag for the correct amps, voltage, phase and cycles. All wiring should be completed by qualified personnel and should comply with your region's electrical codes.
- ❒ **Clearance for safe operation and maintenance.**
  Make sure there is enough clearance around the servo cutter for maintenance and servicing. If the cutter portion has the optional slide base, be sure to check for clearance by extending the slide system in both directions.

WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

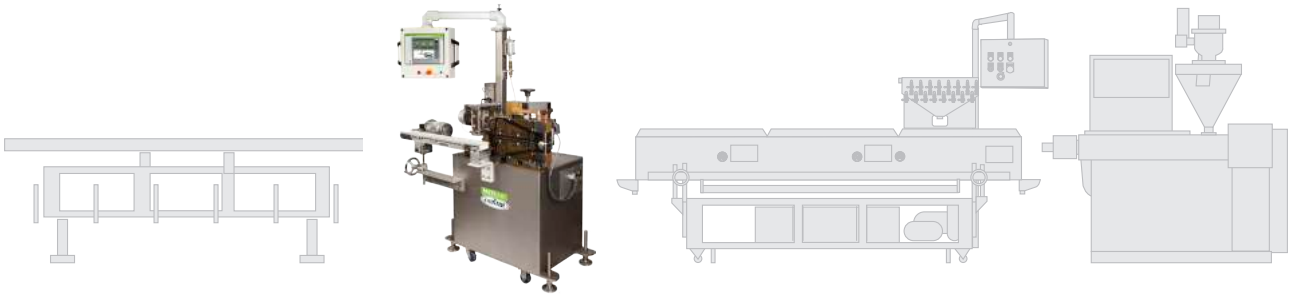
This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

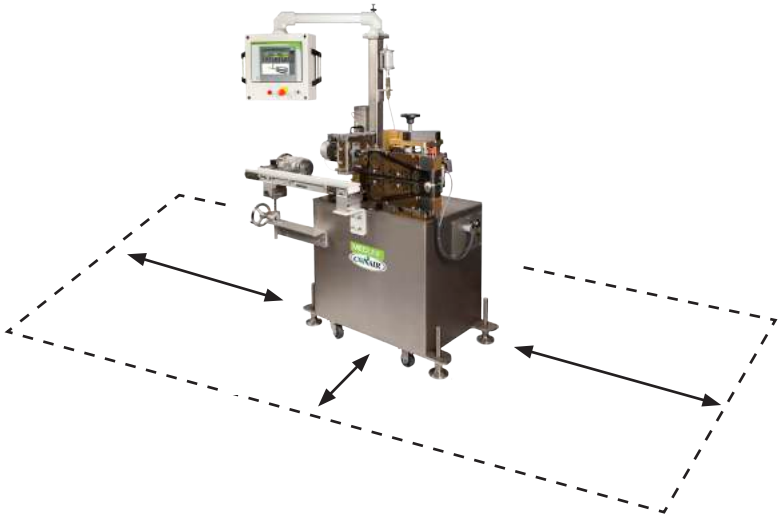
Positioning the Combination Puller / Cutter

1 **Move the MedLine Combination Puller / Cutter into position.** Place the puller / cutter in position downstream of the last sizing or cooling tank.

> ⚠ **WARNING: Lifting**
> To avoid personal injury or damage to the puller / cutter, lift the puller / cutter using a forklift or hoist with straps that have been positioned at the puller / cutter's center of gravity.



2 **Align the puller / cutter with the extrusion line.**



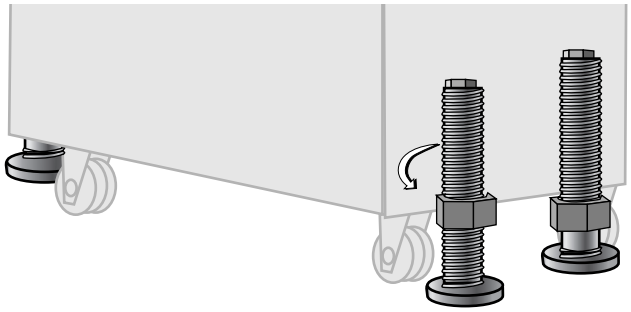
3 **Measure the centerline height of the extrudate as it exits the extrusion die.** Adjust all equipment on the extrusion line (sizing tank, cooling tanks, puller / cutter) to this height.

4 **Adjust the puller / cutter's floor lock/caster assembly** to the center height of the extrusion line using a 16 or 18-inch adjustable wrench. Remove the weight from the casters by locking down the floorlocks.

! **IMPORTANT:** Never leave the puller / cutter on casters only.

(Continued)

Positioning the Combination Puller / Cutter (continued)



5 **Use a plumb line or laser to check for a straight line** from the extrusion die through each line component to the cutter bushings. Adjust as necessary.

6 **Adjust the belt puller entrance guide rollers** to insure consistent product guidance.

Connecting the Main Power Source

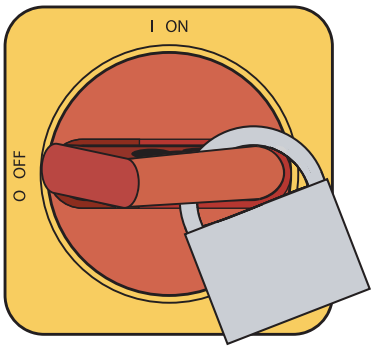
WARNING: Electrical Hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.



! **IMPORTANT:** Always refer to the wiring diagrams that came with your combination puller / cutter before making electrical connections. The diagrams show the minimum size main power cable required for your cutter, and the most accurate electrical component information.

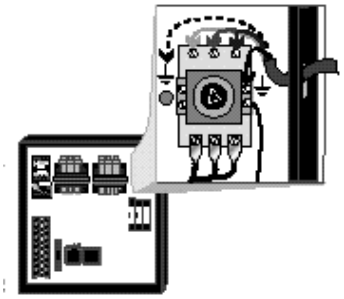
1 **Open the combination puller / cutter's electrical enclosure.** Turn the disconnect dial on the door to the OFF or "O" position and open the door.

2 **Insert the main power wire** through the knockout in the side of the enclosure. Secure the wire with a rubber compression fitting or strain relief.

3 **Connect the power wires** to the terminals indicated on the wiring diagram that came with your machine.

4 **Check every terminal screw** to make sure wires are secure. Gently tug each wire. If a wire is loose, use a screwdriver to tighten the terminal.

5 **Connect the ground wire** to the grounding point shown in the wiring diagram shipped with your unit.



Installing the Cutter Blades

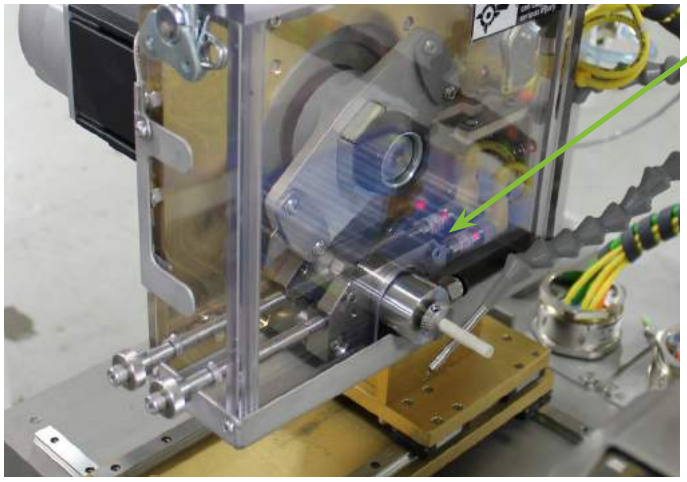
DANGER: Sharp Blades

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

Combination puller / cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard safety switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter "Stop" button activates a circuit that stops the cutter head.



For on-demand cutting, mount the blade at the "on-demand" position stamped on the cutter head. *See the Appendix B, for more information about choosing the appropriate blade for your material*.

Mounting the Cutter Bushings

DANGER: Sharp Blades

Always wear cut-resistant gloves when the cutting chamber is open and when handling blades. Never open cutting chamber without locking out the cutter power and waiting until the cutter head stops spinning.

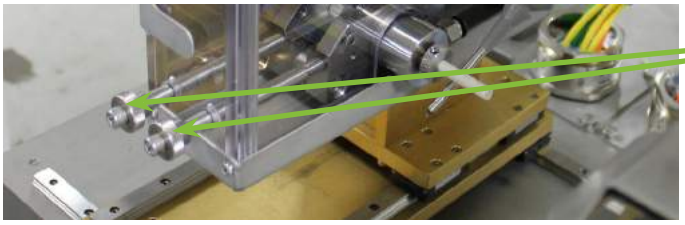
NOTE: There is no separate lockout for the Cutter that is part of a Puller / Cutter combination. However, the Cutter is isolated by use of the safety relays that decouple the motor from the drive.

1 **Rotate the cutter head** until the blade is positioned in the gap between where the bushings are located.

2 **Slide the downstream bushing into position,** positioning it up to and barely touching the blade (using a feeler gauge).

NOTE: the blade should not be deflected.

3 **Tighten the bushing retaining system** against the flat side of the bushing to hold the bushing in position.



4 **Slide the upstream bushing into position,** positioning it up to and barely touching the blade (using a feeler gauge).

NOTE: the blade should not be deflected.

5 **Tighten the bushing retaining system** against the flat side of the bushing to hold the bushing in position.

DANGER: Sharp Blades

Always wear cut-resistant gloves when the cutting chamber is open and when handling blades. Never open cutting chamber without locking out the cutter power and waiting until the cutter head stops spinning.

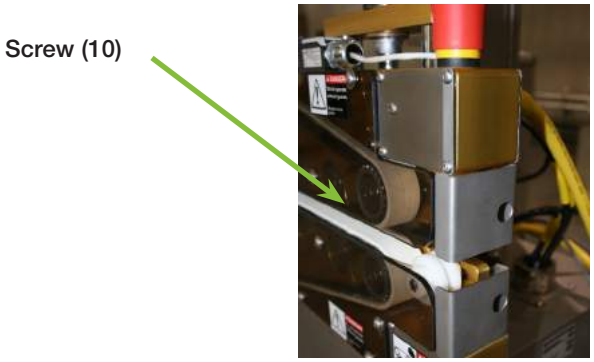
6 **Rotate the cutter head by hand** to make sure the bushings did not move, and the blade still passes through the gap between the bushings.

Adjusting Belt Tension
For Puller Model CPC 1-12 and 2-12

1 **Turn the main power disconnect to the Off position.**

2 **Remove the upper and lower polycarbonate belt guards:**

- Remove the screws attaching guards to unit (five each: front).
- Remove guard.
- Remove the stainless steel Belt Entry Guard. Remove the screws attaching the guard to the unit (four each: top and bottom). Remove guard.



✎ **NOTE:** Loose belts result in belt and product slippage; over-tightened belts result in distorted product and can lead to premature bearing failure.

3 **Remove entrance guards and stainless steel safety guards. Remove screws (4 on upper and lower belts).**

4 **Check belt tension.** Use a tension-measuring tool. Belts should be just tight enough to prevent slipping, and the gap between the upper and lower belts should be even across the width of the belt.

5 **Adjust belt tension, if necessary.** Adjust tension by turning the threaded tension rods. Keep tension on front and back edges, top and bottom belts even or equal.

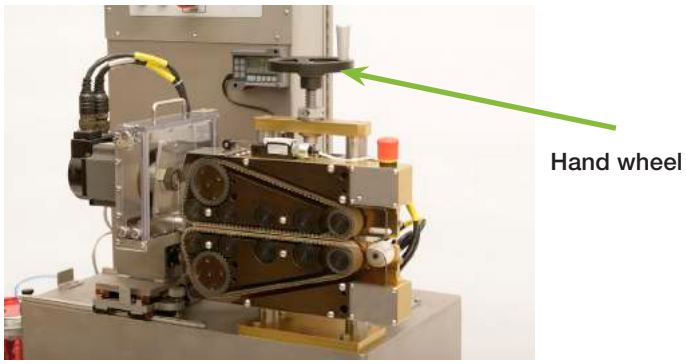
6 **Fine tune tension:**

- Lower the belts to a gap of about 1/8 inch {3 mm}.
  See Installation Section entitled, Setting the Belt Gap.
- From the upstream end of the belts, look down the length of the belts at the gap between the belts. If the gap is not even, adjust the tension until the gap is even and measures 1/8 inch {3 mm}. The shape of the gap should be parallel.
- Check tension and re-adjust as necessary.

Setting the Belt Gap
For Puller Model CPC 1-12 and 2-12

The upper and lower belt boom assemblies are controlled by a common threaded rod. Turn the hand wheel to move the belts up and down. The belt gap should be set to the dimensions of the extruded product, being careful not to make the gap so small that the pressure causes distortion in the product.

1 **Turn the hand wheel** until the gap between the belts reaches the desired distance.



NOTE: Some models have beam adjustment as part of the HMI control options. *Refer to the Operation section of this manual* for more information.

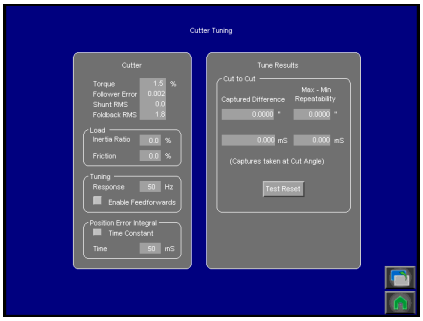
Checking Repeatability

Before any Conair MedLine Combination Puller / Cutters are shipped, they are tested for cut time repeatability to be sure they are within performance specifications. The repeatability test checks the performance of the rotary knife cutter as it passes through the cut point (product). Acceptable repeatability times allowed for each cutter model prior to shipping are:

Type of Cutter	Repeatability Time
MedLine Positional Servo	Less than 0.1 millisecond

NOTE: 1-millisecond at 60 feet per minute is equal to .012 inches.

The repeatability mode is built into the Conair cutter controls and allows you to perform similar tests, without any external test equipment. It is recommended that you check repeatability on a regular basis. Acceleration/deceleration delays of the servo do not contribute to repeatability error; any error is attributed solely to motor stability, couplings, assembly, power, and proximity sensor alignment. Use any blade speed and line speed. The line speed is only seen while in the Encoder or Product Modes. It is recommended that tests be performed at cut intervals between 0.5 and 5 seconds. Do not change the blade speed or the line speed after starting a test.



To test repeatability with Bump tube control:

1 **Turn on the cutter.** Perform the test in Encoder Mode with the cutter on-line.

2 **Press the "Menu" key** to display operator functions.

3 **Press the "Cutter-tuning" key.**

4 **Press the "Test reset" key** to start the testing and display the results.

(Continued)

IMPORTANT: *See Operation Section entitled,Turning the Cutter*; if using Red Lion HMI and Control Techniques/Emerson Servo Drives.

Checking Repeatability (continued)

✎ **NOTE:** "Previous" key returns to menu screen.

Repeat the test by pressing the "Test reset" button to begin a new sample period.

To test repeatability with standard control:

1. **Turn on the cutter.**
2. **Press the "Cutter info" key**.
3. **Press the "Repeatability" key.**
4. **Press the "Reset max" key** to begin a new sample period.

Preparing for Testing

1. **Make sure all components are installed according to assembly drawings.** Make sure that all bolts have been checked for tightness.
2. **Check that the combination puller / cutter is firmly locked into position** with the anchoring screws.
3. **Check that all wiring conforms to electrical codes,** and all wiring covers are in place.

DANGER: Pinch Hazard

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury. Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

Testing the Installation

Touchscreen HMI Interface Operation

1. **Plug in the main power cord and turn on the main disconnect.** The display should fully illuminate and start up. Power on lights will illuminate.
2. **Check that the "Emergency Stop" buttons are in the out, extended position.**

✎ **NOTE:** If the "Emergency Stop" button is pushed in, there will be no power applied to the amplifier and the operator interface will display "starting commands" for an extended period of time.

3. **Make sure that the Cut On\Off is Off.** If necessary, press button to display off.
4. **Press "Start Puller" button.** The puller must be activated before the cutter portion can be turned on. Once the puller is running press the start button for the cutter section, the blade will begin to operate to make cuts at defined length.

✎ **NOTE:** For more information about setting and adjusting the gap for the bushings, *see Appendix C, About Cutter Bushings.*

5. **Open the knife guard.** The cutter will stop and the touchscreen on the Main Page will display "Stopped" above the cutter section of the control.

If the cutter is not working properly at any time, turn it off immediately and refer to the Troubleshooting section of this User Guide.

If you do not encounter any problems, proceed to the Operation section.

SECTION
4a

Operation - Standard Software

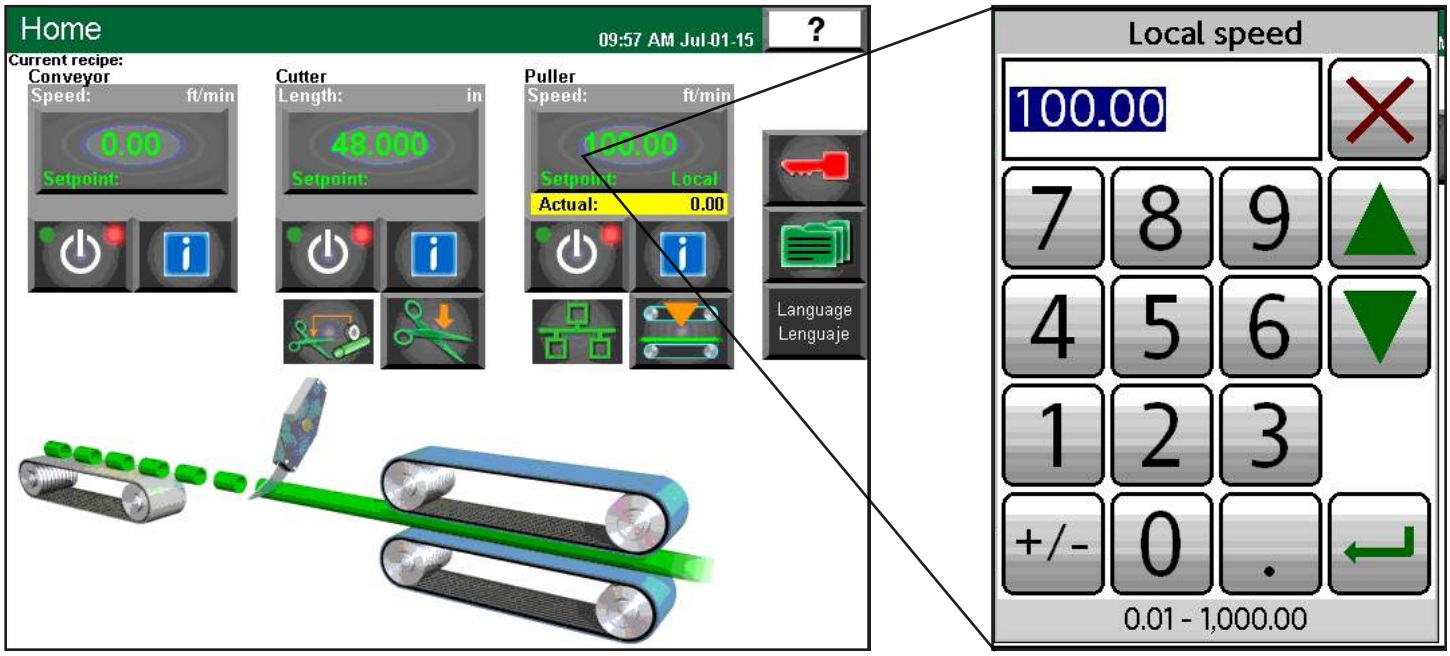
MedLine Puller / Cutter Splash Screen

NOTE: This section is for machines with no optional Bump/Taper Tube software installed. *See Section 4b for more details.*

This initial startup screen appears for the first three seconds while the equipment initializes.

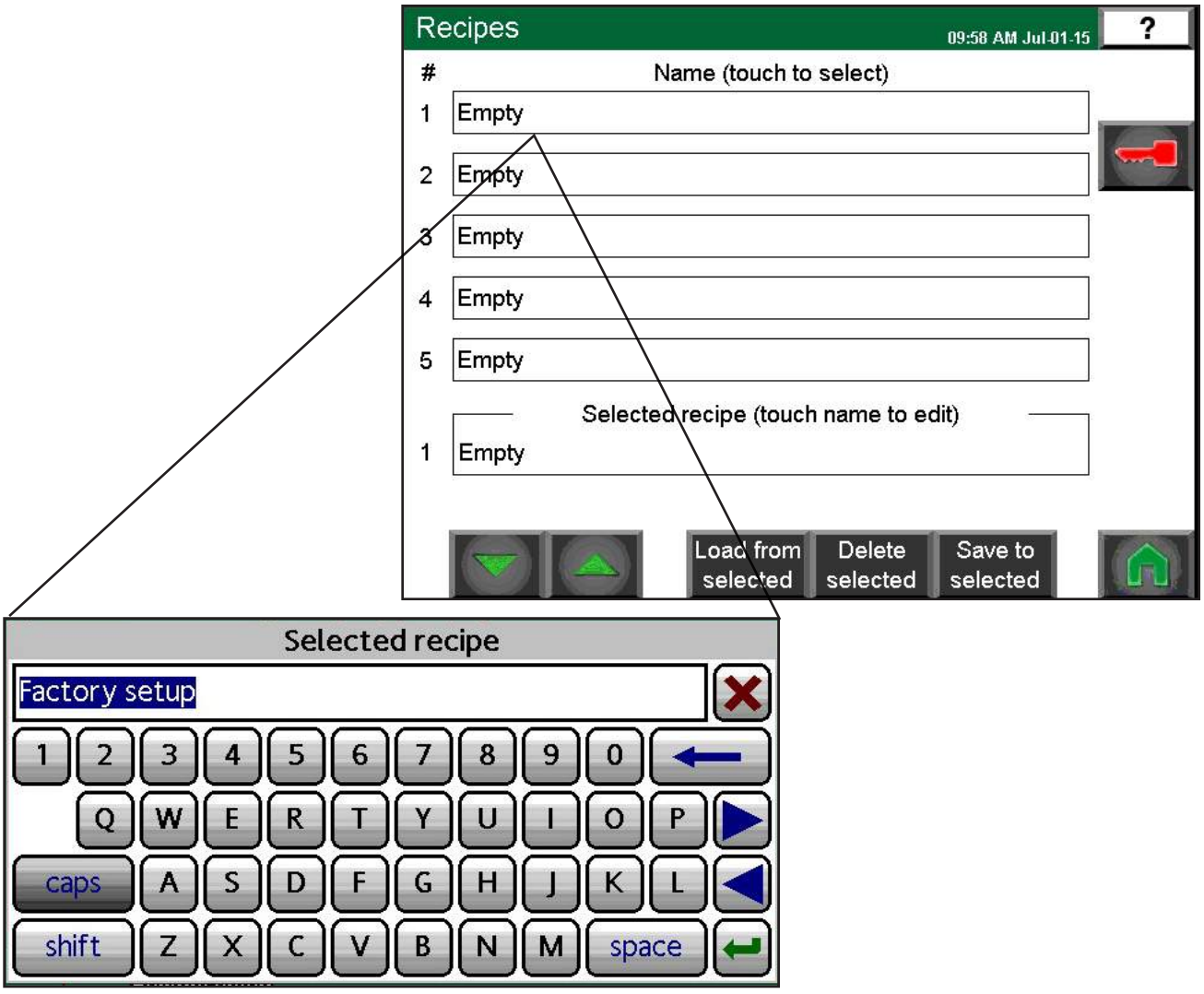
How to Navigate the Control Screen

Navigate through the CPC Control Screens by touching any button which opens a screen or pop up window.



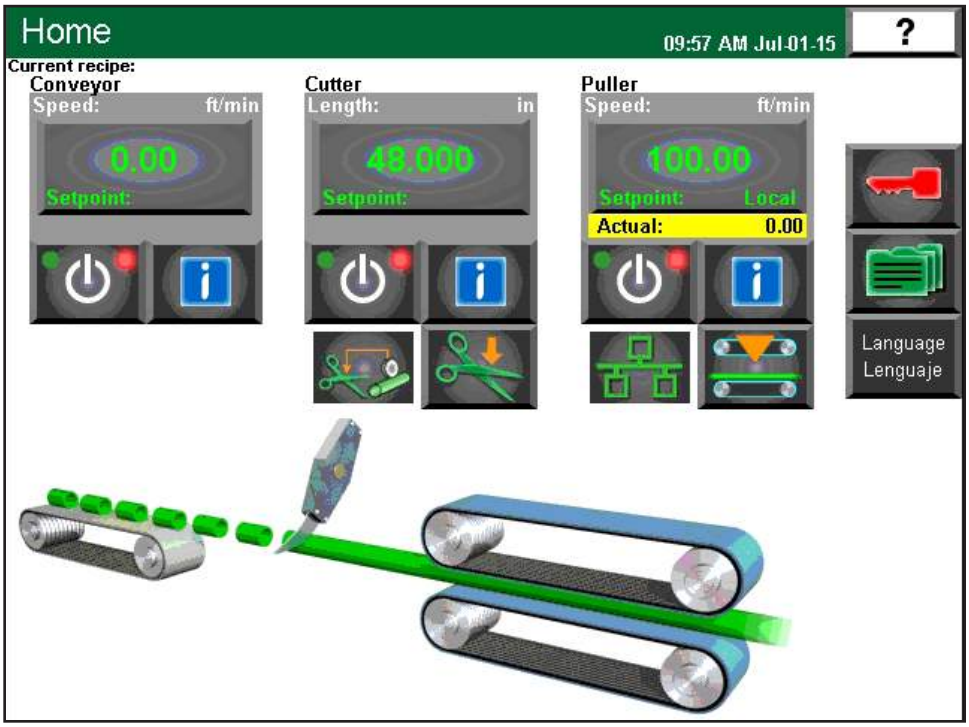
Example of Pop Up Number Pad

How to Navigate the Control Screen (continued)



Example of Pop Up Number Pad

MedLine Puller / Cutter Operator Instructions Home Screen



The home page is displayed automatically upon power up after the system is done initializing. The home page is where most machine control functions are performed. From here the puller, cutter, and conveyor (if equipped) can be started and stopped. Touch the power button to start. Touch the power button to stop. The running indicator on the power buttons indicates the current state of the equipment.

There are three puller control modes available: “Local/Remote – Ethernet”, Local/Remote – Analog”, “Local/Remote – Pulse”. To select a mode, touch the information button. Mode selection is only allowed when the puller is stopped.

When the “Local/Remote” button is in the “Local” position the speed reference comes from the value shown on the main page. To change the local speed, touch the value. A keypad will appear allowing data entry into this parameter. When the button is in the “Remote” position the speed reference comes from the remote source as selected by the control mode. The value of the remote source is displayed directly below the “Remote” position. On either side of the local speed reference are small scroll and large scroll buttons. These buttons allow changing the local setpoint by the local scroll amounts. The scroll values can be changed on the local scroll page.

Small Scroll

Large Scroll

The puller has a built in length counter. The length counter can be reset by pressing the counter reset button.

(Continued)

MedLine Puller / Cutter Operator Instructions Home Screen (continued)

Cutter Section

The cutter buttons and the cutter running indicator function similar to the puller buttons/ indicator. The cutter has 5 modes of operation. The currently selected mode is displayed directly below the running indicator. The cutter mode can only be changed when the cutter is stopped. To change the mode touch the information button. A window will appear allowing mode selection. The cutter is capable of two styles of cutting, “Demand” and “Continuous”. In demand the cut is triggered by one of three sources. The three sources of demand cutting are: “Encoder”, “Timer” and “End Sense”. In Continuous style of cutting, the flywheel runs at a constant speed. Depending on the cutter mode selection, the flywheel can be synchronized to the line speed. The flywheel will automatically adjust speed to maintain a constant cut length.

A manual cut button allows triggering a cut from the HMI. This is only active in the “Demand” style of cutting.

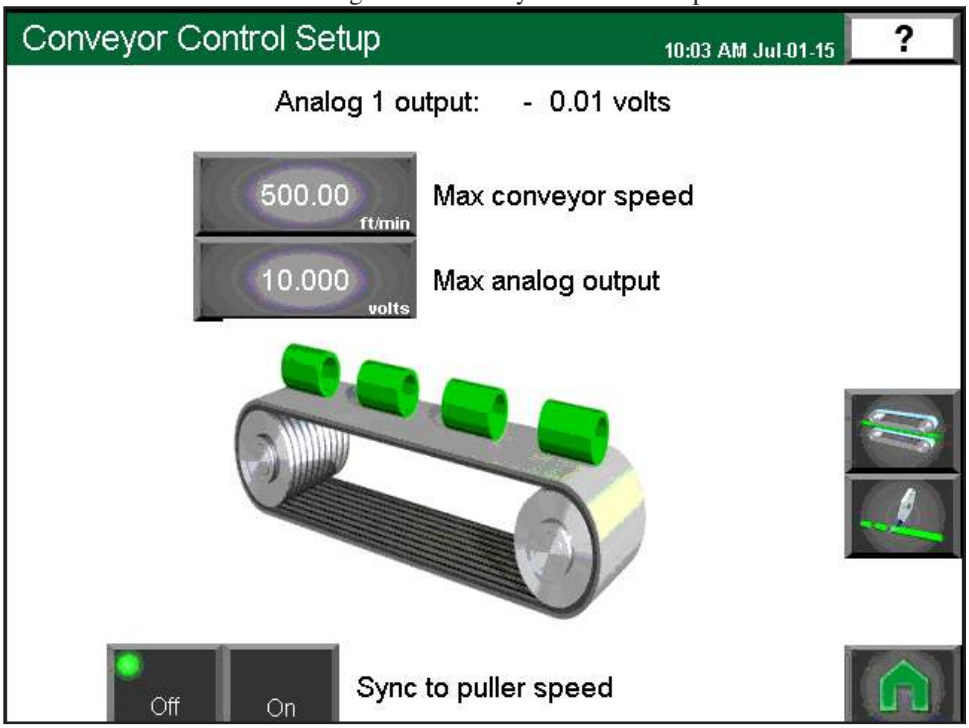
The cutter has a built in part counter. The part counter button can be reset by pressing the counter reset button.

Cutter flywheel speeds, accel/decel and blade count can be accessed from the main page. Touch the “Speeds” button in the cutter section.

Conveyor Section

From the Home page the conveyor (if equipped) can be started and stopped. Touch the power button to start. Touch the power button to stop. The running indicator on the power buttons indicates the current state of the equipment.

Touch the information button to go to the Conveyor Control Setup Screen.

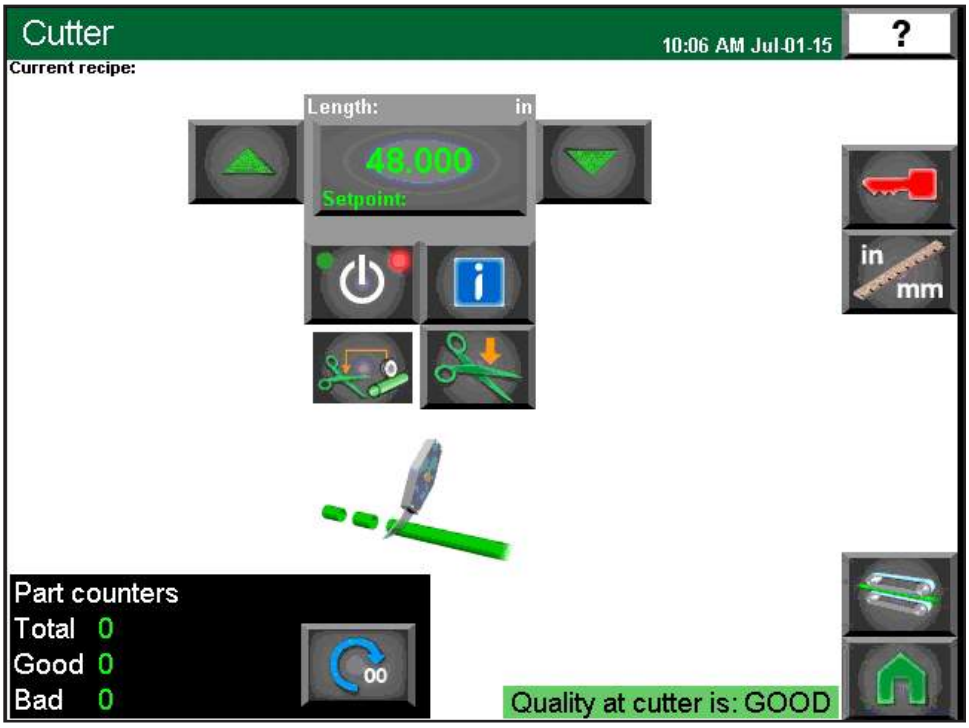


Touch the home button to return to the home page.

(Continued)

MedLine Puller / Cutter Operator Instructions Home Screen (continued)

Cutter Home Page



Touch the information button on the Cutter Home page to go to the Cutter Setup Page.

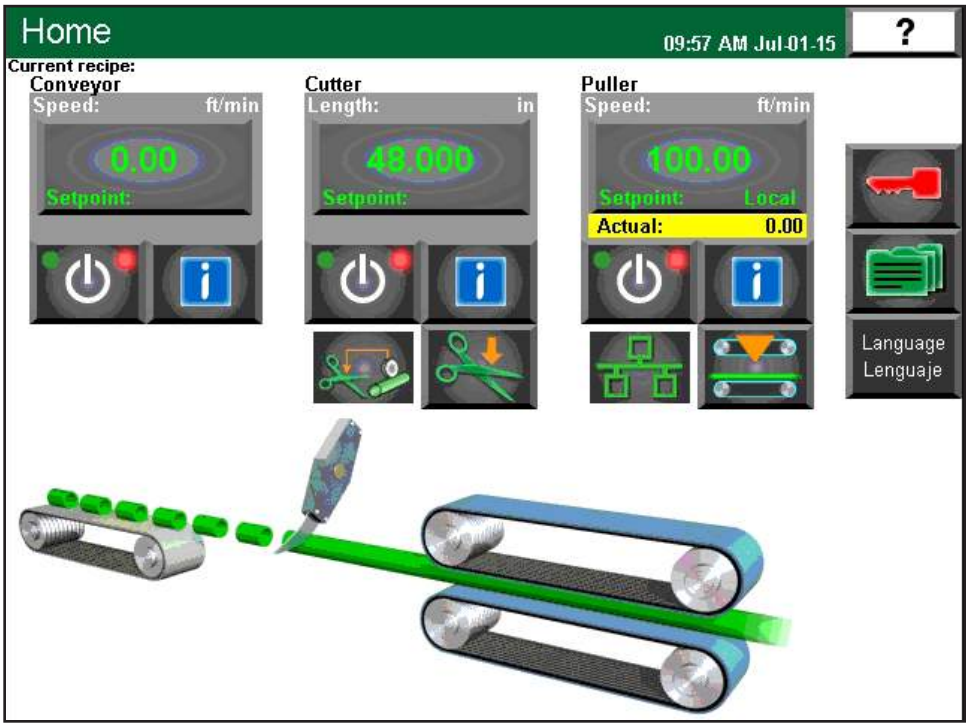
Security page: This screen allows you to create a password for a User and to "LogOn" or "LogOff" of the system. The "Set Pass" button takes you to the Security Manager screen where the password is assigned. Once the password has been assigned, the "LogOn" and LogOff" buttons can be used to access the system.

Units of Measure page: This page allows customer to set the units of measure to English or Metric.

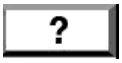
Conveyor page: This page takes you to the conveyor page, where conveyor information and settings are.

Home page: This will take you back to the home page.

MedLine Puller / Cutter Operator Right Side Navigation Buttons



Help page: This page displays the version information of the Crimson programming software used to create the HMI pages. It also displays Conair's contact information. Touchscreen calibration is accessed from this page.

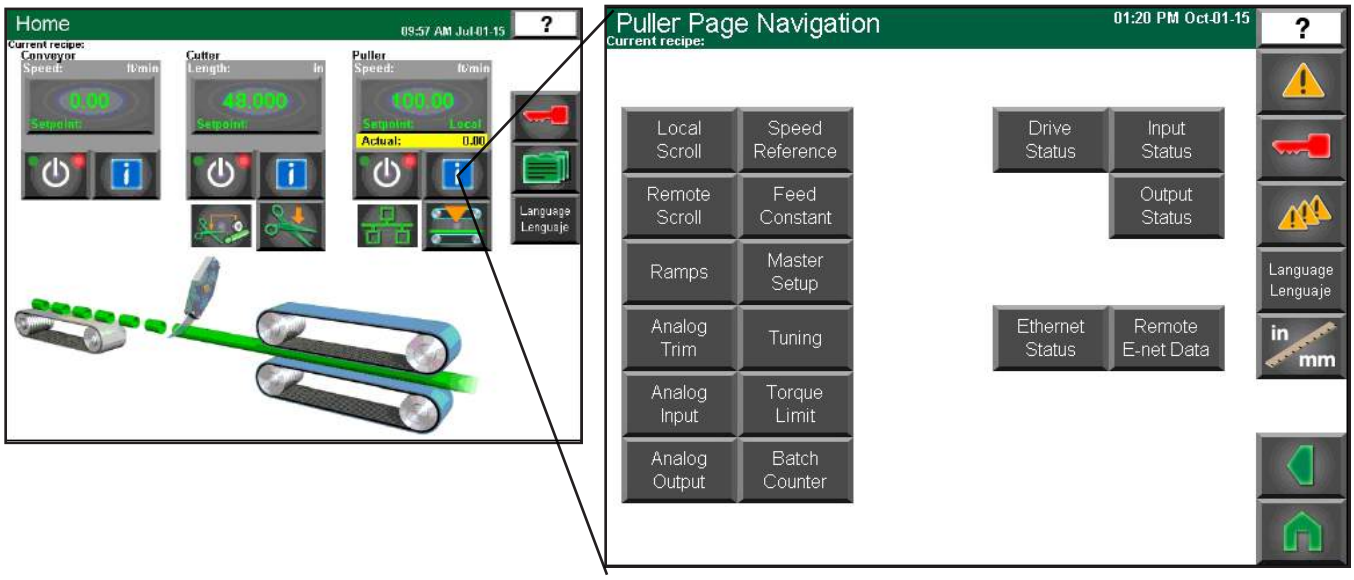


System Security page: This screen allows you to create a password for a User and to "LogOn" or "LogOff" of the system. The "Set Pass" button takes you to the Security Manager screen where the password is assigned. Once the password has been assigned, the "LogOn" and LogOff" buttons can be used to access the system.

Recipes page: This page allows access to the recipe storage system. The current setup of the machine running parameters can be saved to a recipe file. The system allows storage of 100 recipes. The running parameters can be changed by loading a saved recipe file.

Language: This screen allows you to select a language.

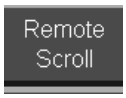
MedLine Puller / Cutter Control Instructions Puller Menu Screen



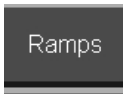
Puller Menu Setup Page from Pressing Info Button on Puller Home Page

Puller Home page: This page allows access to the puller setup page.

Puller Local Scroll page: This page allows access to the puller local scroll parameters. The puller speed can be adjusted by means of up and down scroll buttons located on the Puller main page. The small and large scroll values are adjusted here.



Puller Remote Scroll page: This page allows access to the puller remote speed scroll parameters. The puller speed can be adjusted by means of dry contact closures provided by the customer. The speed of the puller can be adjusted up or down by these contacts. The amount of speed adjustment can be set by these parameters.



Puller Ramps page: This page allows access to the puller acceleration and deceleration parameters. The acceleration and deceleration controls how quickly the puller will change from one speed setting to another.

Puller Analog Trim page: This page allows access to the analog trim parameters. The puller speed can be trimmed from the puller analog input. The value of the +/- trim amount and on/off status can be changed here.

Puller Analog Input page: This page allows access to the puller analog input scaling parameters. The puller speed can be controlled by a 0-10 vdc analog input provided by the customer. These parameters can be adjusted to match the actual minimum and maximum analog value provided.

Puller Analog Output page: This page allows access to the puller analog output scaling parameters. The puller provides two 0-10 vdc analog outputs, one is proportional to actual puller speed, the other proportional to motor running torque. These parameters can adjust the minimum and maximum voltage of the analog outputs.

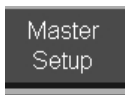
(Continued)

MedLine Puller / Cutter Control Instructions Puller Menu Screen (continued)

Puller Speed Reference page: This page allows access to the puller remote speed reference service

Puller Feed Constant page: This page allows access to the puller feed constant parameters. The feed constant scales the speed units (i.e. ft/min) to motor rpm.

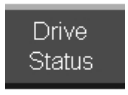
Puller Master Setup page: This page allows access to the master encoder input scaling parameters. The puller speed can be controlled by a quadrature encoder input signal provided by the customer. These parameters scale encoder pulses to puller speed.



Puller Tuning page: This page allows access to the puller servo tuning parameters. These parameters will affect how tightly the puller servo controls the speed of the servo motor. These parameters are adjusted at the factory and generally do not need to be adjusted by the customer.

Puller Control Status page: This page allows access to the puller servo control module status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.

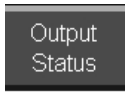
Puller Drive Status page: This page allows access to the puller servo drive module status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.



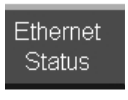
Puller Fault History page: This page allows access to the puller fault history information.

Puller Input Status page: This page allows access to the puller servo control digital input status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.

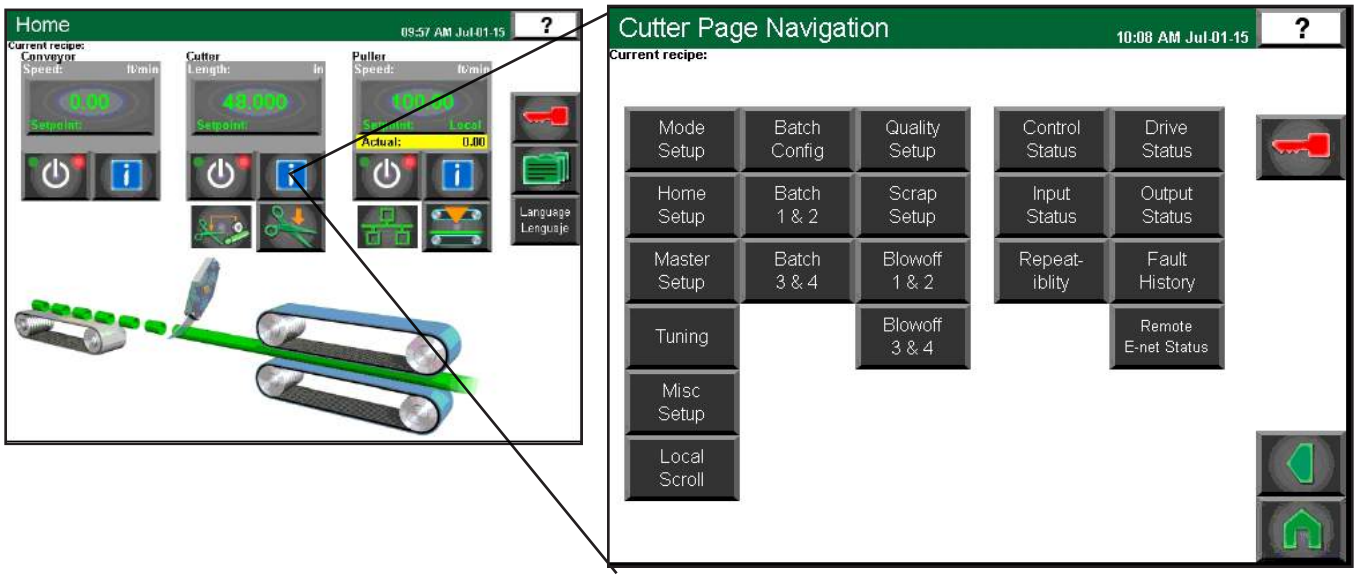
Puller Output Status page: This page allows access to the puller servo control digital output status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.



Puller Remote E-net Data page: This page allows access to the puller remote Ethernet data information. This information would be used to troubleshoot the remote Ethernet communications.



MedLine Puller / Cutter Control Instructions Cutter Menu Screen



Cutter Menu Page from Pressing Info Button on Cutter Home Page

Mode Setup

Cutter Mode Setup page: This page allows access to the cutter operating remote parameters. Refer to Control Function Flow Chart - Cutter Section from Home Page.

Cutter Home Setup page: *Refer to "Cutter Home Setup Page" in the "Control Function Description" heading of this Section.*

Master Setup

Cutter Master Setup page: This page allows access to the master encoder input scaling parameters. The cutter uses a quadrature encoder input signal to measure product length. These parameters scale encoder pulses to product length.

Tuning

Cutter Tuning page: This page allows access to the cutter servo tuning parameters. These parameters will affect how tightly the cutter servo controls the speed and position of the servo motor. These parameters are adjusted at the factory and generally do not need to be adjusted by the customer.

Misc Setup

Cutter Misc. Setup page: This page allows access to the cutter speed, acceleration/deceleration, and blade counter parameters.

Local Scroll

Cutter Local Scroll page: This page allows access to the acceleration settings for the local scroll amounts.

(Continued)

MedLine Puller / Cutter Control Instructions Cutter Menu Screen (continued)

Cutter Batch Config page: This page allows access to the cutter batch configuration parameters. The cutter provides part batch counting and blowoff control. Up to 4 batches and 4 blowoff's are available. Batch #1 counter is always enabled. The other 3 can be enable/disabled from this page. Each batch counter can be assigned to any 1 blowoff.

Cutter Batch 1 & 2 page: This page allows access to the cutter batch counters 1 & 2 parameters. Each batch counter has an associated cut length. If more than 1 batch counter is enabled, the cutter switches to the next batch counter enabled and switches the cut length. This allows cutting batches of different length products automatically. Each batch counter has a preset and warning preset parameter.

Cutter Batch 3 & 4 page: This page allows access to the cutter batch counters 3 & 4 parameters. Each batch counter has an associated cut length. If more than 1 batch counter is enabled, the cutter switches to the next batch counter enabled and switches the cut length. This allows cutting batches of different length products automatically. Each batch counter has a preset and warning preset parameter.

Cutter Quality Setup page: This page allows access to the quality input setup parameters. The quality input is a "dry contact" input from a customer supplied gauge. This input tells the cutter whether good or bad product is passing through the cutter. This input works in conjunction with the blowoffs for product separation at the conveyor. A quality mode can be set that tells the cutter that all product is "good", "bad" or "gauge". "Gauge" mode tells the cutter that the product state comes from the quality input.

Scrap Mode Setup page: This page allows access to the scrap mode setup parameters. Scrap mode works in conjunction with the quality input. Scrap mode allows the cutter to make bad,(scrap), product a different length than good product. The cutter can be configured to stop cutting or to cut a scrap length. Scrap mode can be turned on or off.

Cutter Blowoff 1 & 2 page: This page allows access to the blowoff 1 & 2 parameters. The blowoff outputs can operate in either "on demand" or "continuous" mode. "On demand" mode is active whenever the cutter is in either "Encoder", "Timer" or "End Sense" mode. "Continuous" mode is active whenever the cutter is in "Flywheel" or "Follower" mode. The blowoff's work in conjunction with the quality input. This allows good and bad product to be separated at the take away conveyor.

Cutter Blowoff 3 & 4 page: This page allows access to the blowoff 3 & 4 parameters. The blowoff outputs can operate in either "on demand" or "continuous" mode. "On demand" mode is active whenever the cutter is in either "Encoder", "Timer" or "End Sense" mode. "Continuous" mode is active whenever the cutter is in "Flywheel" or "Follower" mode. The blowoff's work in conjunction with the quality input. This allows good and bad product to be separated at the take away conveyor.

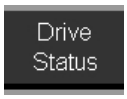
Cutter Control Status page: This page allows access to the cutter servo control module status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

(Continued)

MedLine Puller / Cutter Control Instructions Cutter Menu Screen (continued)

Cutter Input Status page: This page allows access to the cutter servo control digital input status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

Cutter Repeatability page: This page allows access to the cutter repeatability information. This information would be used to troubleshoot cutter performance issues.



Cutter Drive Status page: This page allows access to the cutter servo drive module status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

Cutter Output Status page: This page allows access to the cutter servo control digital output status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

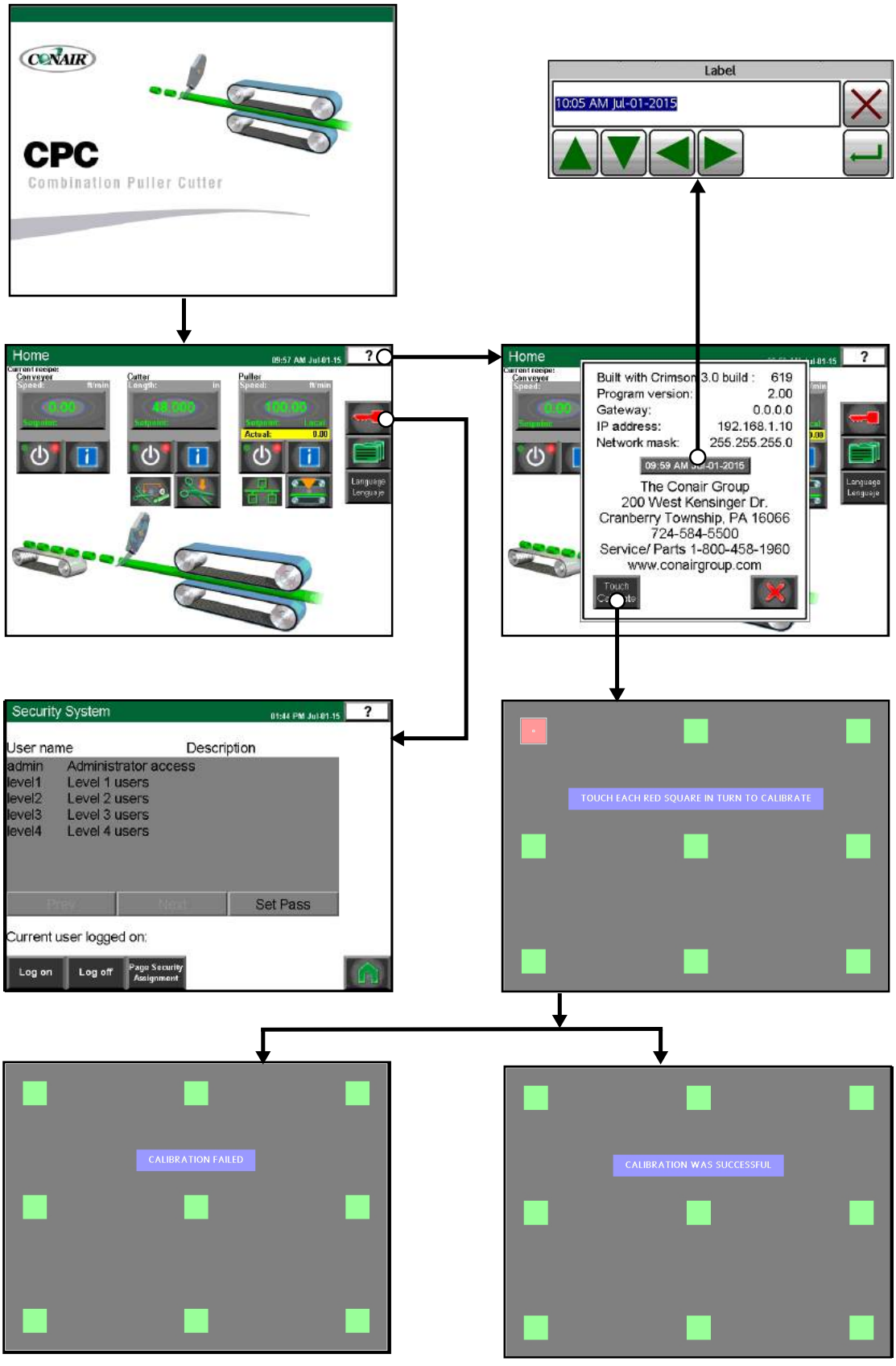
Cutter Fault History page: This page allows access to all cutter fault history.

Cutter Remote E-net Data page: This page allows access to the cutter remote Ethernet data information. This information would be used to troubleshoot the remote Ethernet communications.

Cutter Conveyor Setup page: This page allows access to the conveyor setup parameters. The cutter can control the speed of a conveyor by way of a 0-10 vdc analog signal. This page allows scaling of the analog signal to speed units.

Control Function Flow Charts

Info and Security



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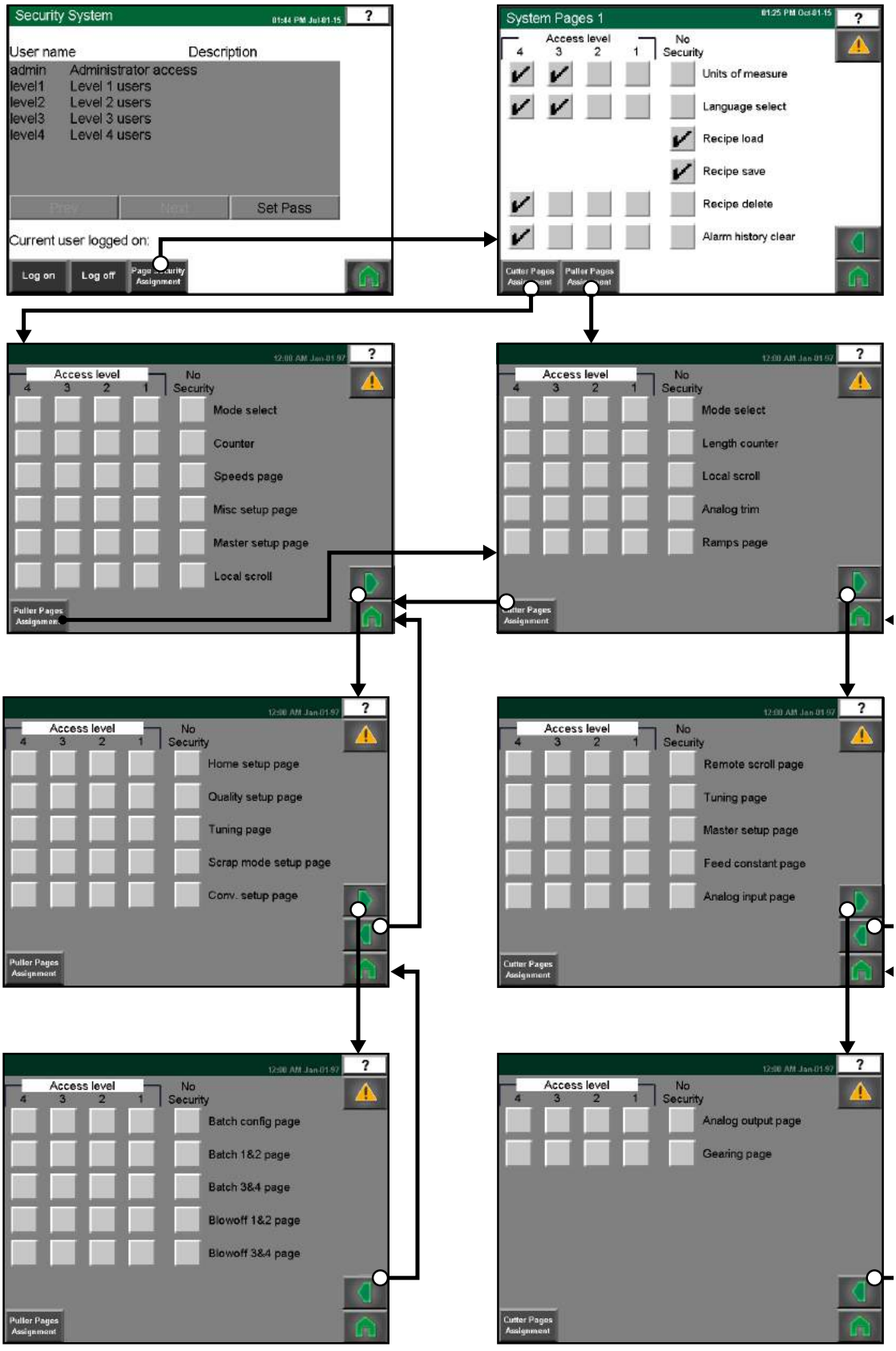
Control Function Flow Charts

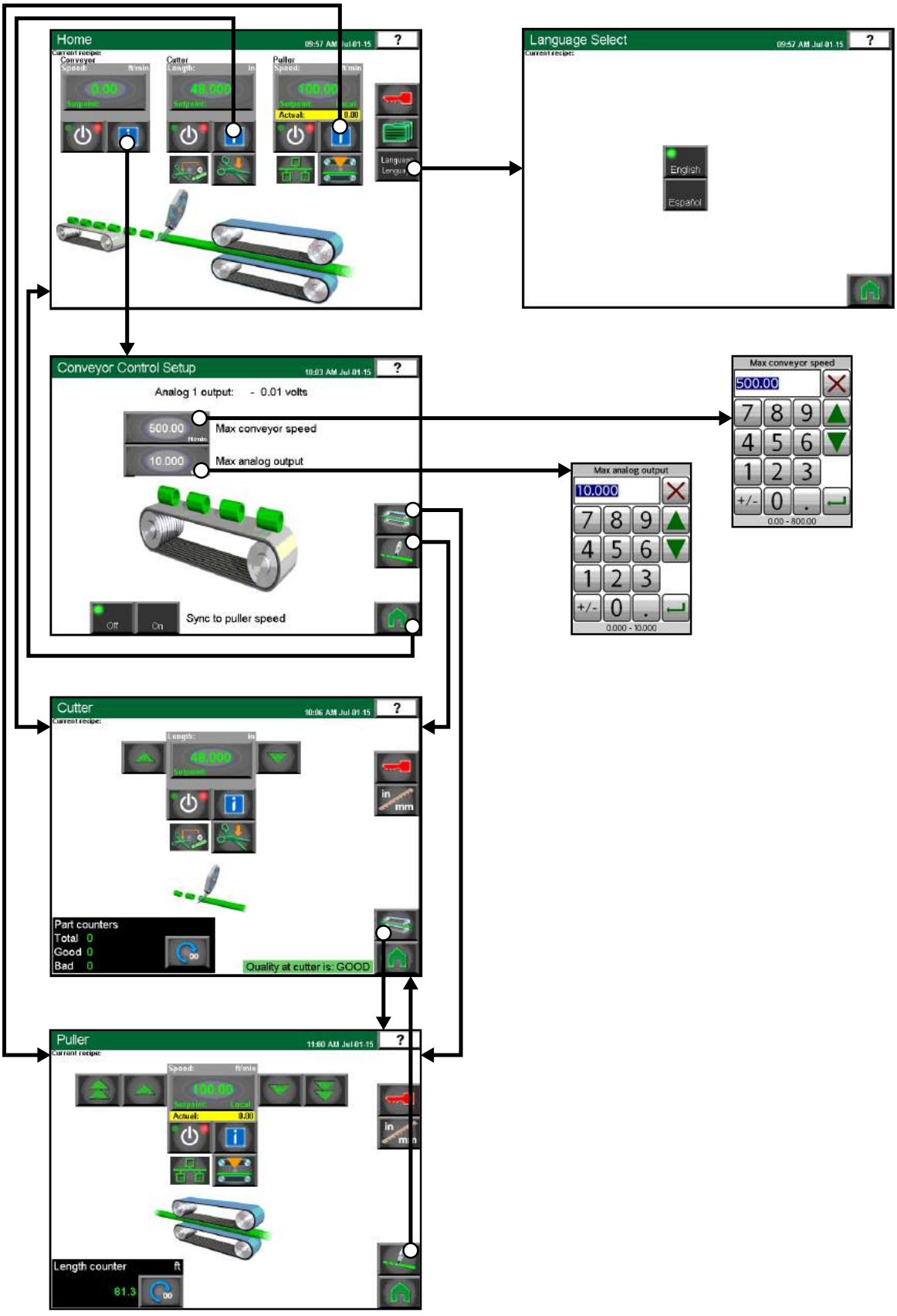
Security



(Continued)

Control Function Flow Charts

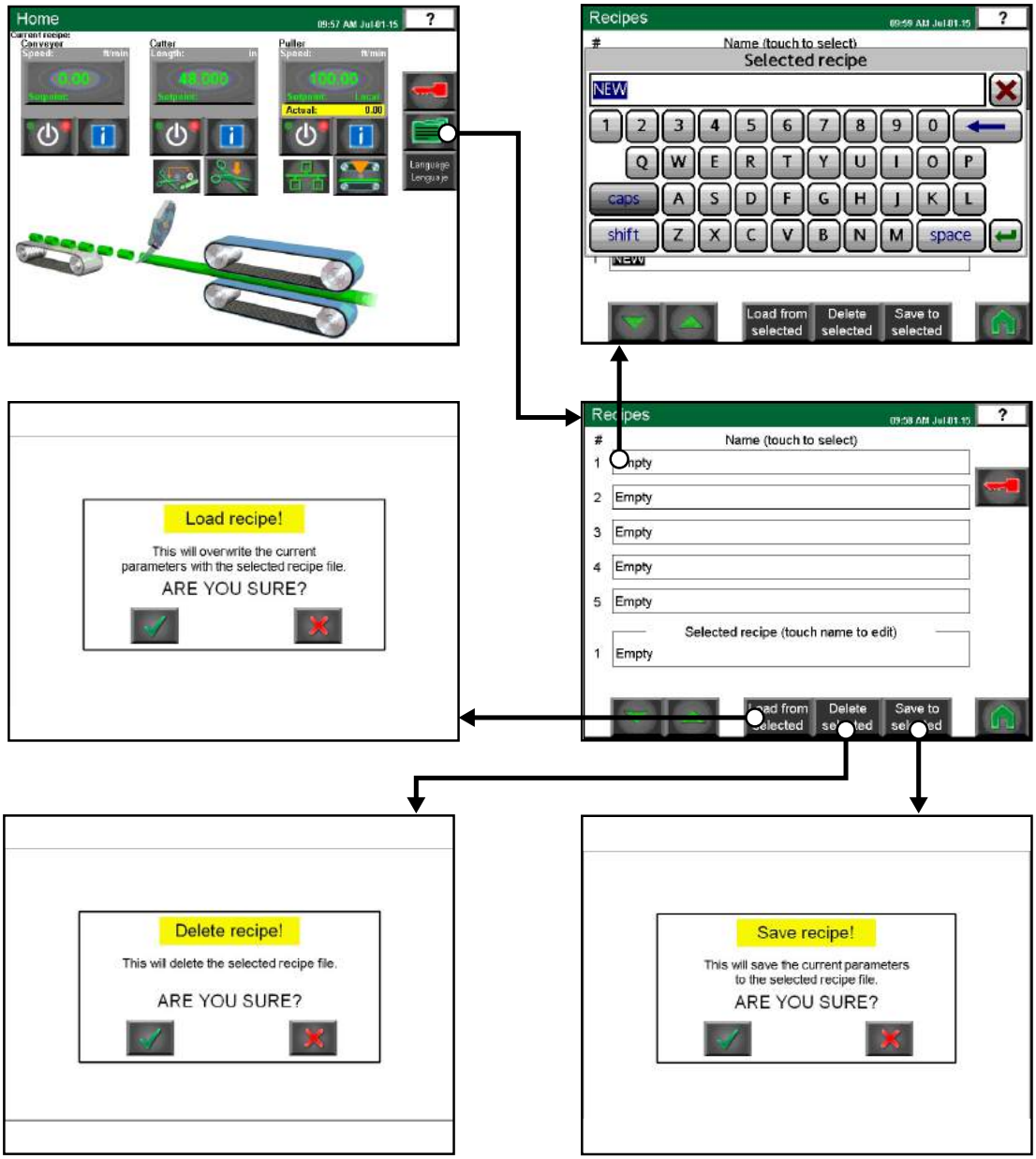
Conveyor and Language



(Continued)

Control Function Flow Charts

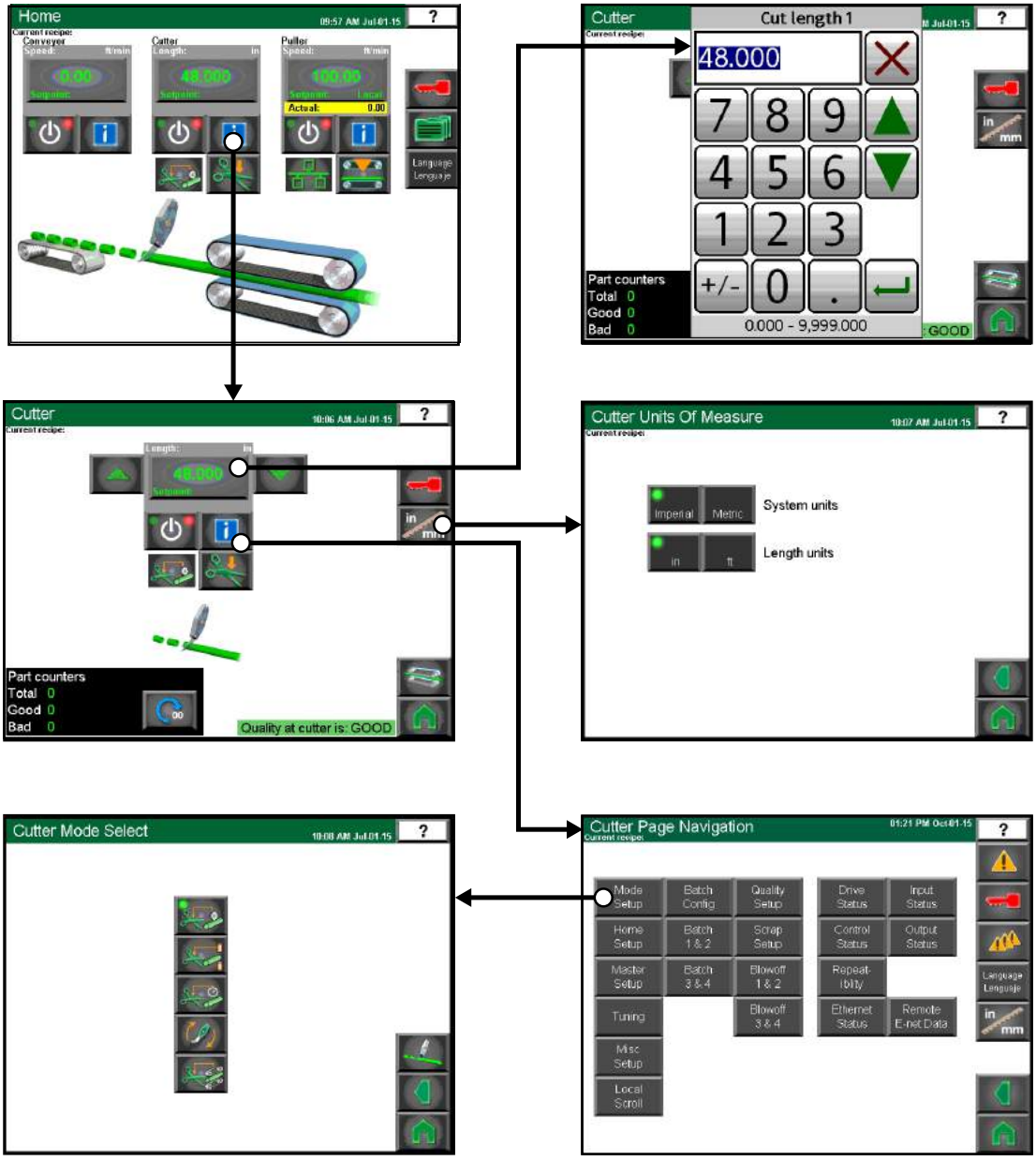
Recipes



(Continued)

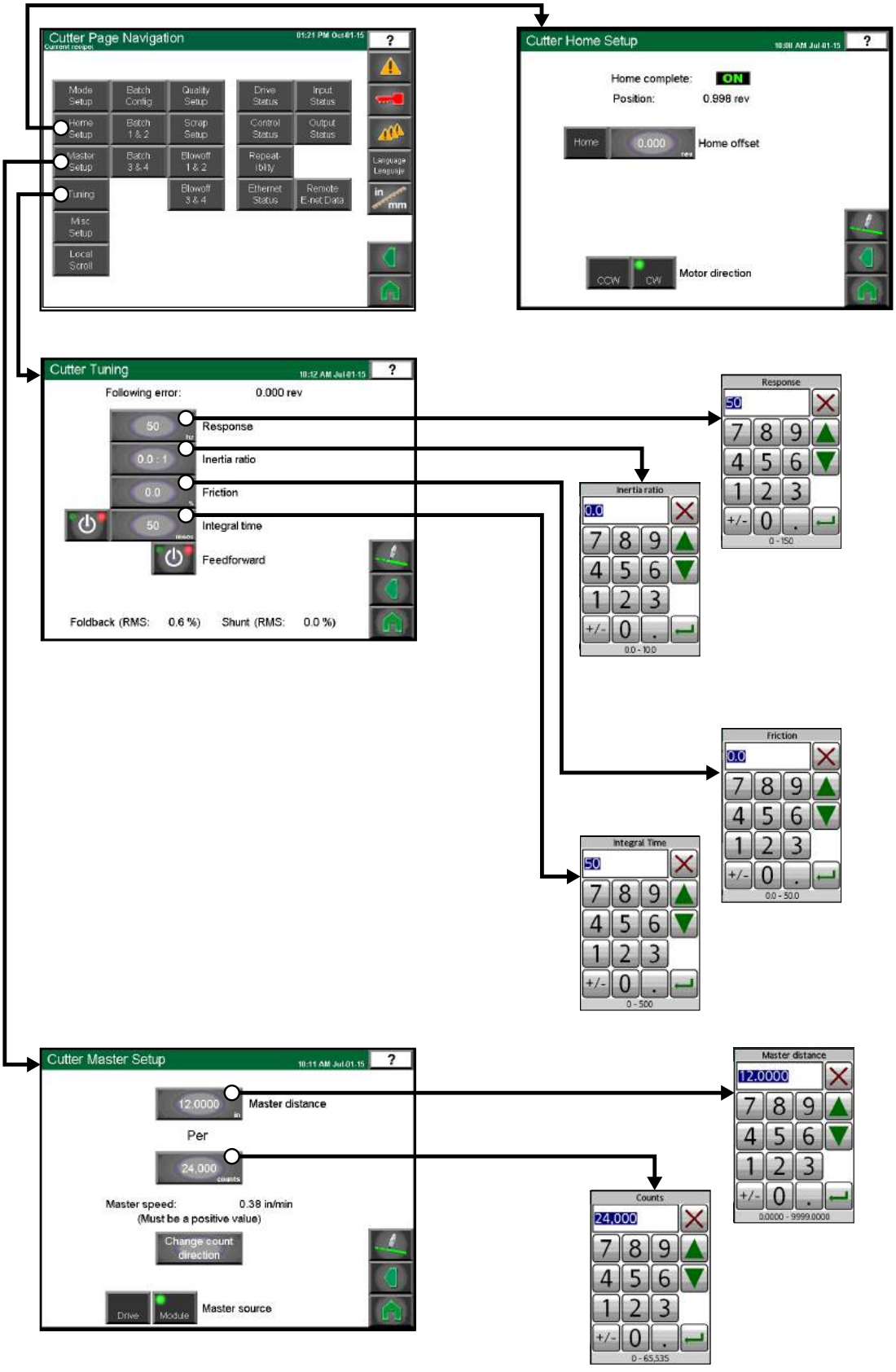
Control Function Flow Charts

Cutter



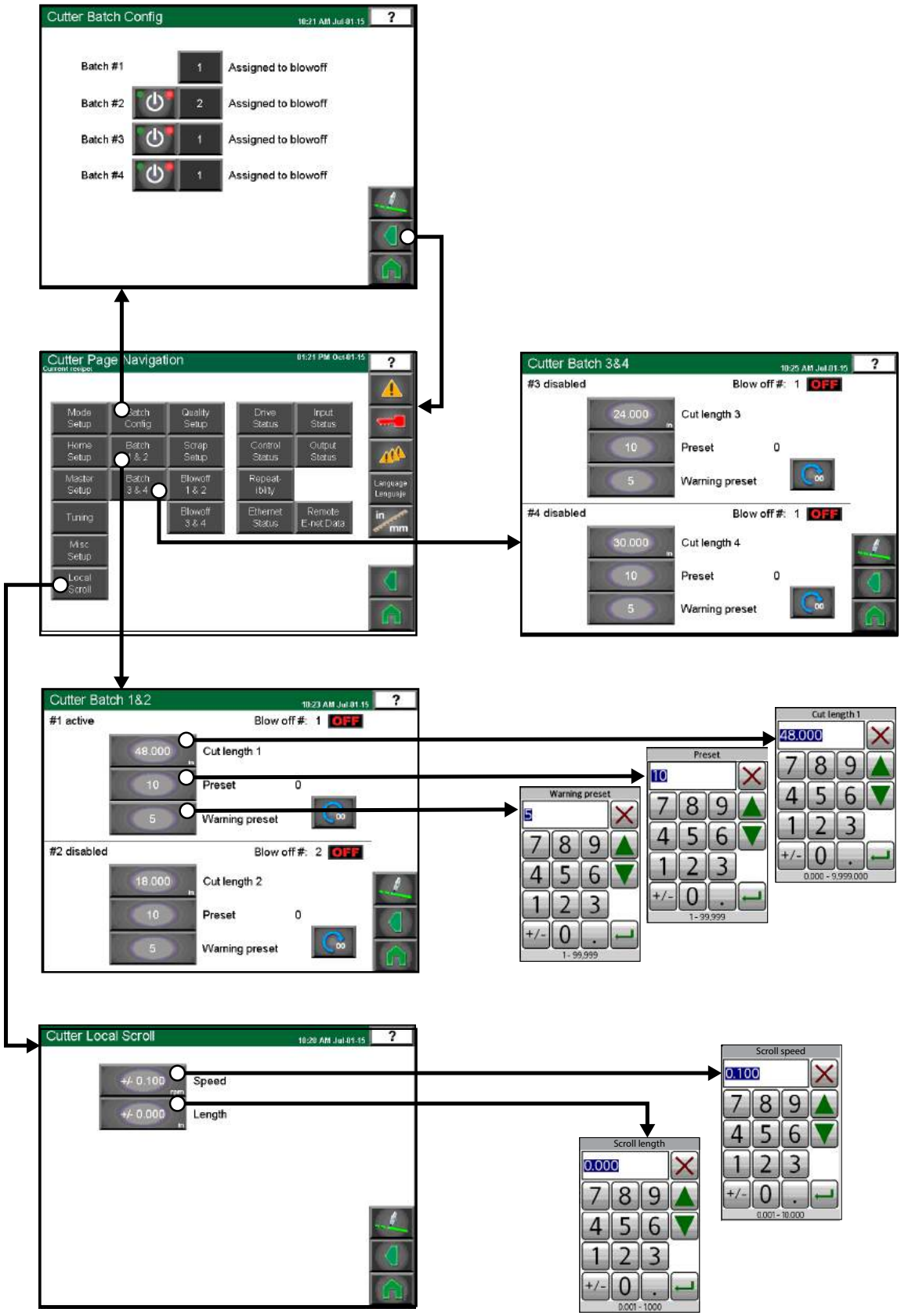
Control Function Flow Charts

Cutter Page Navigation



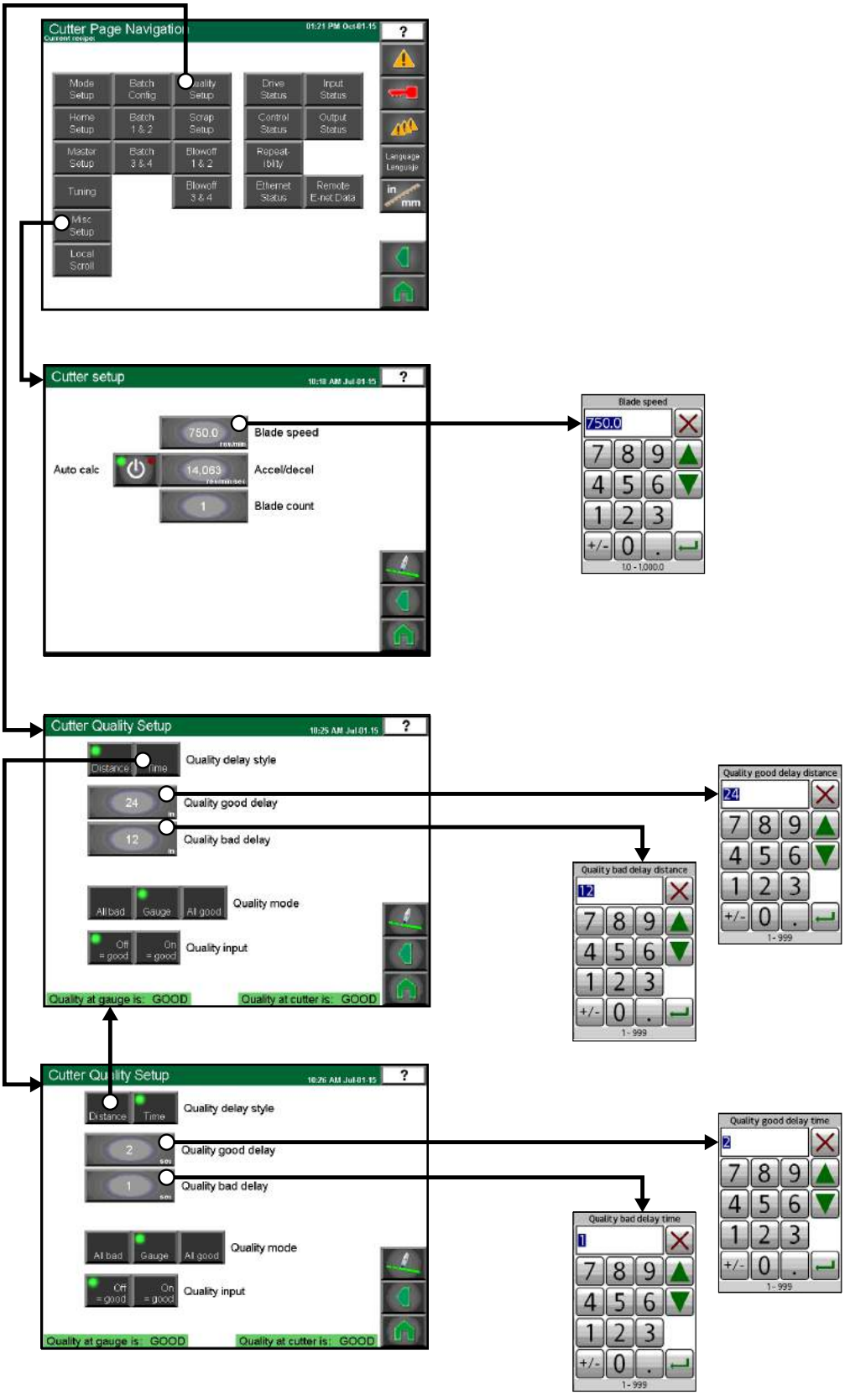
(Continued)

Control Function Flow Charts



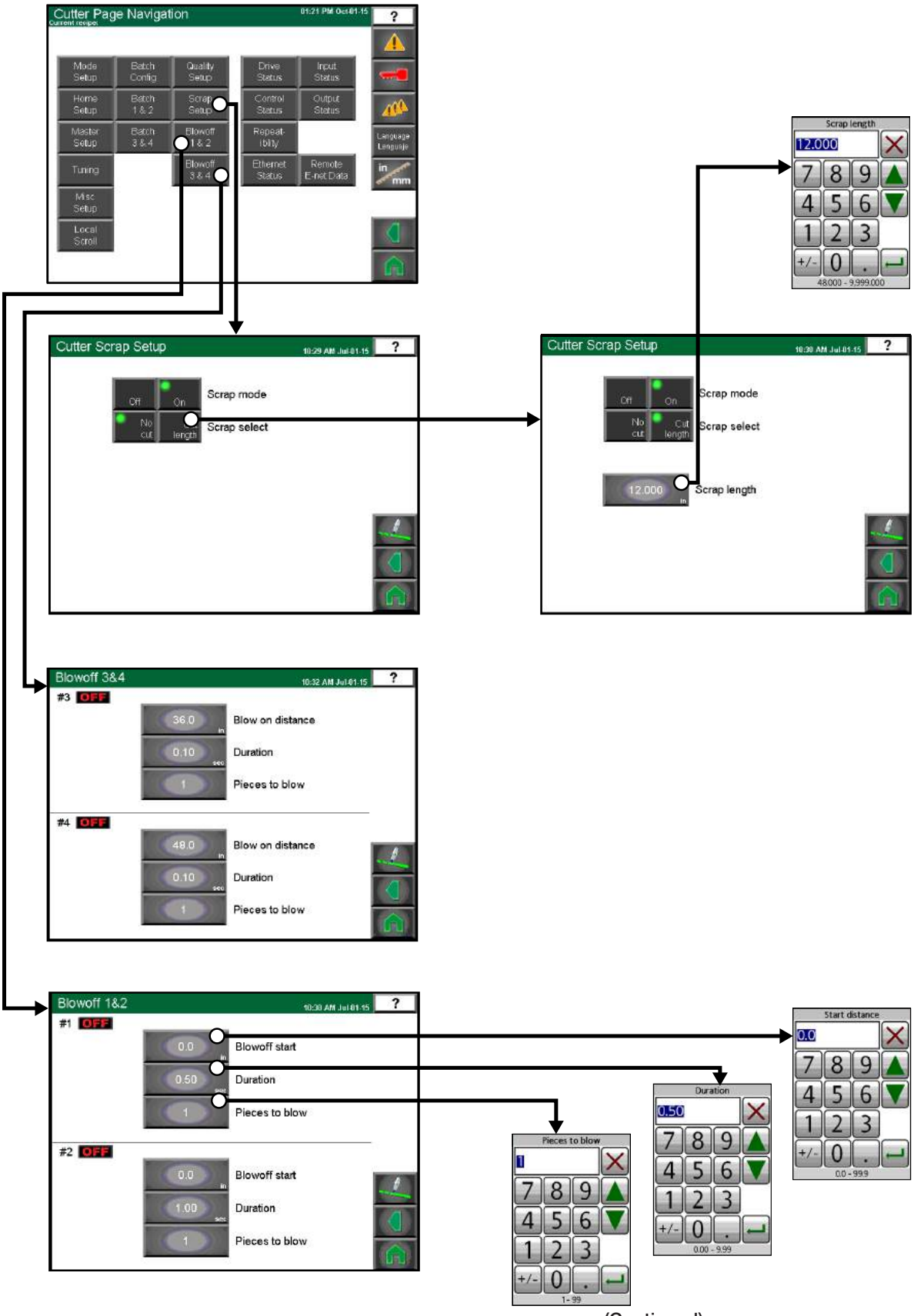
(Continued)

Control Function Flow Charts



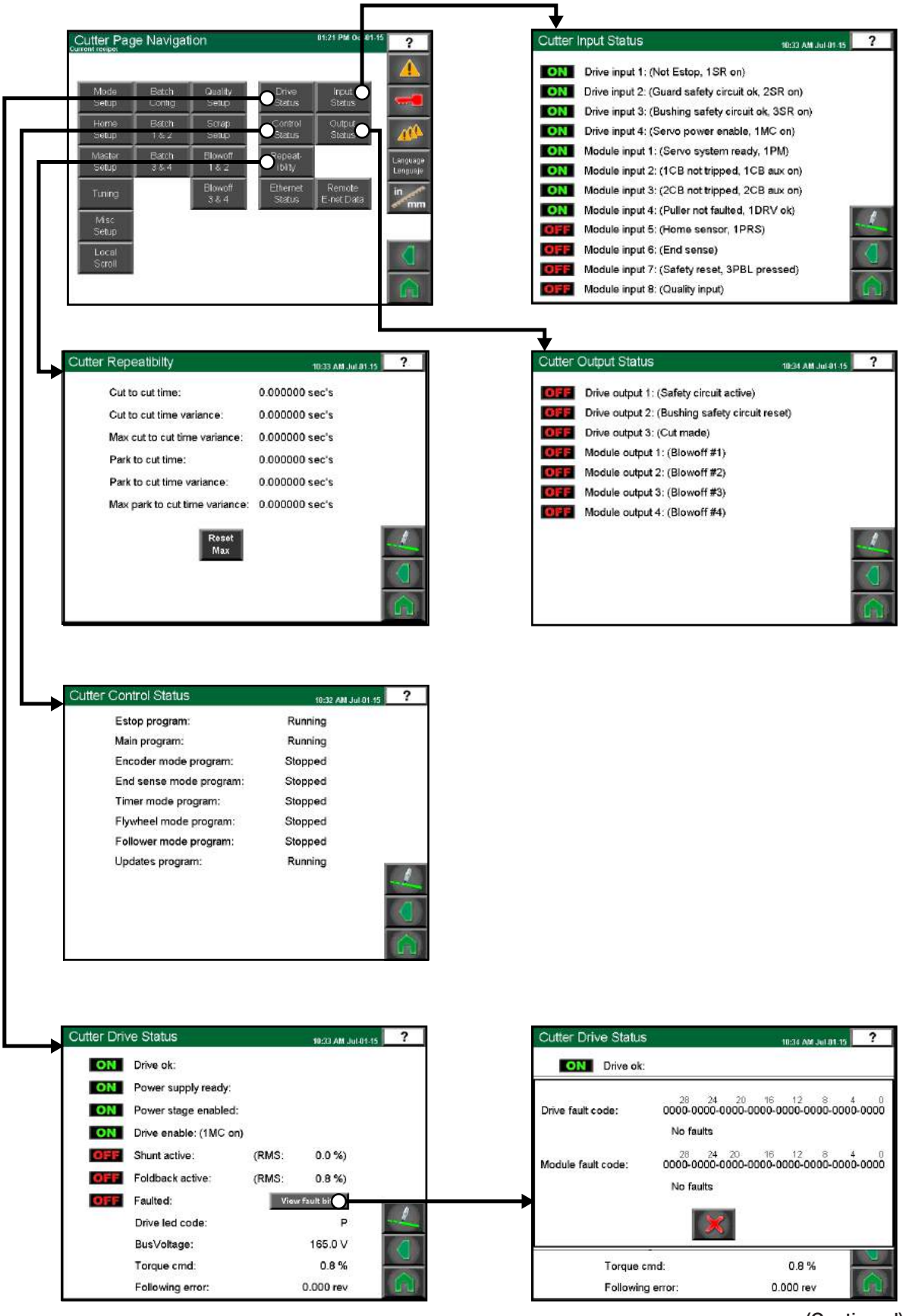
(Continued)

Control Function Flow Charts



(Continued)

Control Function Flow Charts



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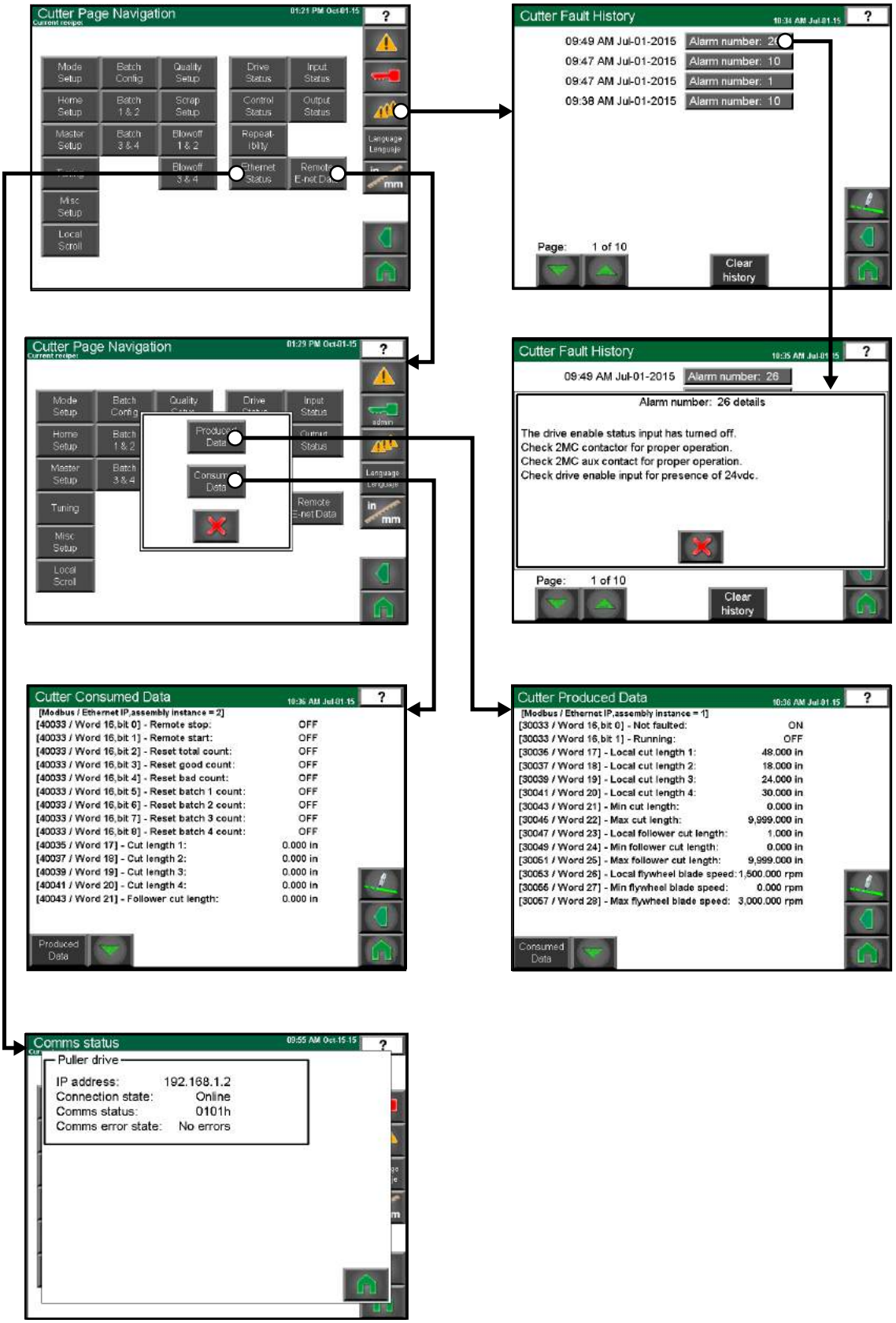
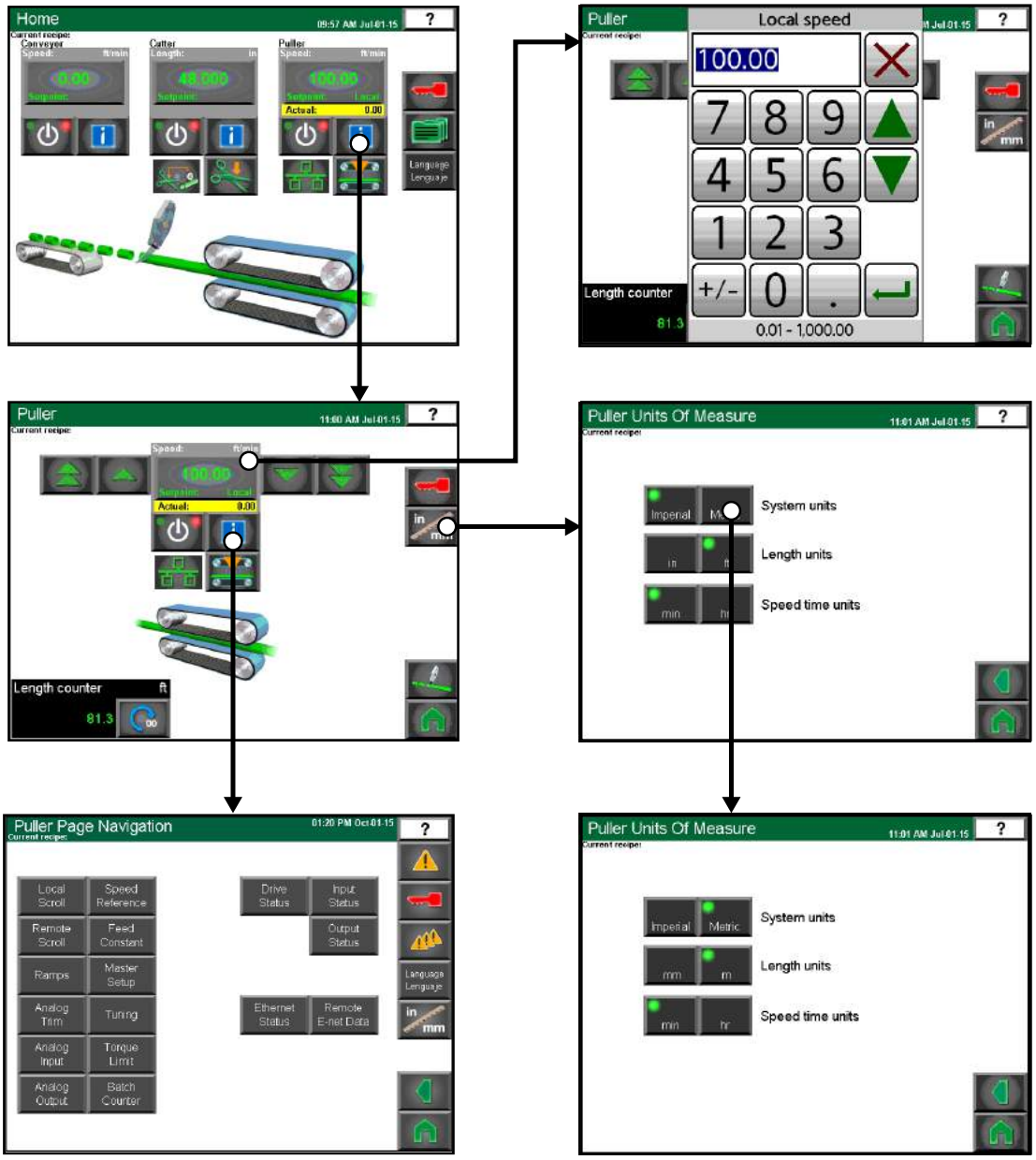
Control Function Flow Charts



(Continued)

Control Function Flow Charts

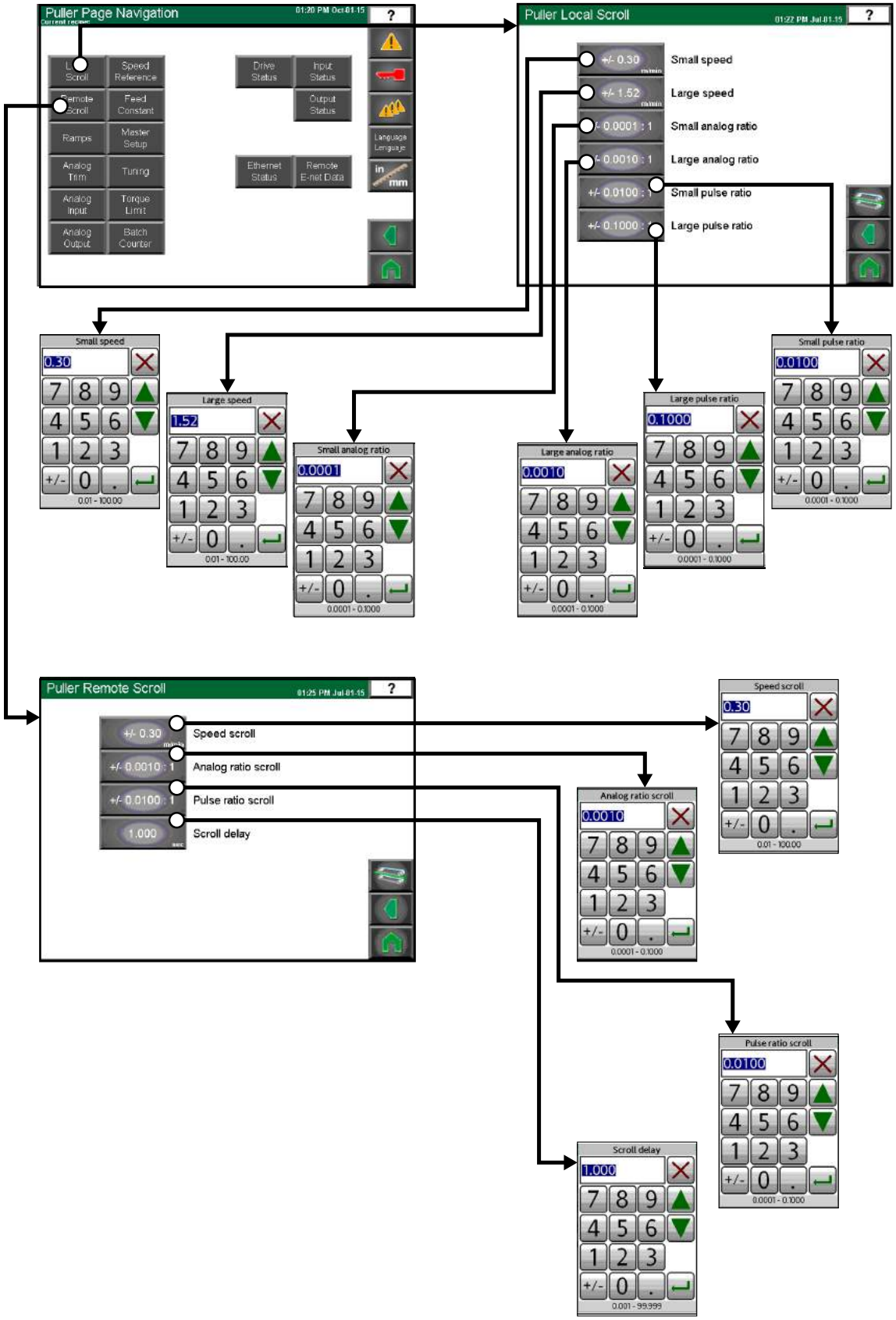
Puller



(Continued)

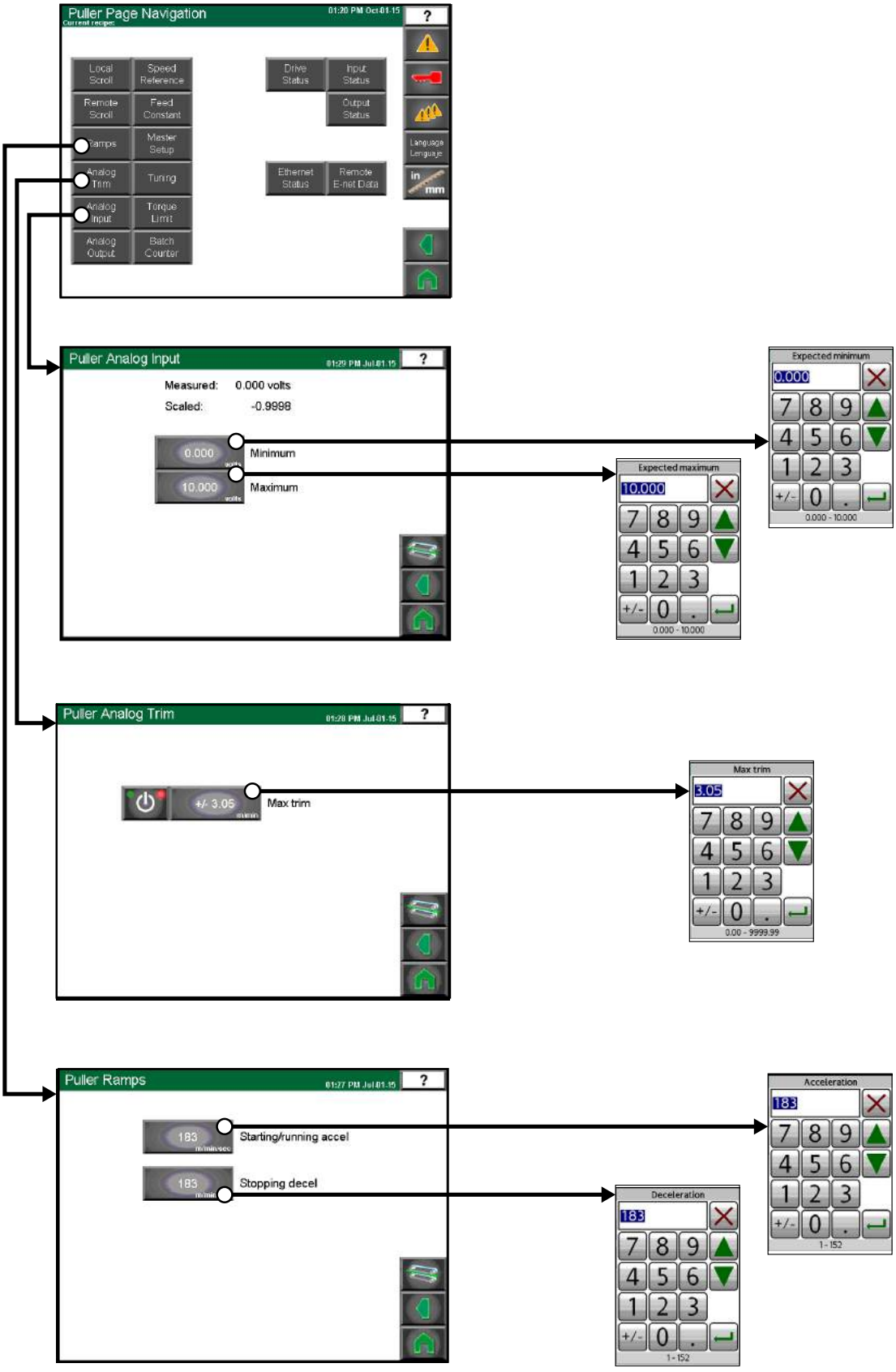
Control Function Flow Charts

Puller Page Navigation



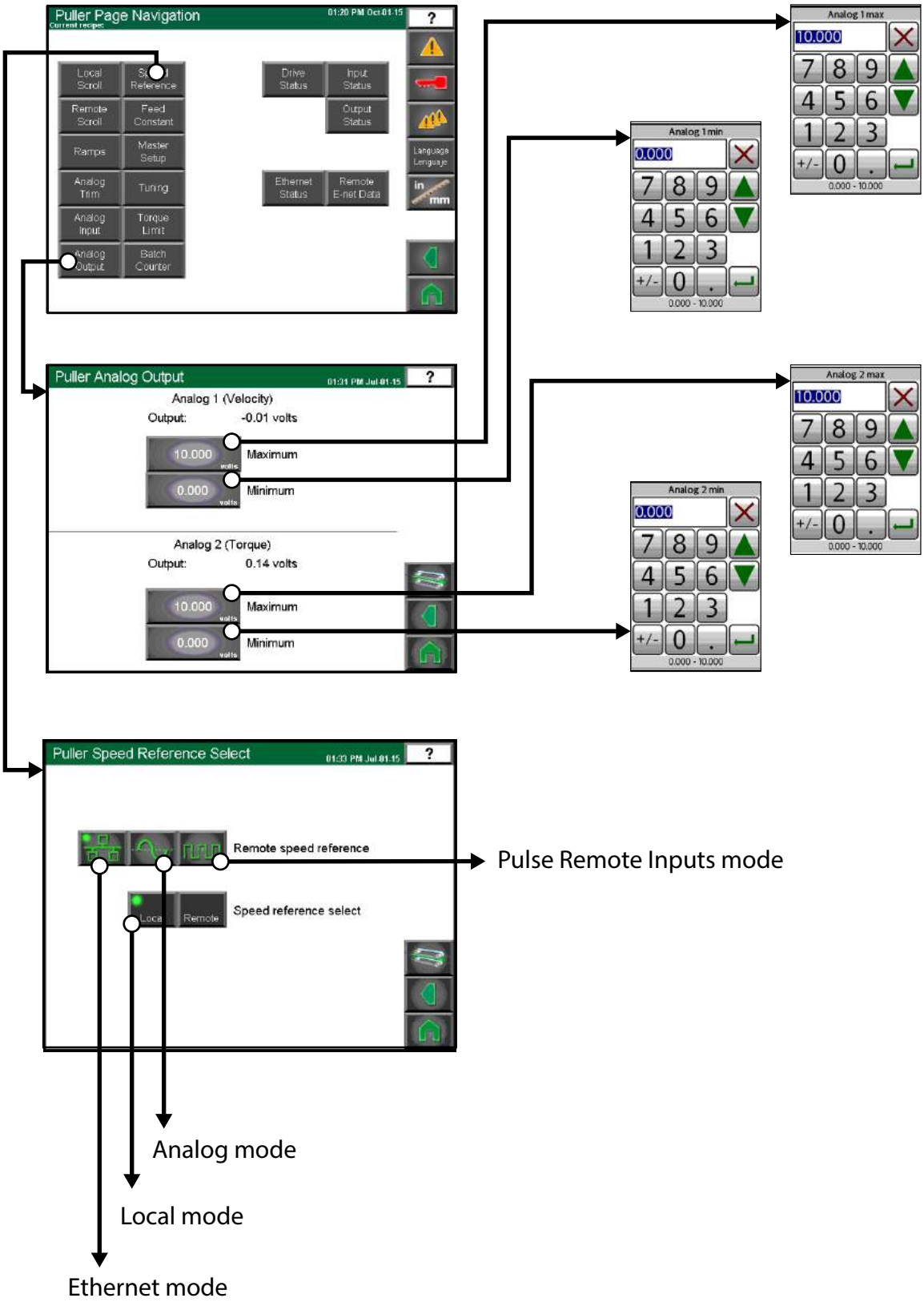
(Continued)

Control Function Flow Charts



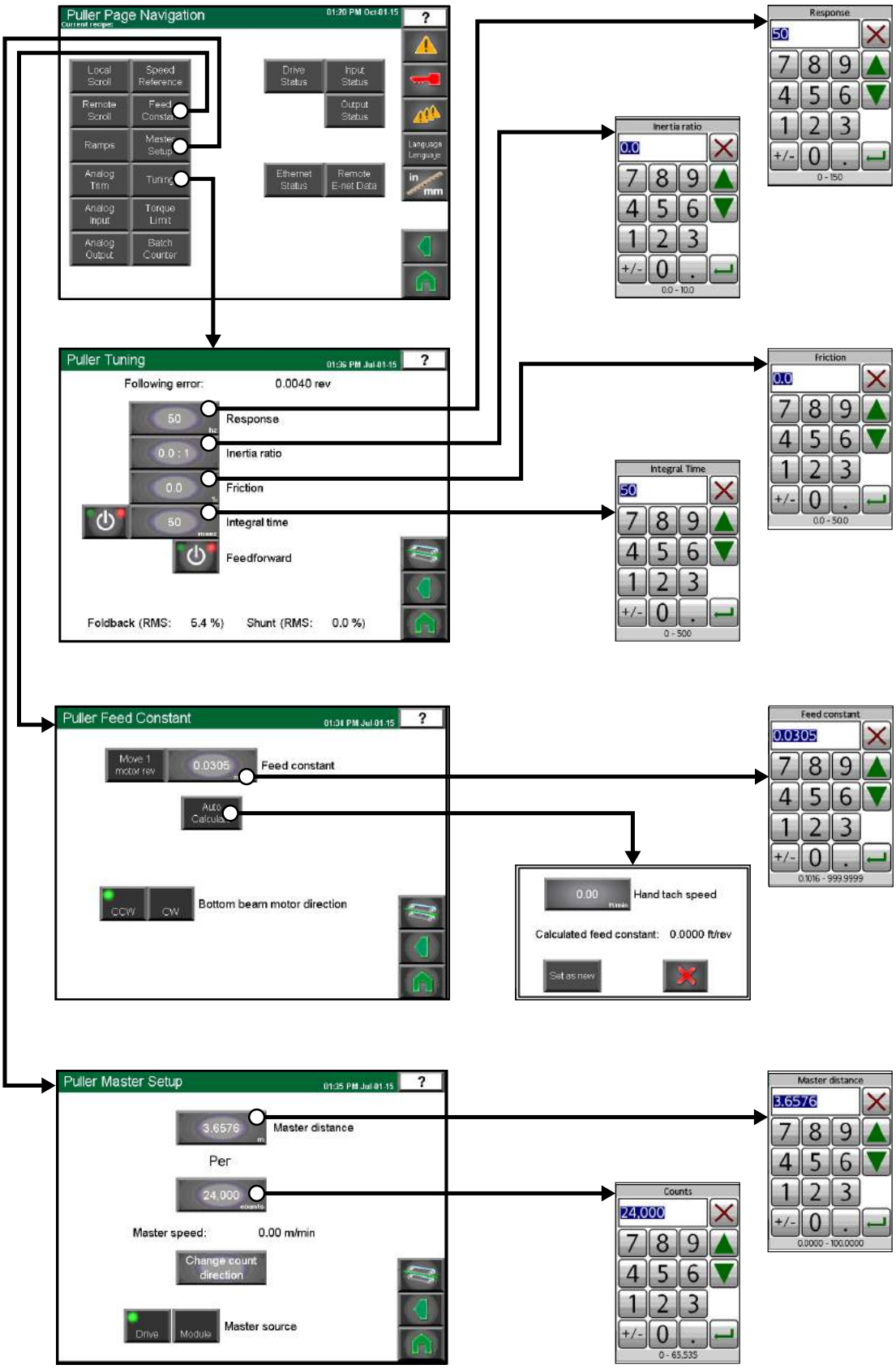
(Continued)

Control Function Flow Charts



(Continued)

Control Function Flow Charts



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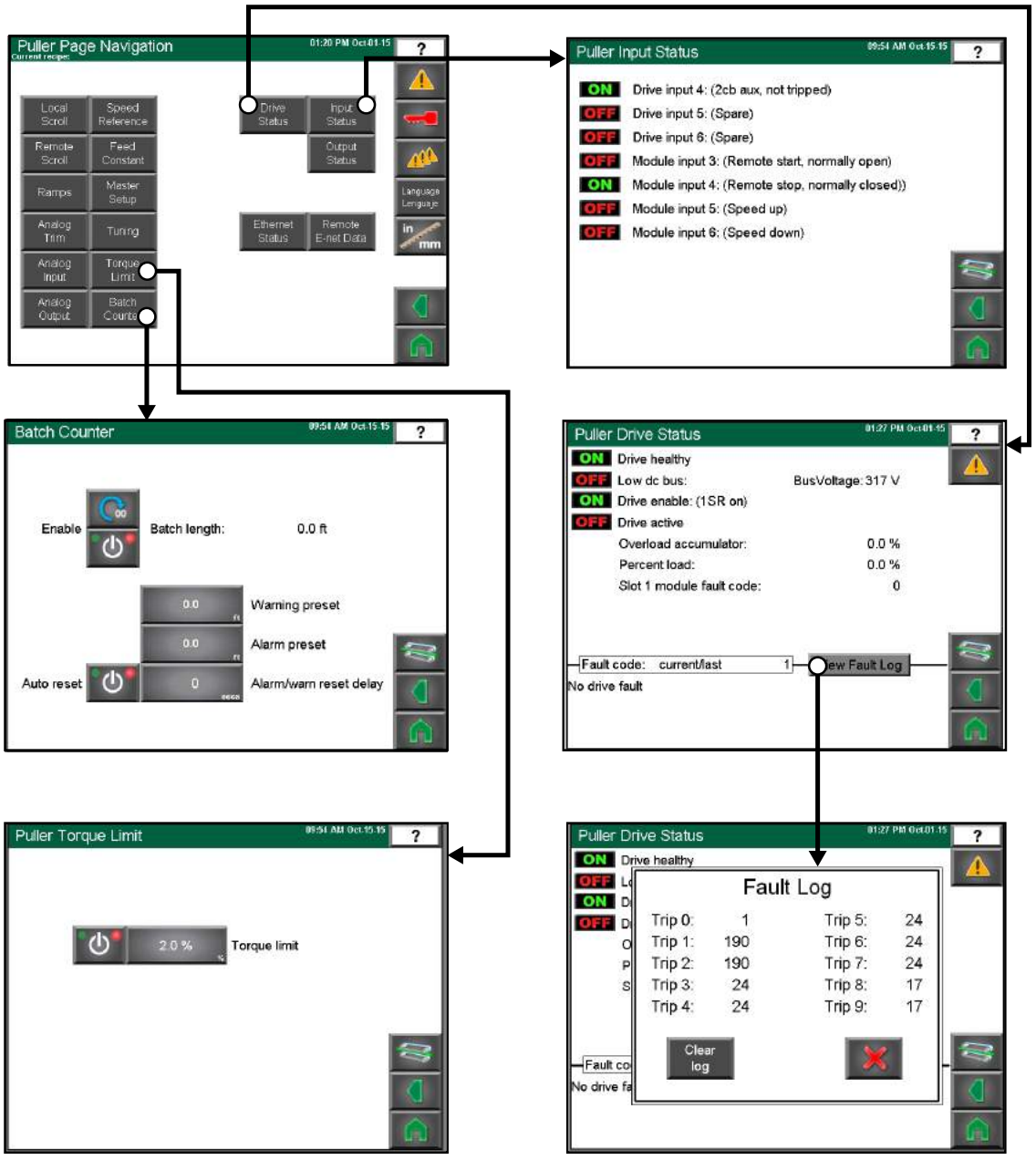
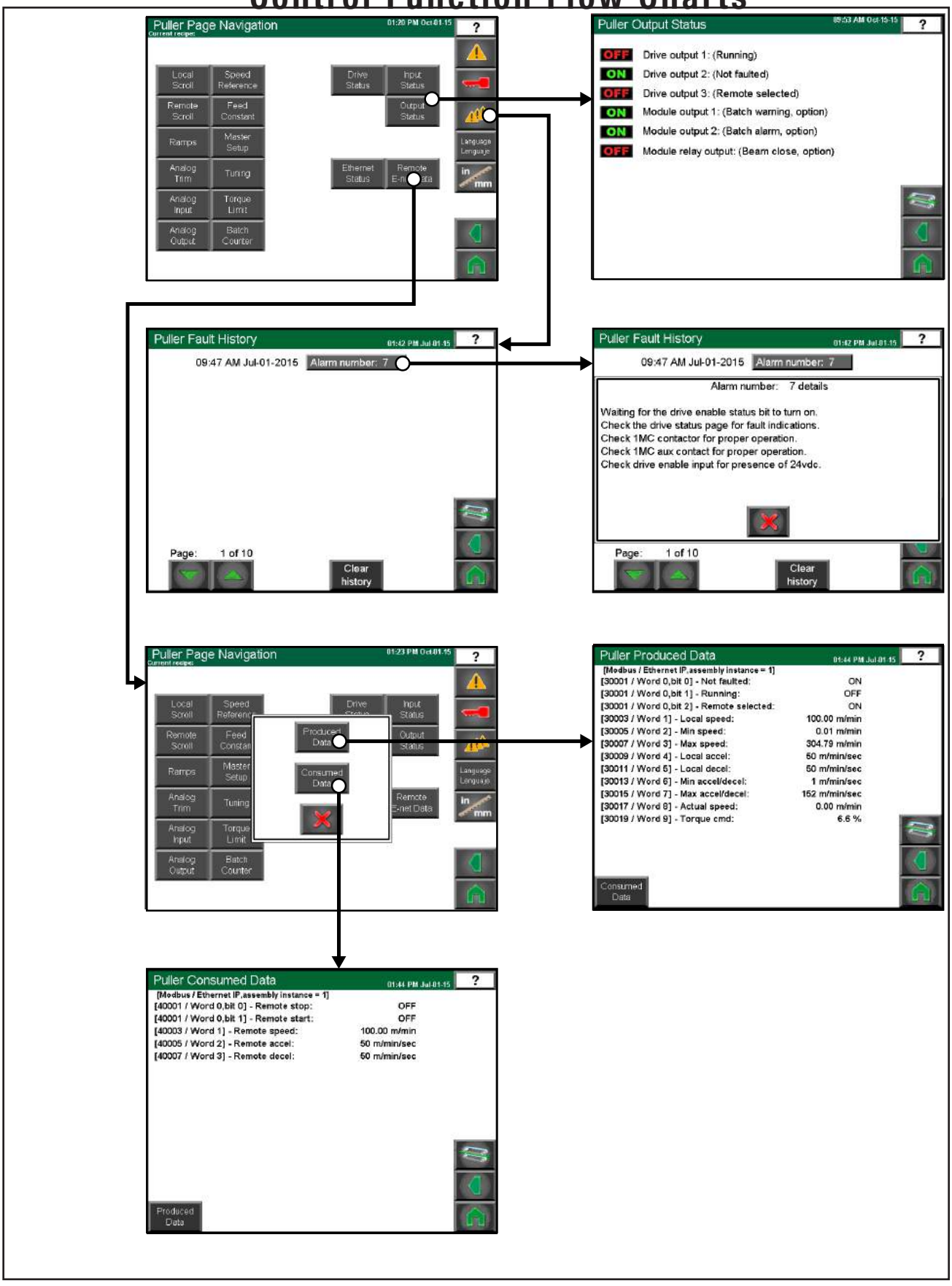
Control Function Flow Charts

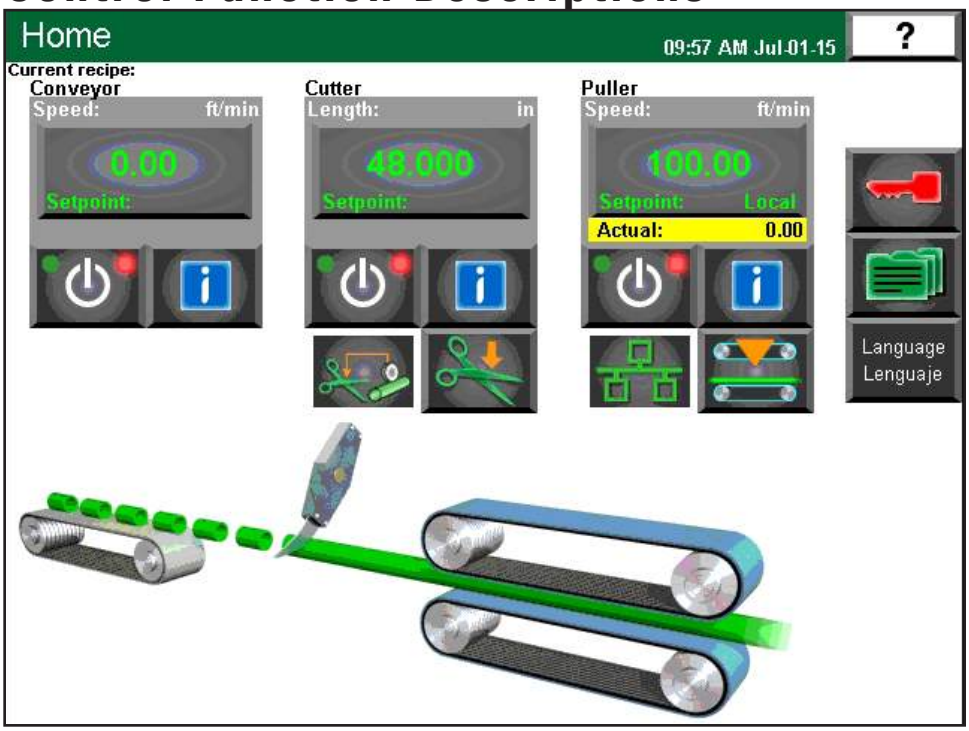


(Continued)

Control Function Flow Charts

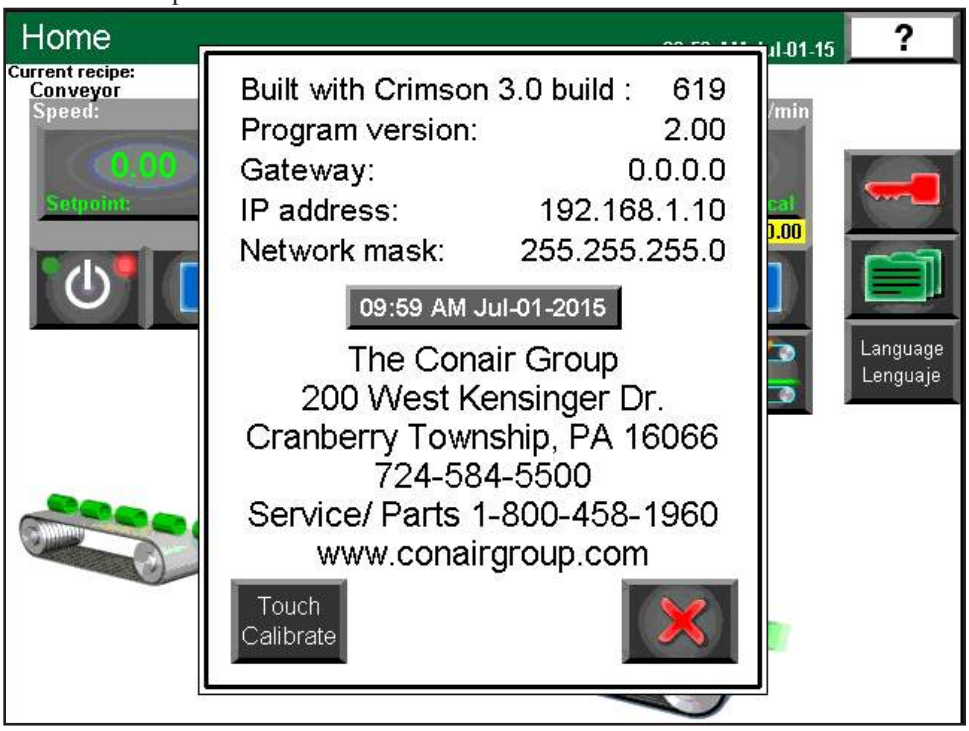


Control Function Descriptions



Home Page

The home page is displayed automatically upon power up after the system is done initializing. The home page is where most machine control functions are performed. The page allows for both puller and cutter control functions.

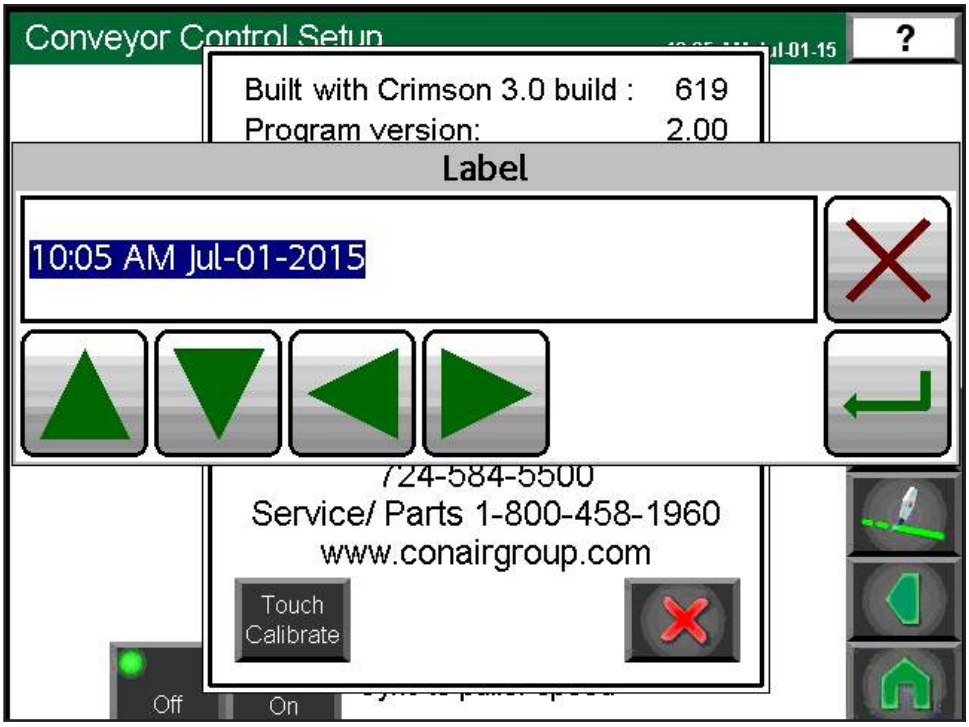


About Page

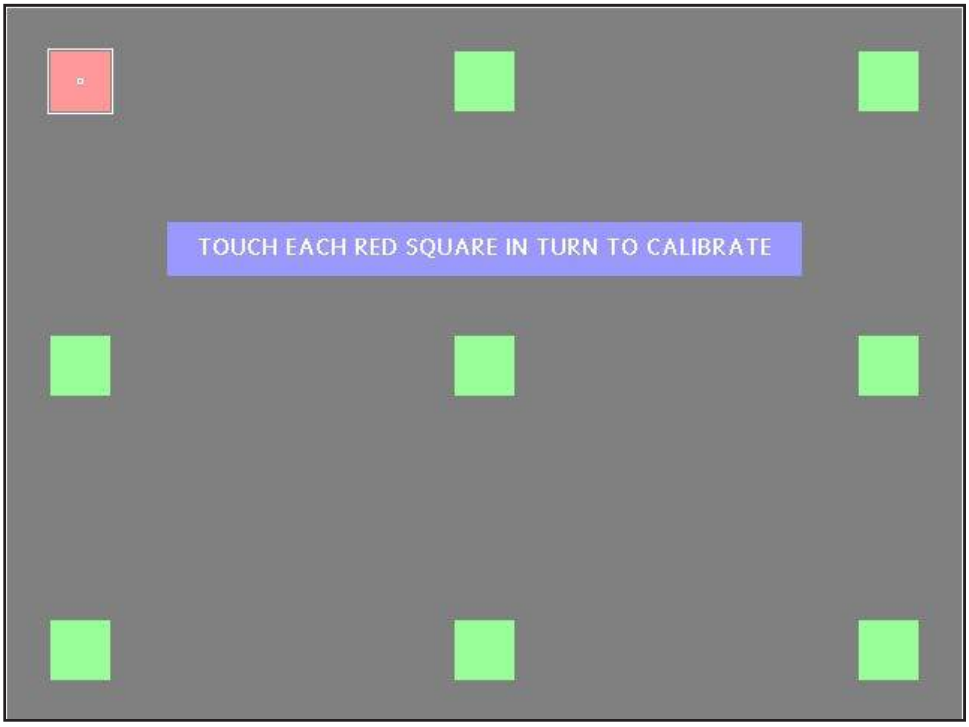
This page displays the version information of the Crimson programming software used to create the HMI pages. It also displays Conair's contact information. Touchscreen calibration is accessed from this page.

(Continued)

Control Function Descriptions



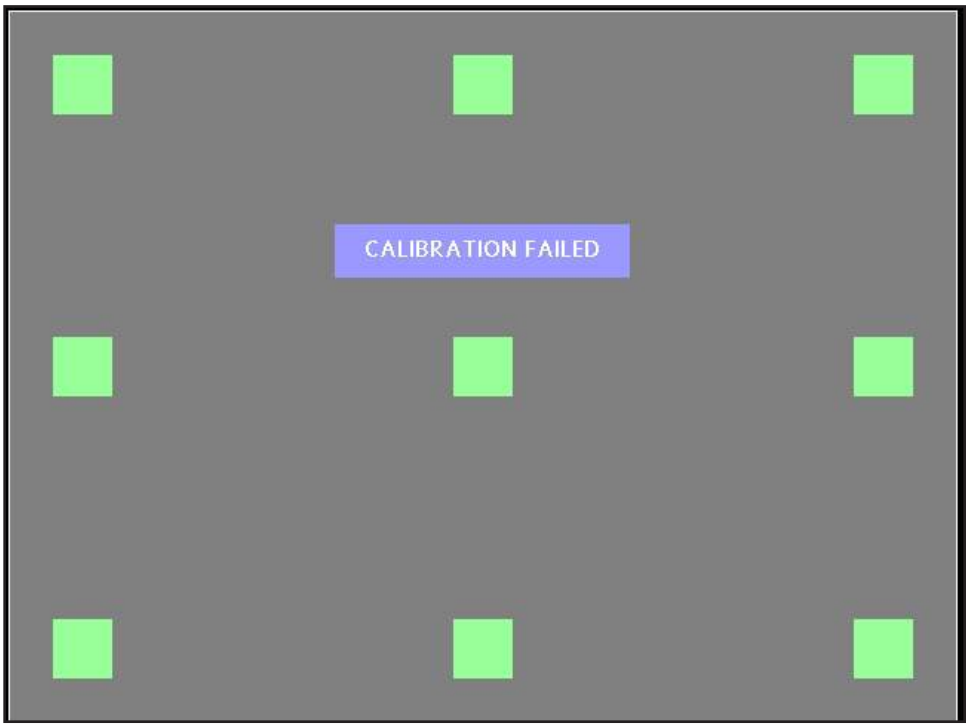
Date and Time Page
This page displays a pop up screen with the current date and time.



Touch Calibrate Page
The HMI touchscreen can be calibrated by this page. Selecting this page begins the calibration procedure. The user is guided to touch various points on the screen to complete the procedure.

(Continued)

Touch Calibrate Success Page

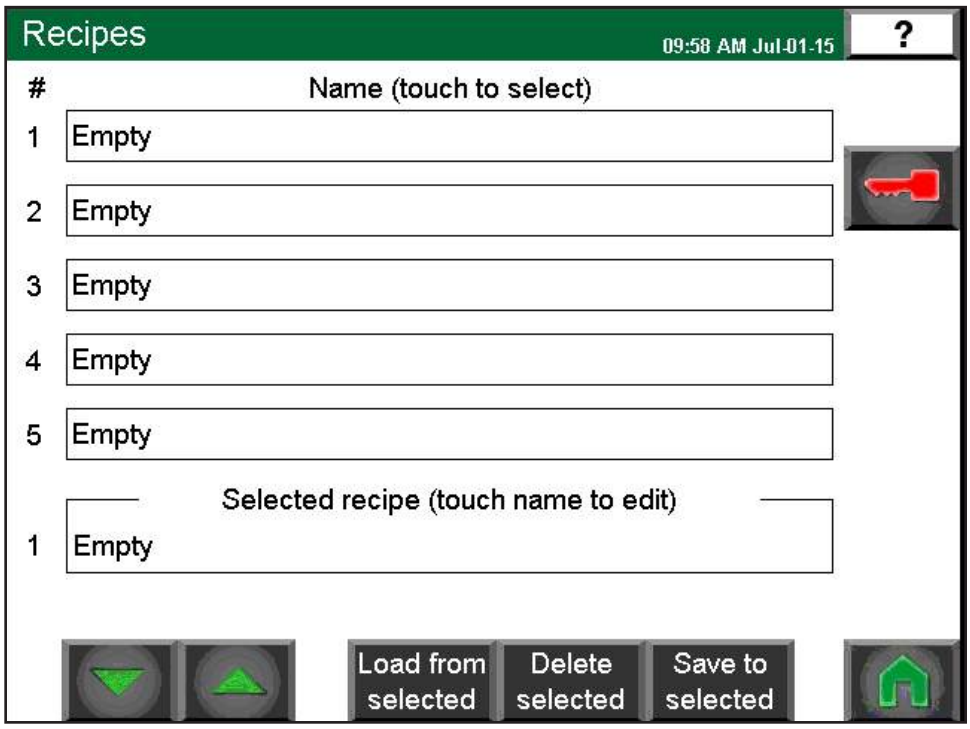


Touch Calibrate Failure Page
The calibration has failed. Attempt calibration again, if unsuccessful, contact Conair Parts and Service.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

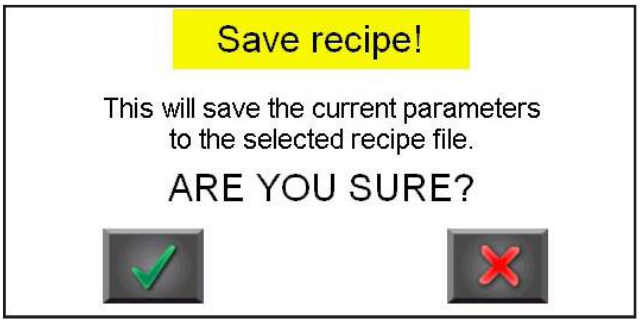
(Continued)

Control Function Descriptions



Recipes Page
The recipe page allows access to the recipe storage/retrieval system. Up to 100 recipe files are available and are numbered 1 through 100. Each recipe file can be given a name up to 40 characters. Five recipe file numbers/names are displayed at once. To view other recipe file names touch the "Pg Up" or "Pg Dn" buttons. The recipe files are scrolled five at a time.

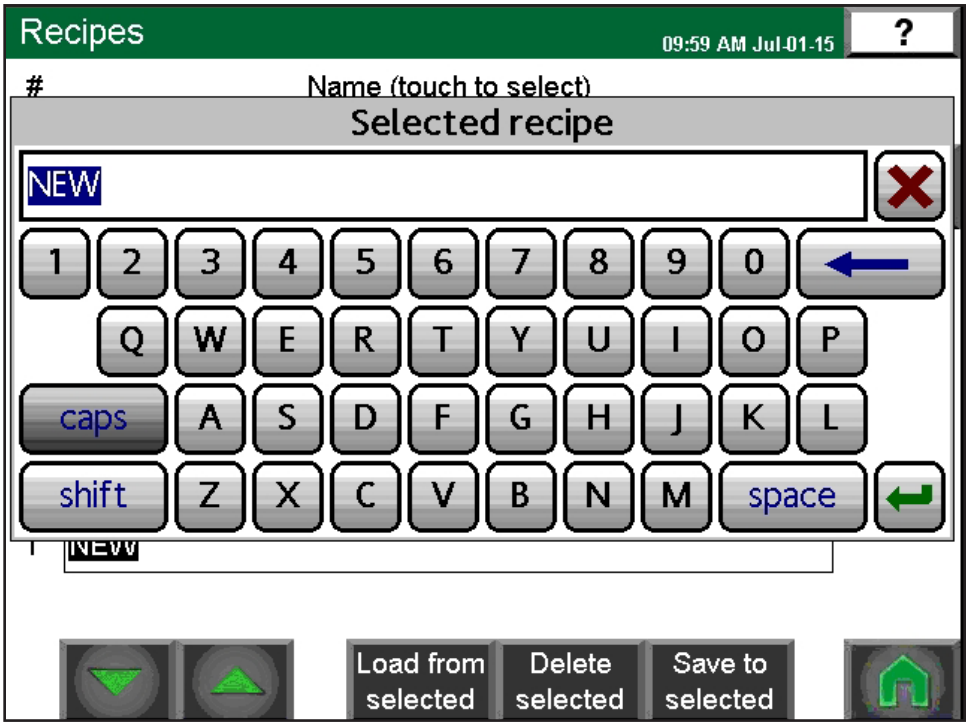
Three recipe function can be performed. They are "Load from selected", "Delete selected" and "Save to selected". To perform one of these functions a recipe file must first be selected. To select a recipe from the recipe file, touch the name of the desired recipe from the list of five currently displayed. The recipe name and number will appear as the selected recipe file. The name of the selected recipe can be changed by touching the selected recipe name.



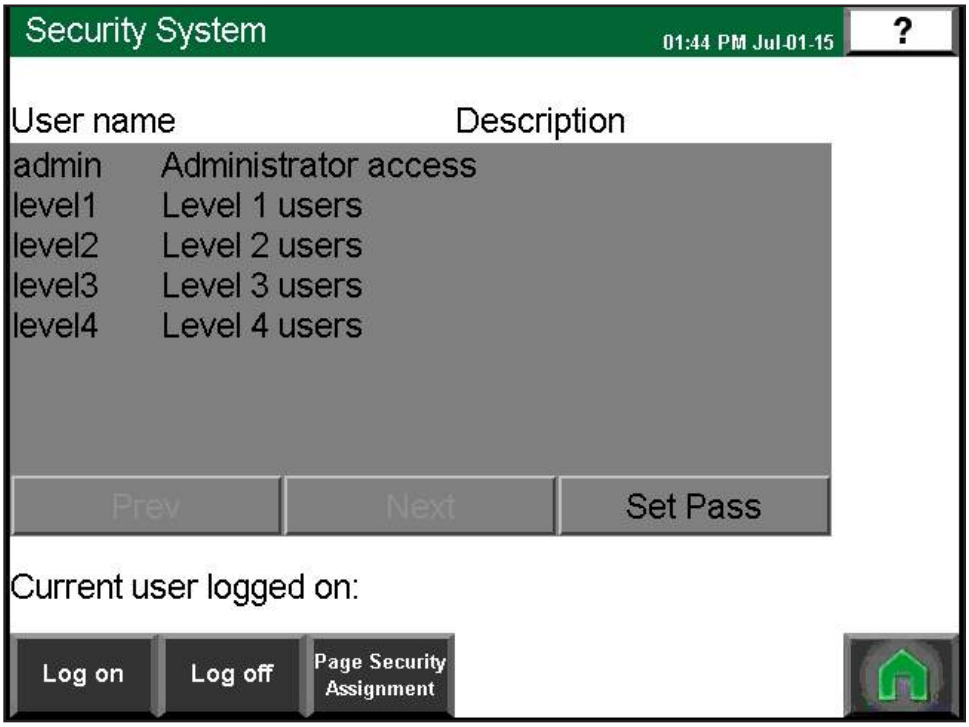
Recipe Save Page
The "Save to selected" function is available anytime. This function will save the active parameters to the selected recipe file.

(Continued)

Control Function Descriptions

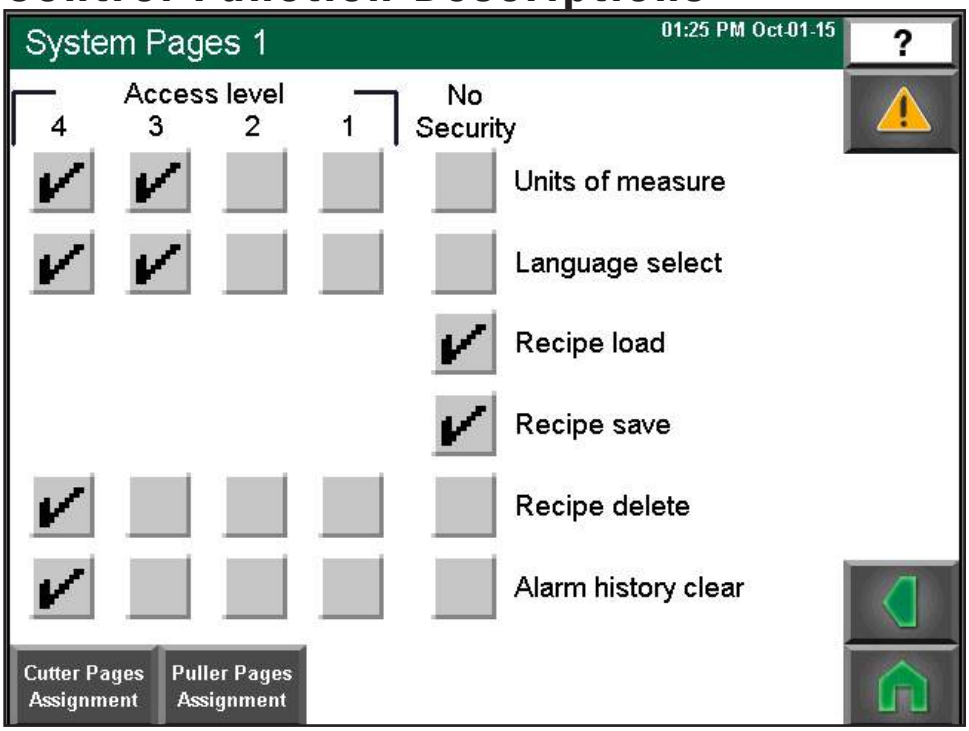


Recipe Name Edit Page
This pop up data entry screen is used to enter a new recipe name.



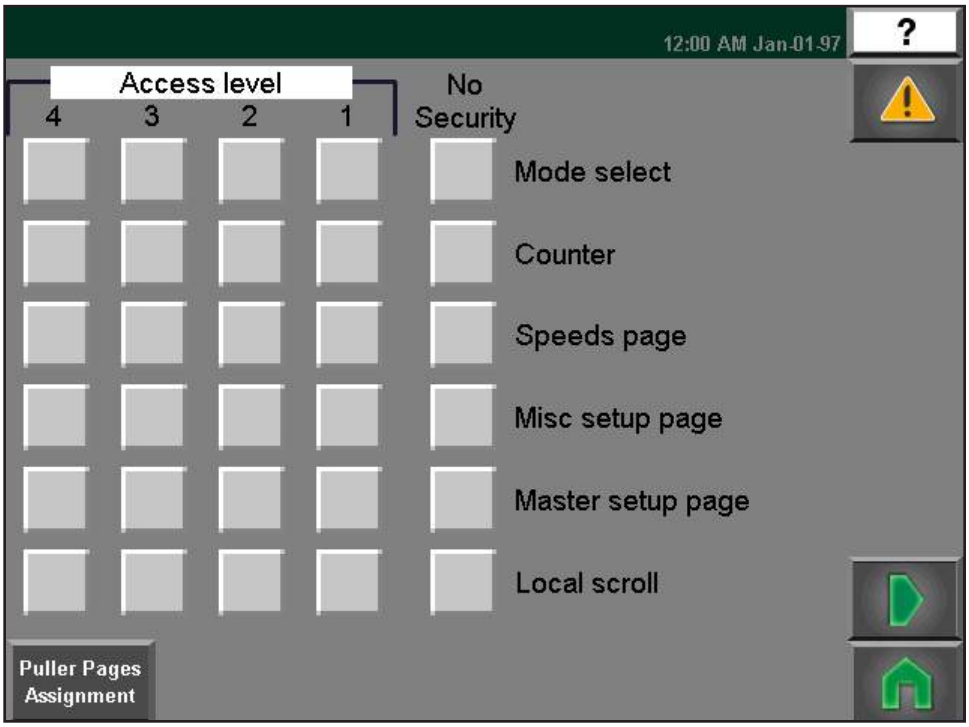
Security System Page

(Continued)



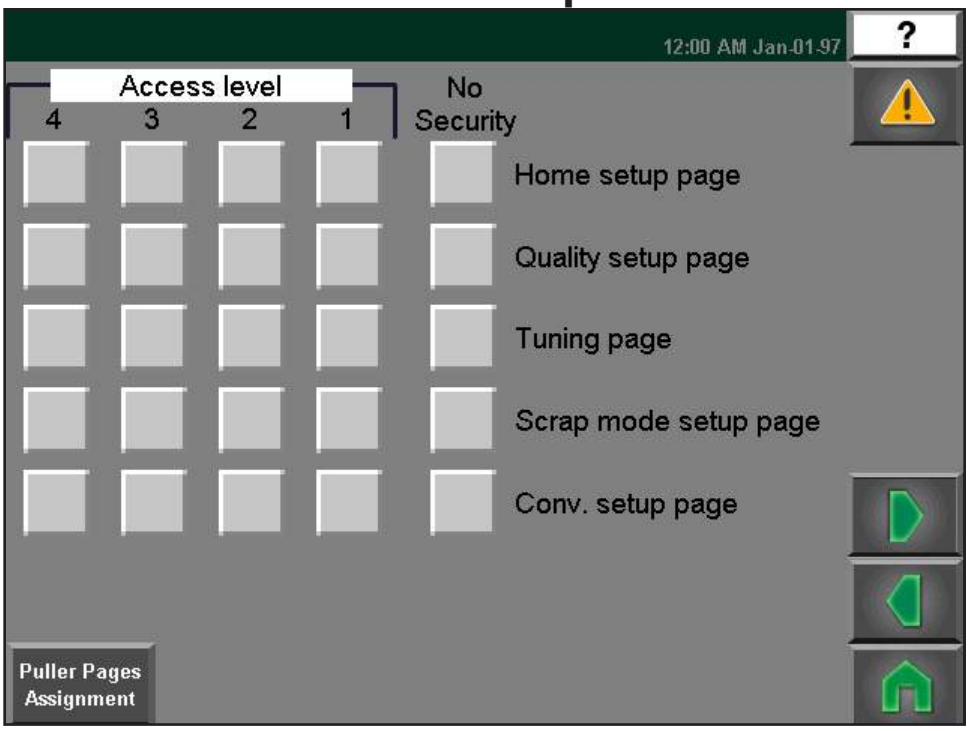
Security System Access Config 1 Page

Touching a button or buttons below any access level will toggle the security function of the items shown to the right. If access is allowed for that security level, a check mark (✓) will appear on the button. Touching the buttons below "No Security" will toggle security function off for all user levels. This enables each of the security levels to have customized security access.

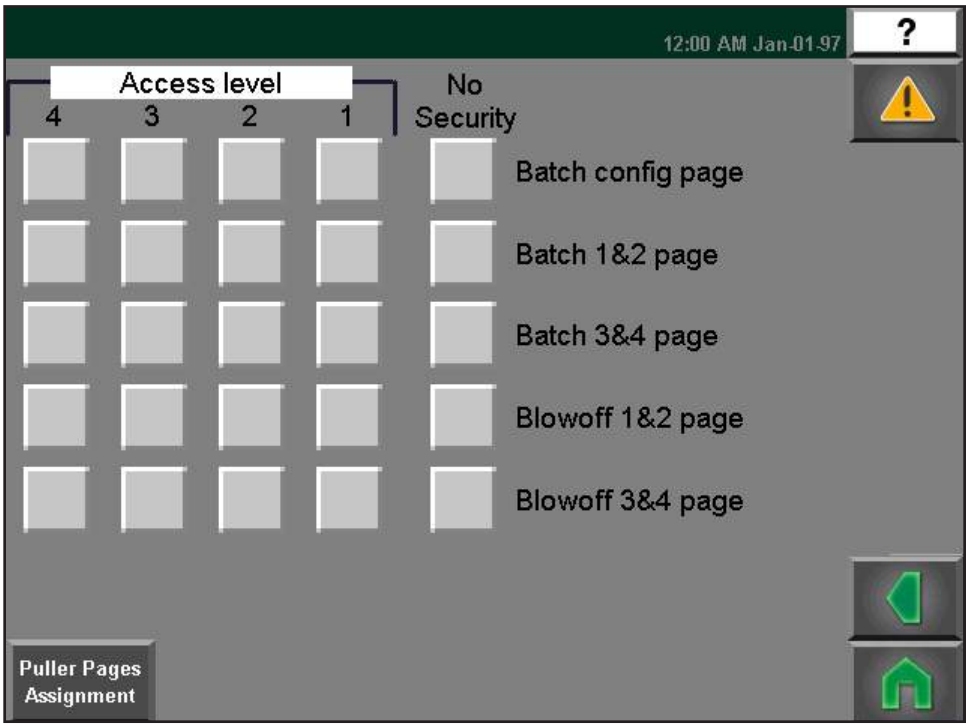


Security Cutter Page Access Config 1

(Continued)

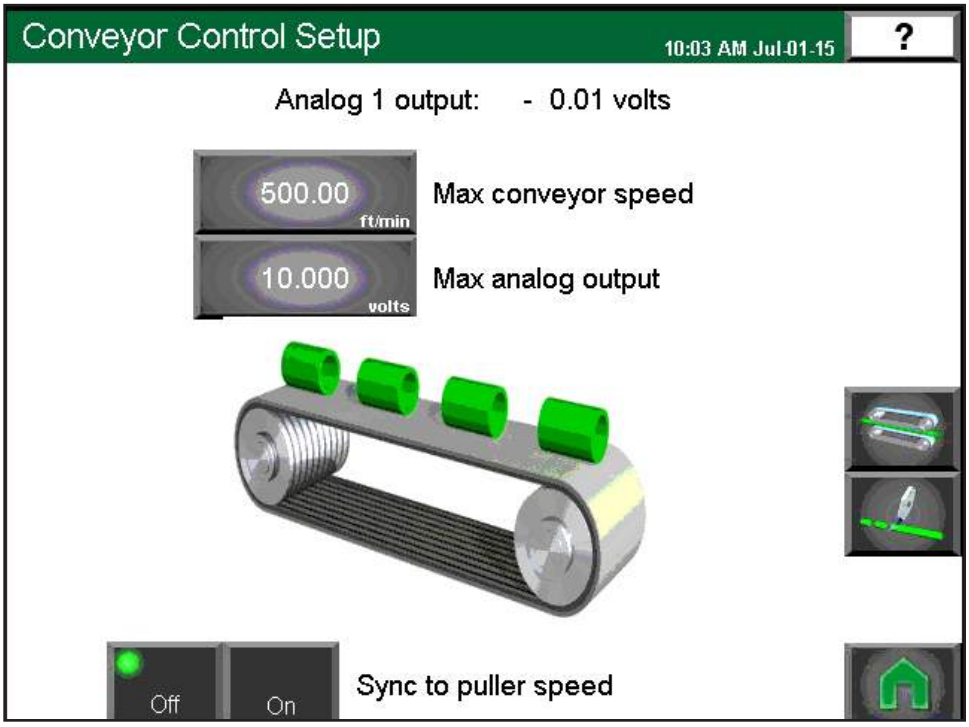


Security Cutter Page Access Config 2

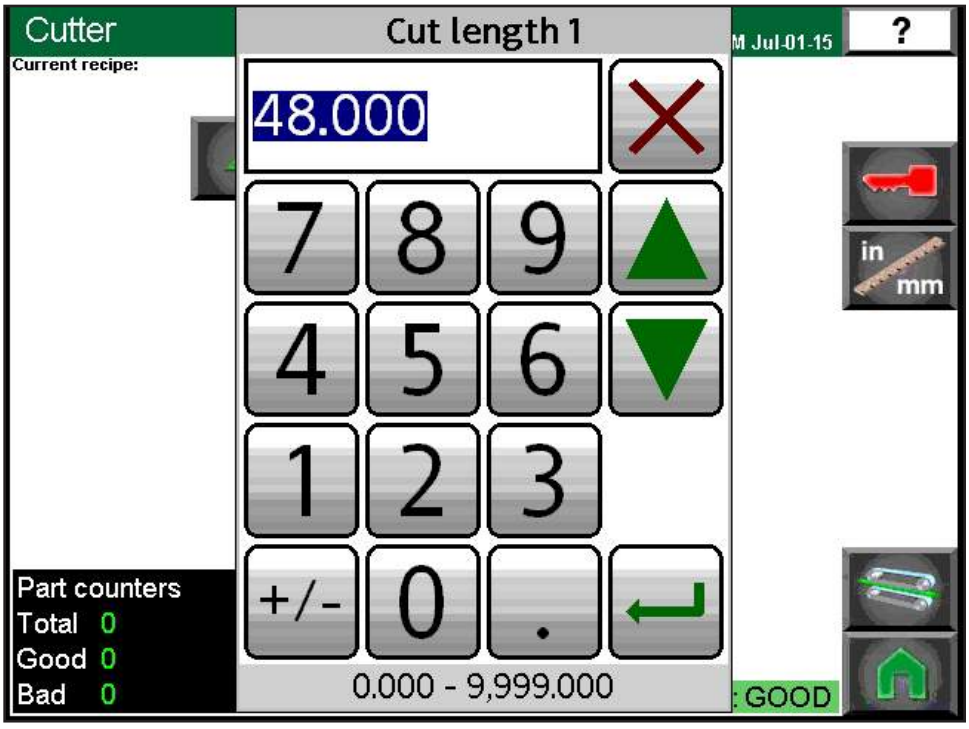


Security Cutter Page Access Config 3

Control Function Descriptions



Cutter Drive Conveyer Control Setup Screen with Sync Puller Speed On

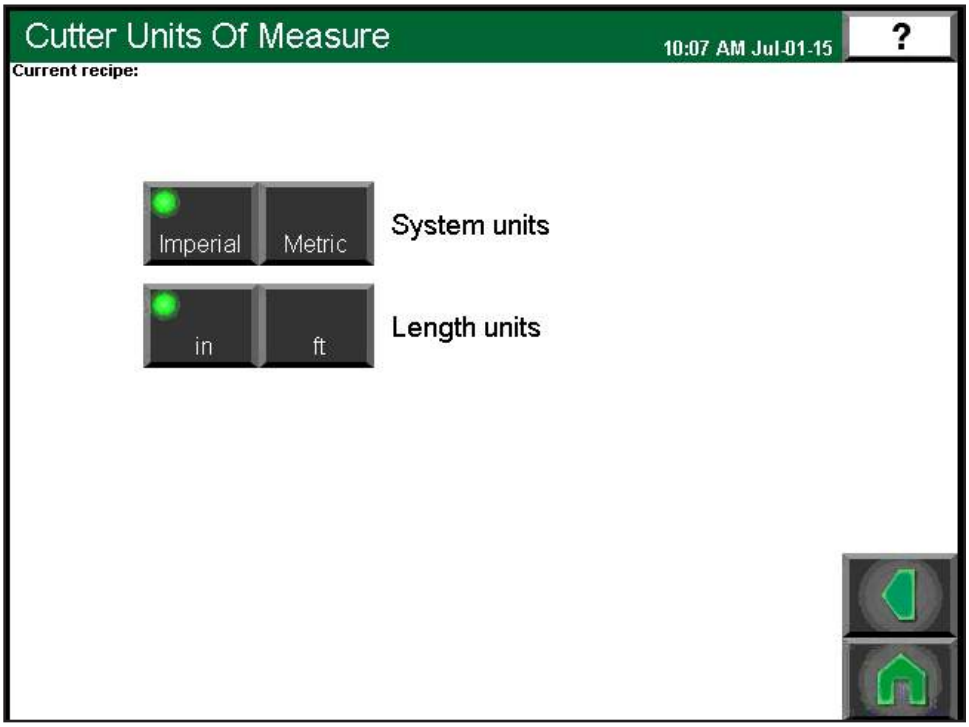


Cutter Data Entry Page

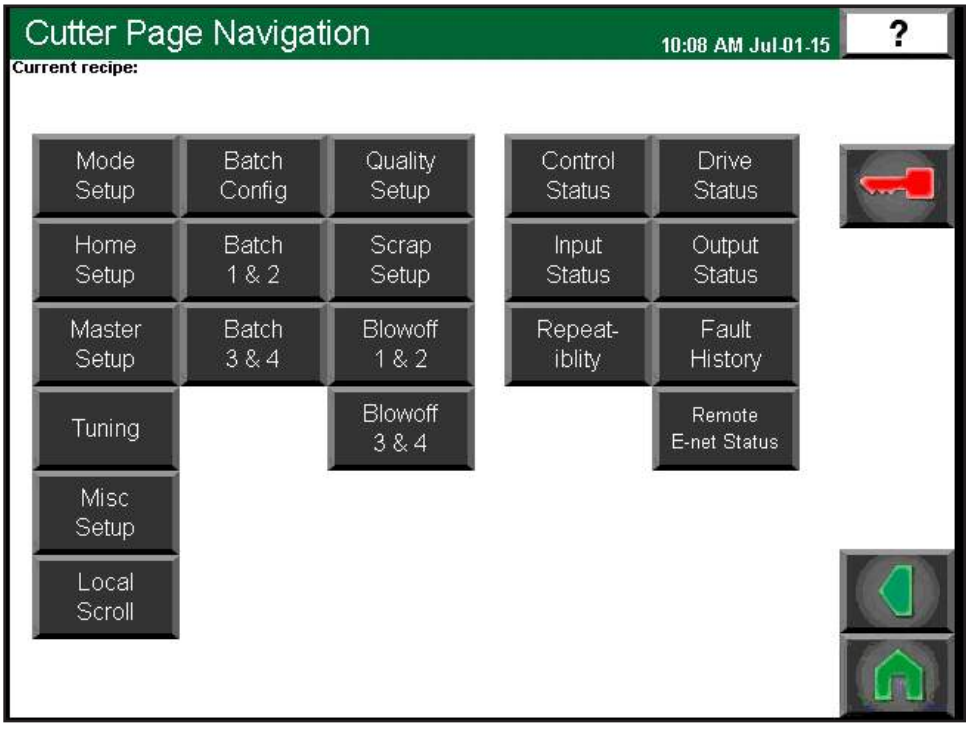
This pop up data entry screen allows settings to be entered into the cutter.

(Continued)

Control Function Descriptions



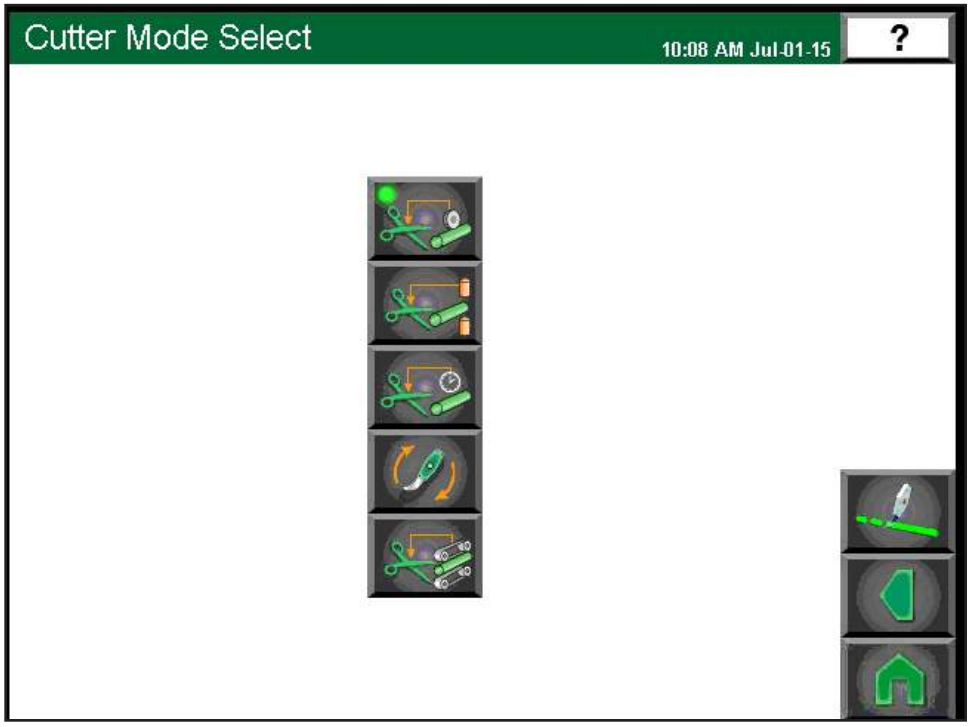
Units of Measure Page
Selecting “Imperial” sets length units to inches and speed units to feet/min, (FPM). Selecting “Metric” sets length units to centimeters and speed units to meter/min, (MPM).



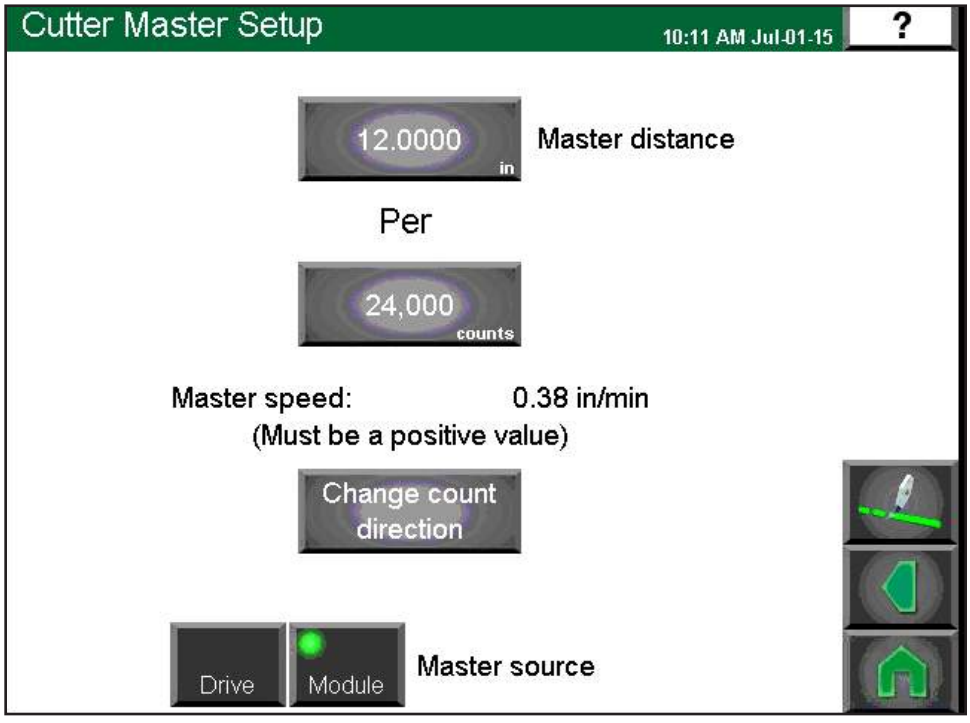
Cutter Menu Page
The menu page is the root page for screen navigation.

(Continued)

Control Function Descriptions



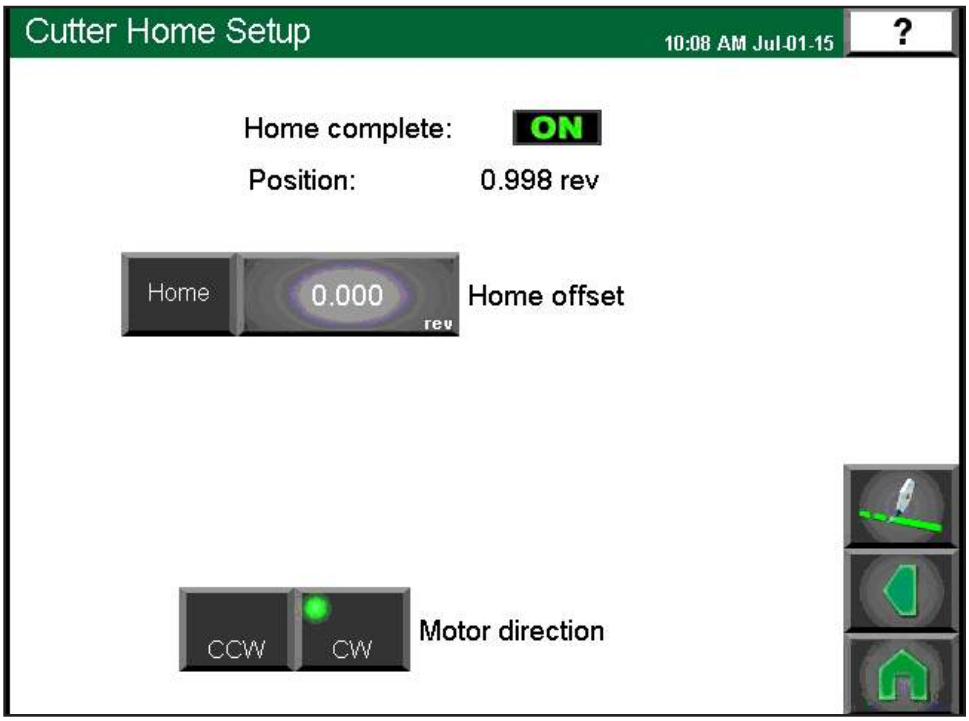
Cutter Mode Setup Page
This page will open the mode selection screen for the cutter. Mode changes can only occur when the cutter is turned off.



Cutter Master Setup Page
This page allows access to the master encoder input scaling parameters. The cutter uses a quadrature encoder input signal to measure product length. These parameters scale encoder pulses to product length.

(Continued)

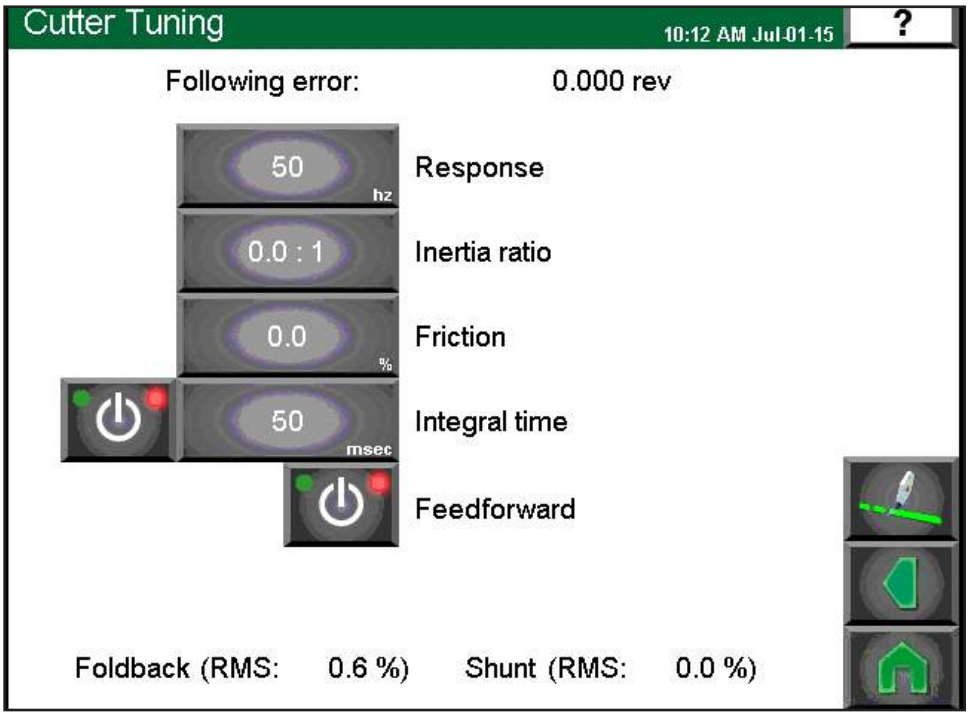
Control Function Descriptions



Cutter Home Setup Page

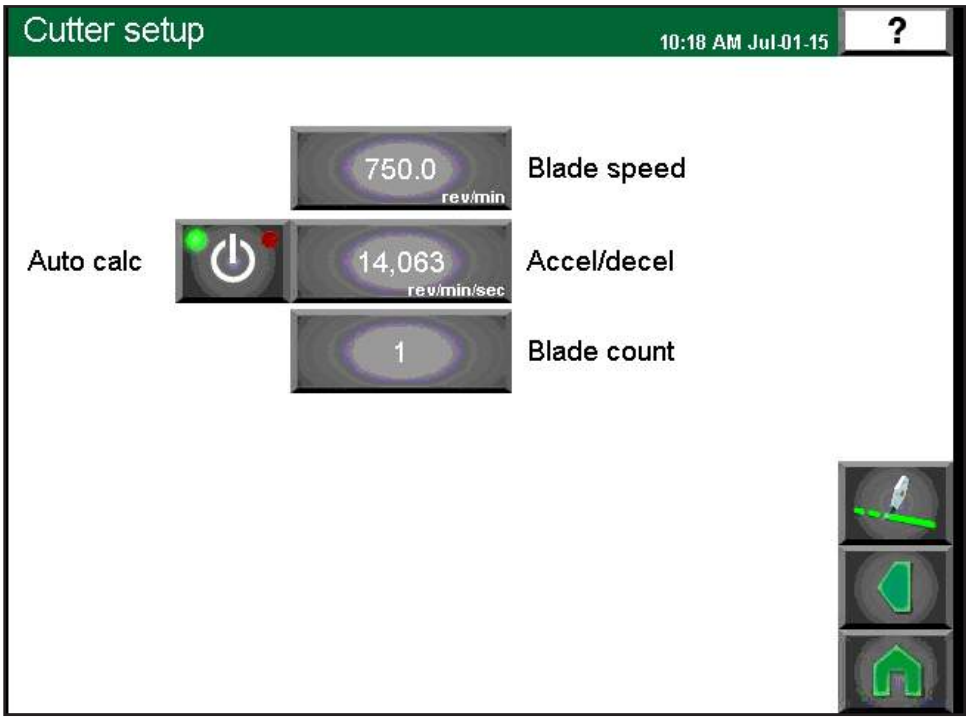
This page allows access to the cutter flywheel homing parameters. When the cutter is first powered up a zero, (home), position needs to be established for the flywheel. When the emergency stop circuit is reset and no faults exist, the cutter will automatically home. Cutters that have a gear reducer attached to the motor will use a proximity sensor as the home input. Cutters that do not have a gear reducer will use the motor encoder marker pulse as the home input. When the homing procedure begins the flywheel will turn at a slow speed until the home sensor is detected. After finding the home sensor the flywheel will move an "offset" distance and stop. This offset distance from the home sensor is the zero, or park position of the flywheel. The cutter remembers this zero position until E-Stopped or powered down.

(Continued)



Cutter Tuning Page

This page allows access to the cutter servo tuning parameters. These parameters will affect how tightly the cutter servo controls the speed and position of the servo motor. These parameters are adjusted at the factory and generally do not need to be adjusted by the customer.

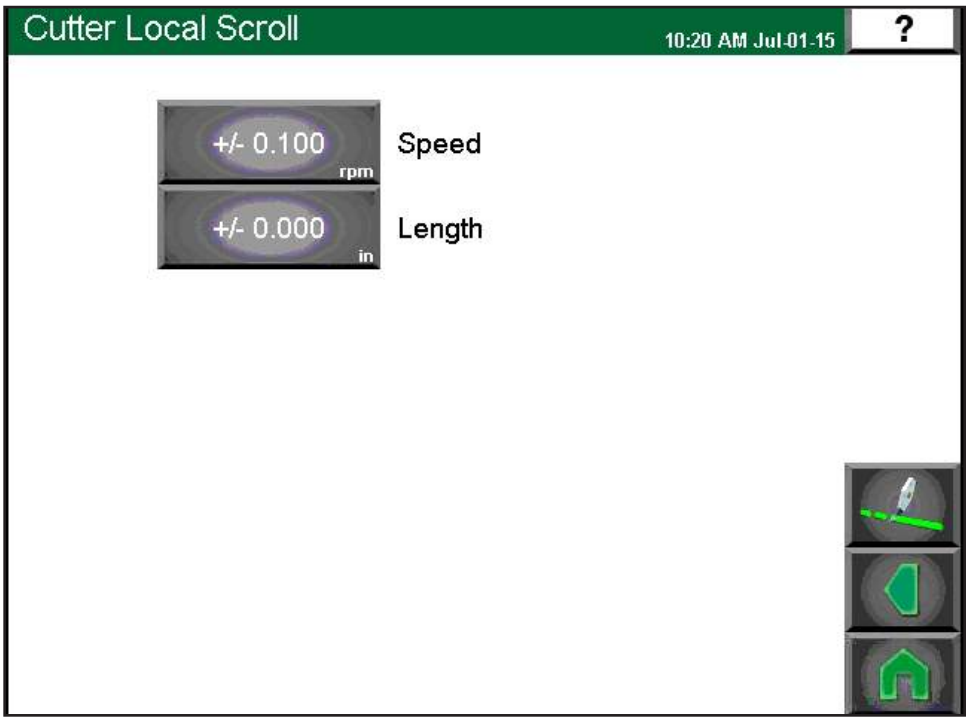


Cutter Misc Setup Page

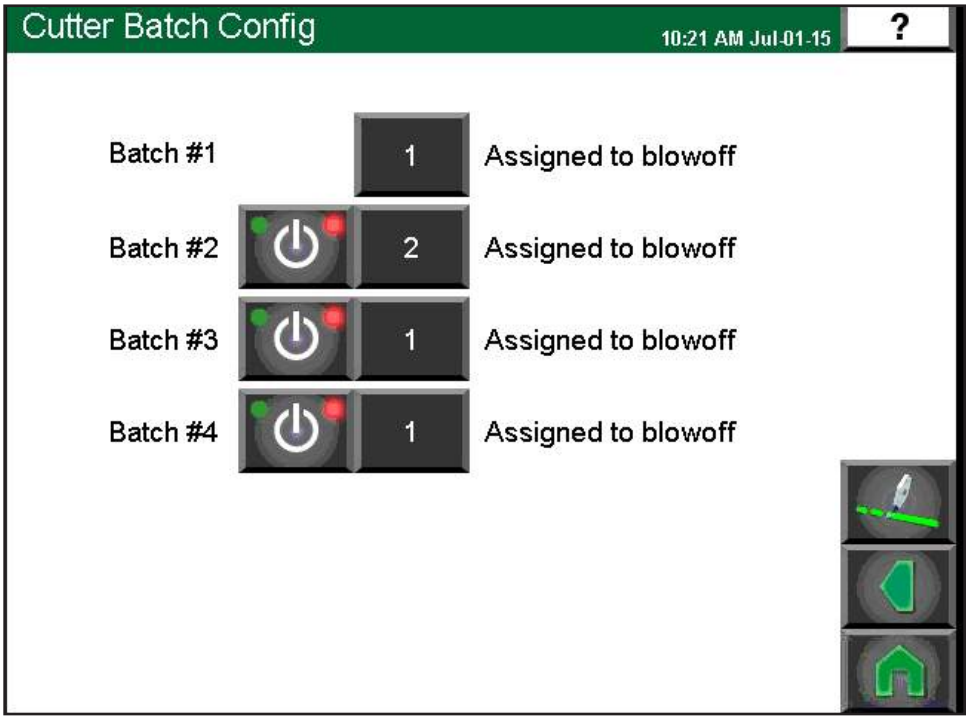
This page allows the user to set the Blade Speed, Accel/Decel speeds, and change the Blade count. The Auto Calc feature uses calculations to calculate the appropriate Accel/Decel speeds based on the blade speed.

(Continued)

Control Function Descriptions



Cutter Local Scroll Page

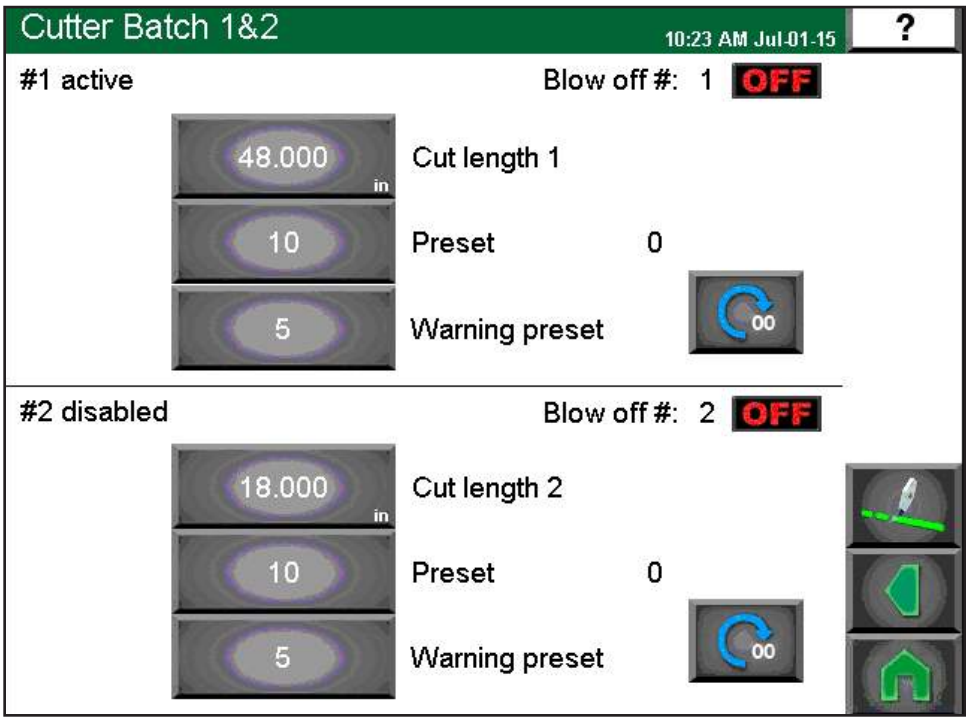


Cutter Batch Configuration Page

This page allows access to the cutter batch configuration parameters. The cutter provides part batch counting and blowoff control. Up to 4 batches and 4 blowoff's are available. Batch #1 counter is always enabled. The other 3 can be enable/disabled from this page. Each batch counter can be assigned to any individual blowoff.

(Continued)

Control Function Descriptions



Cutter Batch 1 & 2 Page

Cut length 1: Cut length of pieces associated with batch #1.

Cut length 2: Cut length of pieces associated with batch #2.

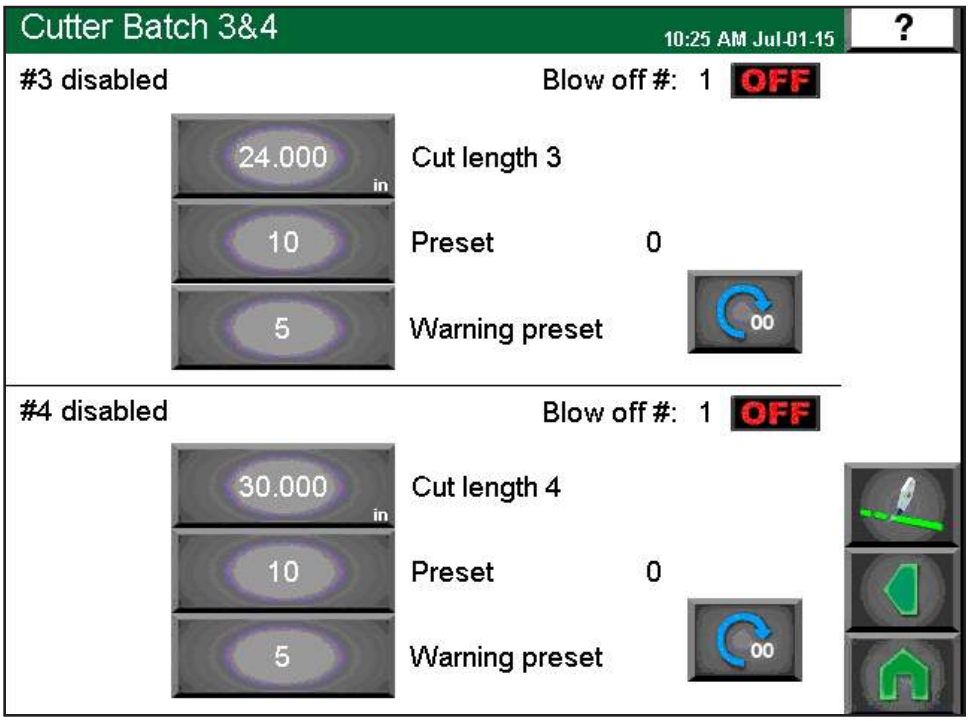
Preset: Value at which this batch completes and next enabled length begins.

Warning preset: Value at which a warning message will appear on the main screen, indicating that the batch count is nearing the preset value.

Reset button: Pressing this button will zero the batch counter. This button is active at any time.

(Continued)

Control Function Descriptions



Cutter Batch 3 & 4 Page

Cut length 3: Cut length of pieces associated with batch #3.

Cut length 4: Cut length of pieces associated with batch #4.

Preset: Value at which this batch completes and next enabled length begins.

Warning preset: Value at which a warning message will appear on the main screen, indicating that the batch count is nearing the preset value.

Reset button: Pressing this button will zero the batch counter. This button is active at any time.

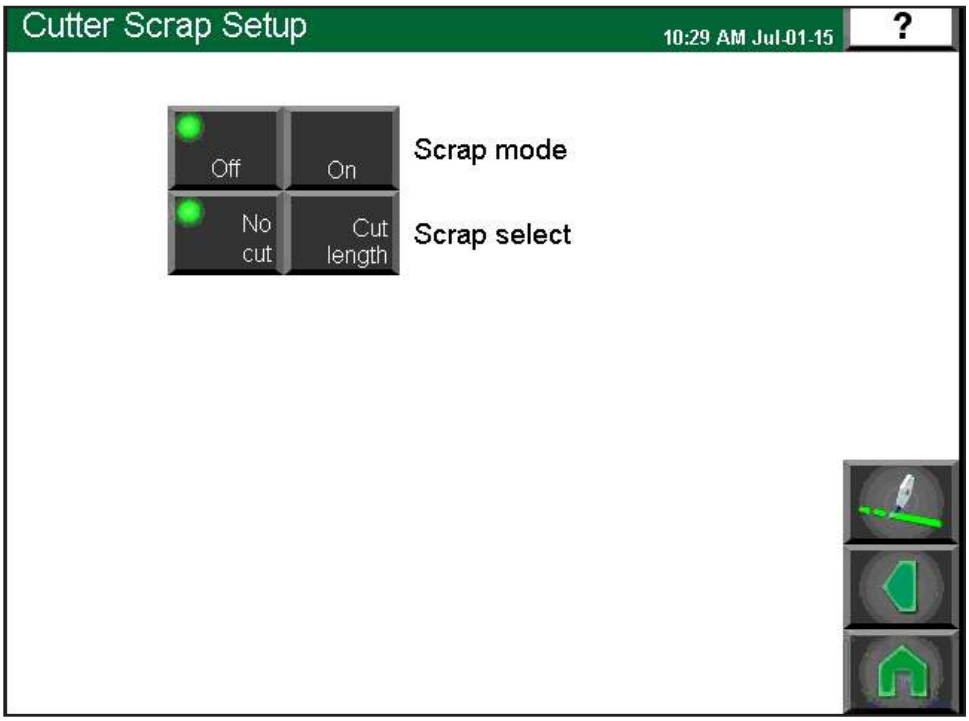
(Continued)

Cutter Quality Setup Page

This page allows access to the quality input setup parameters. The quality input is a “dry contact” input from a customer supplied gauge. This input tells the cutter whether good or bad product is passing through the cutter. This input works in conjunction with the blowoffs for product separation at the conveyor. A quality mode can be set that tells the cutter that all product is “good”, “bad” or “gauge”. “Gauge” mode tells the cutter that the product state comes from the quality input.

(Continued)

Control Function Descriptions

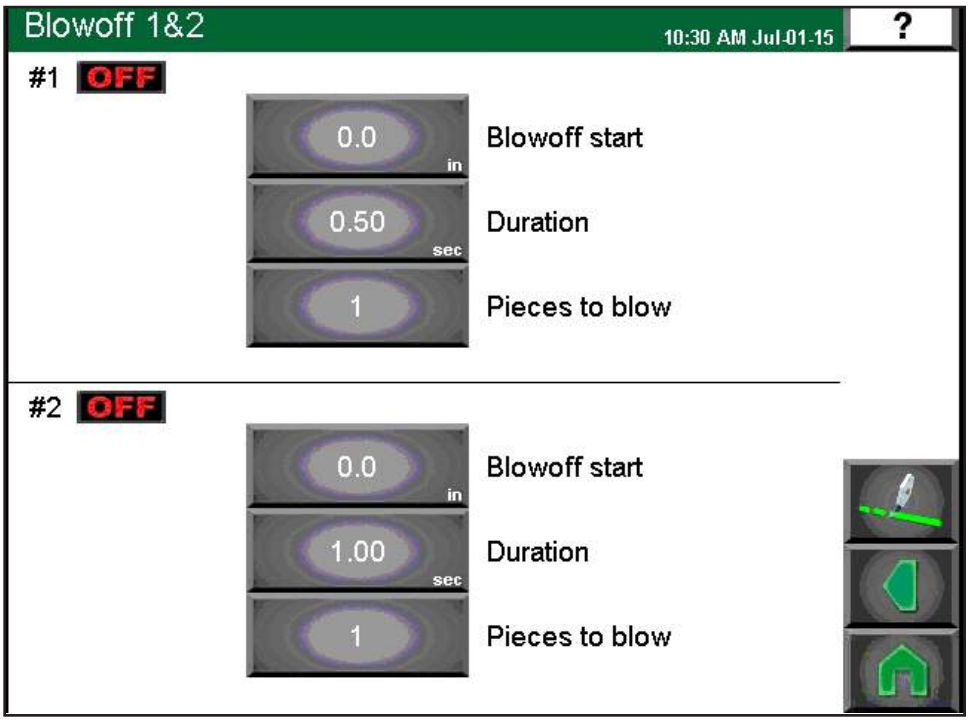


Cutter Scrap Mode Setup Page

This page allows access to the scrap mode setup parameters. Scrap mode works in conjunction with the quality input. Scrap mode allows the cutter to make bad, (scrap), product a different length than good product. The cutter can be configured to stop cutting or to cut a scrap length. Scrap mode can be turned on or off.

(Continued)

Control Function Descriptions

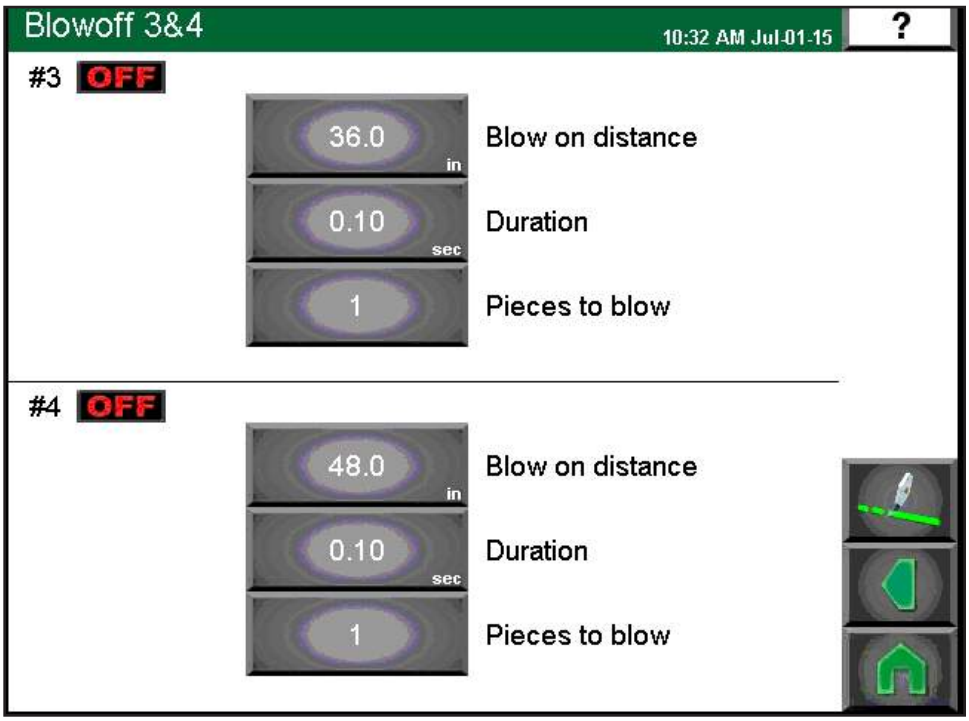


Cutter Blowoff 1 & 2 Page

This page allows access to the blowoff 1 & 2 parameters. The blowoff outputs can operate in either “on demand” or “continuous” mode. “On demand” mode is active whenever the cutter is in either Encoder”, ”Timer” or “End Sense” mode. “Continuous” mode is active whenever the cutter is in “Flywheel” or “Follower” mode. The blowoff’s work in conjunction with the quality input. This allows good and bad product to be separated at the take away conveyor.

(Continued)

Control Function Descriptions

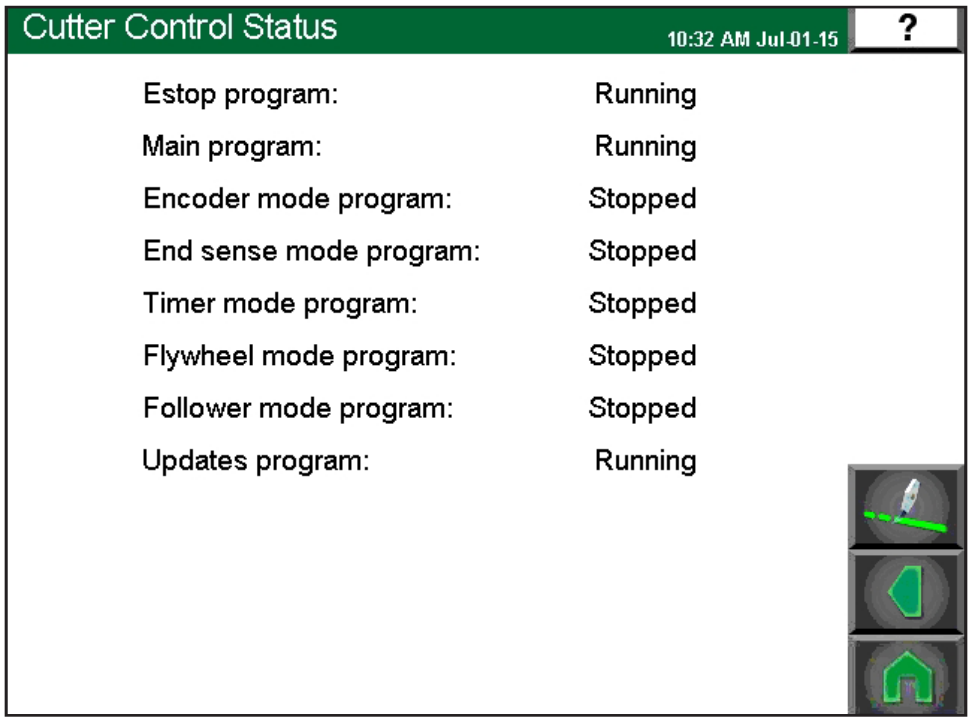


Cutter Blowoff 3 & 4 Page

This page allows access to the blowoff 3 & 4 parameters. The blowoff outputs can operate in either “on demand” or “continuous” mode. “On demand” mode is active whenever the cutter is in either “Encoder”, ”Timer” or “End Sense” mode. “Continuous” mode is active whenever the cutter is in “Flywheel” or “Follower” mode. The blowoff’s work in conjunction with the quality input. This allows good and bad product to be separated at the take away conveyor.

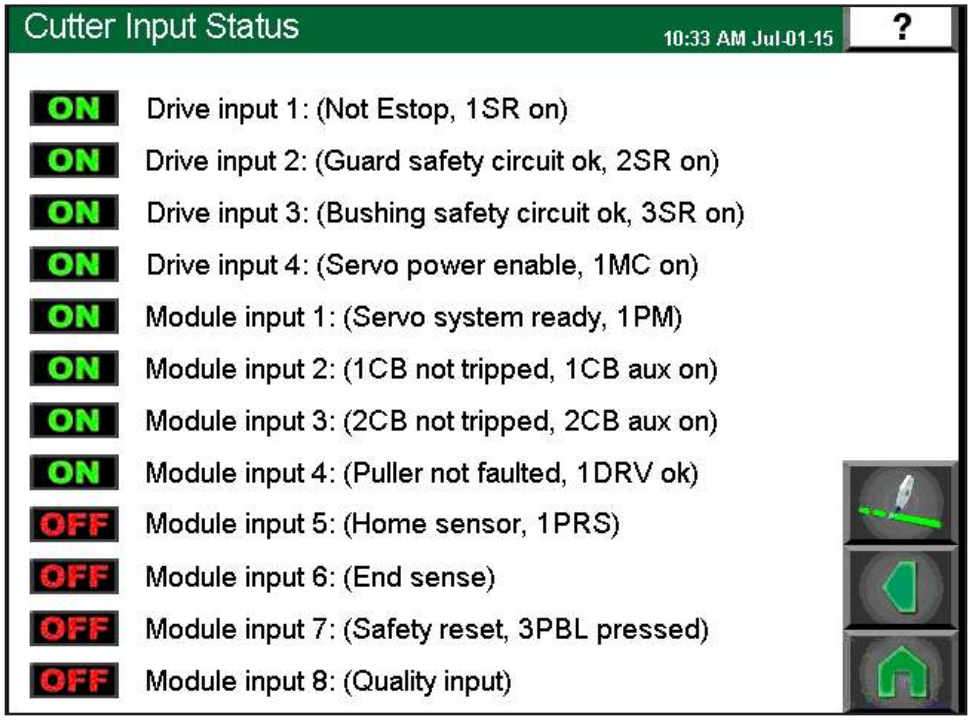
(Continued)

Control Function Descriptions



Cutter Control Status Page

This page allows access to the cutter servo control module status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

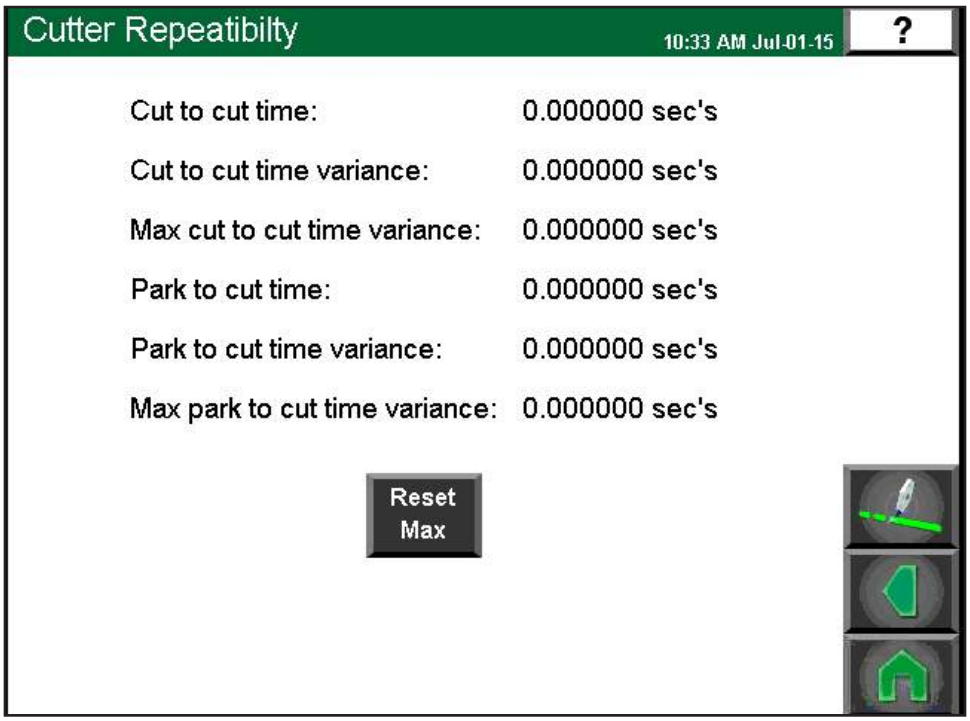


Cutter Input Status Page

This page allows access to the cutter servo control digital input status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

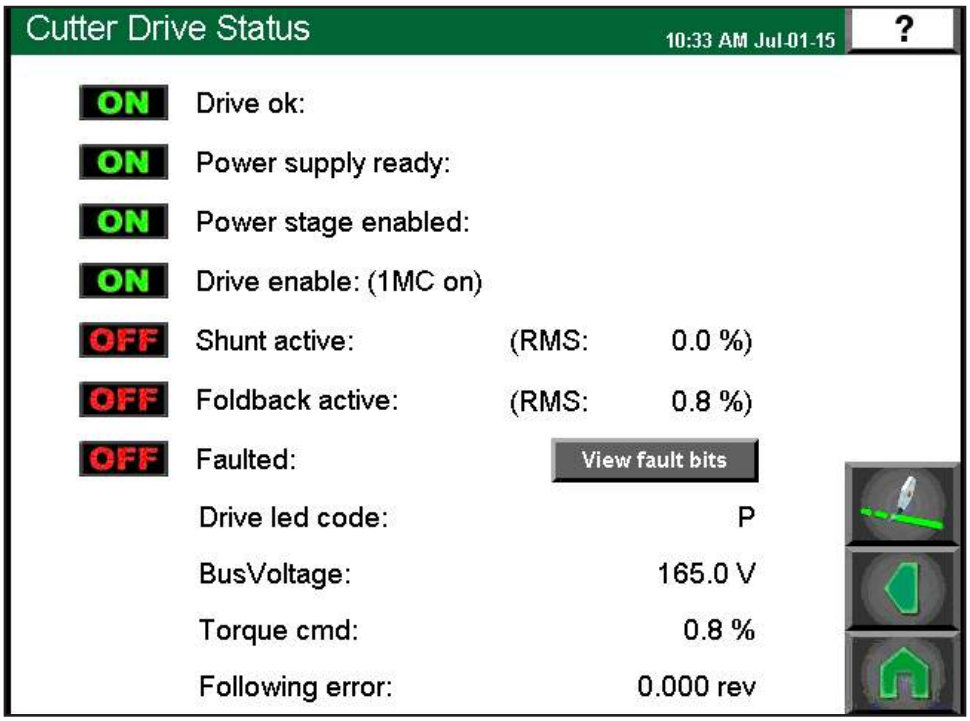
(Continued)

Control Function Descriptions



Cutter Repeatability Page

This page allows access to the cutter repeatability information. This information would be used to troubleshoot cutter performance issues.

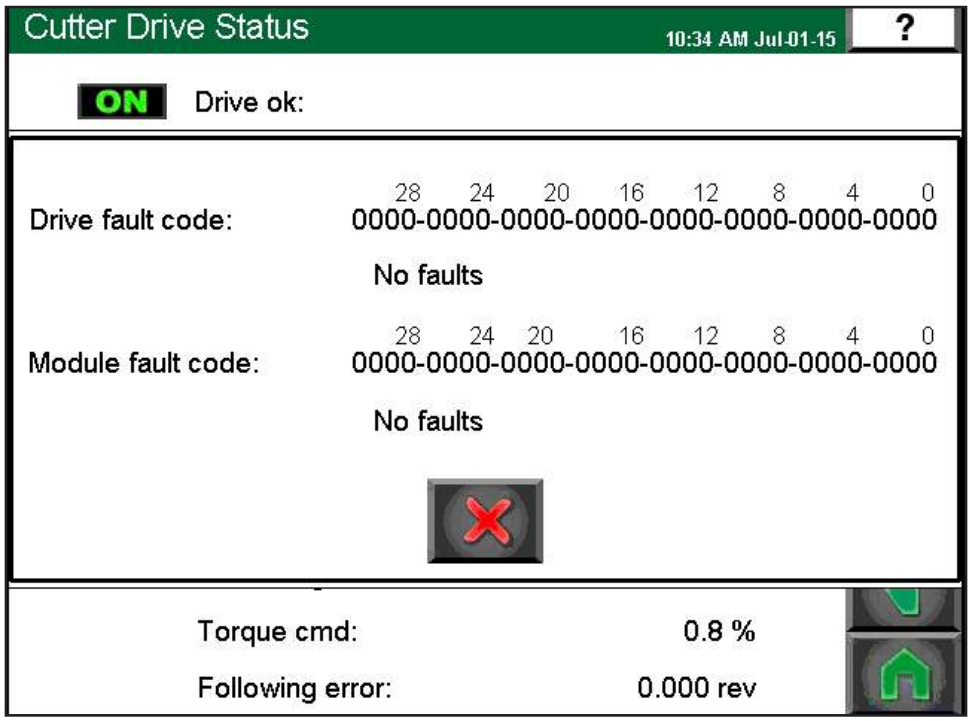


Cutter Drive Status Page

This page allows access to the cutter servo drive module status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

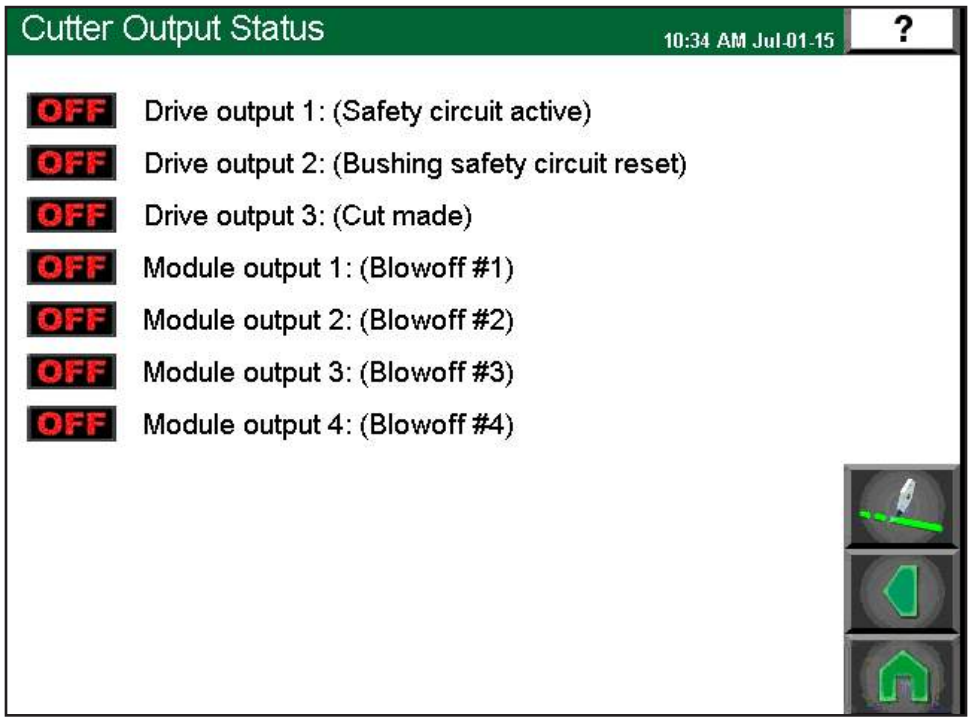
(Continued)

Control Function Descriptions



Cutter Drive Status View Fault Bits Page

Multiple faults could occur simultaneously. This page will show all faults that exist in either this drive or the control module.

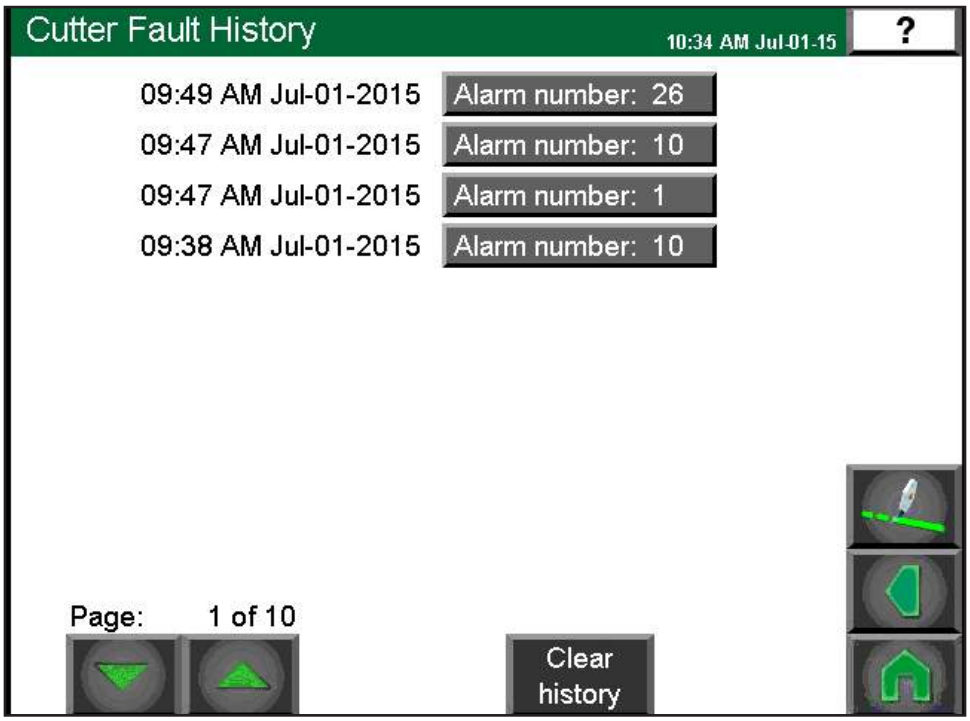


Cutter Output Status Page

This page allows access to the cutter servo control digital output status. The information displayed on this page would be used to help troubleshoot problems encountered with the cutter.

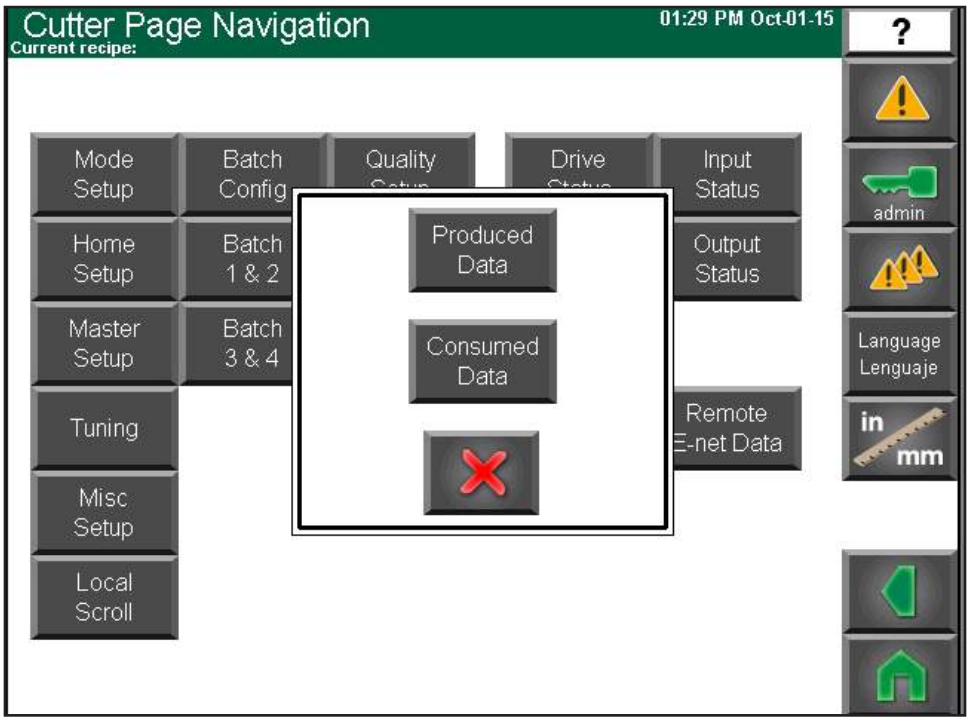
(Continued)

Control Function Descriptions



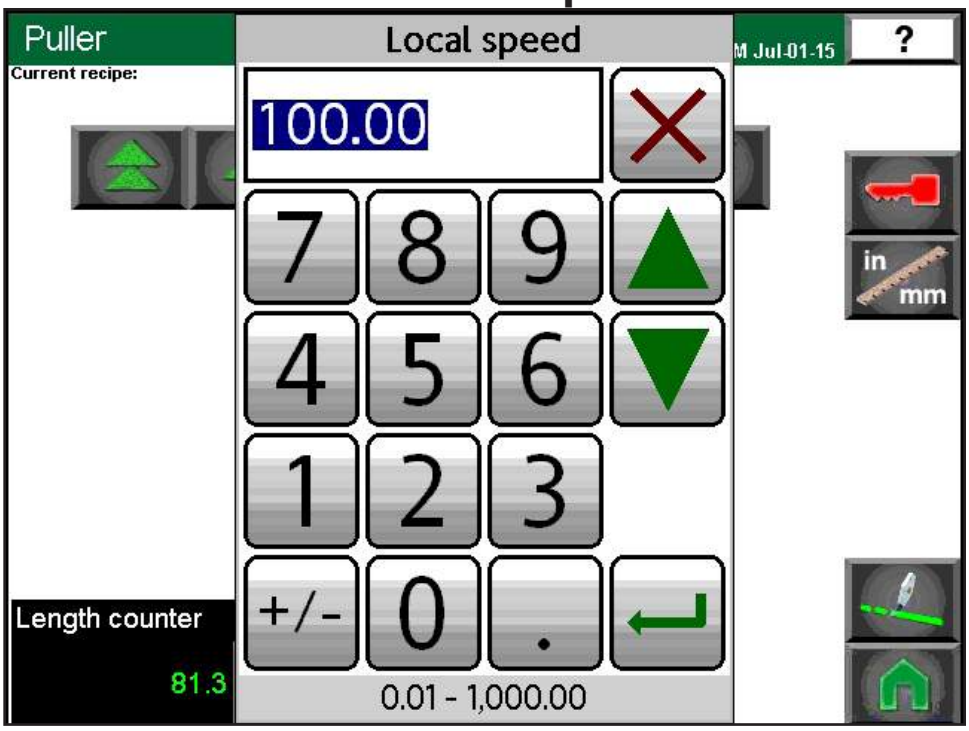
Cutter Fault History Page

This page lists the history of faults. Pressing a fault will display the detailed fault descriptions.



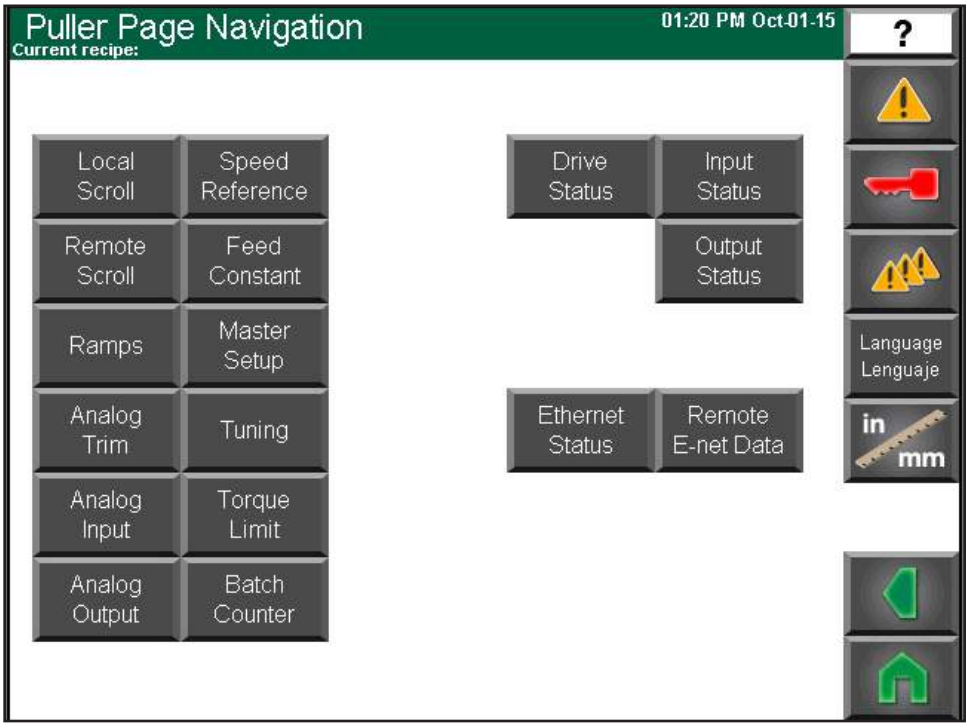
Cutter Remote E-net Data Page

(Continued)



Puller Speed Edit Page

This page allows access to the puller speed by pushing the number area of the speed section bringing up a keypad. The desired speed can be entered via the keypad.

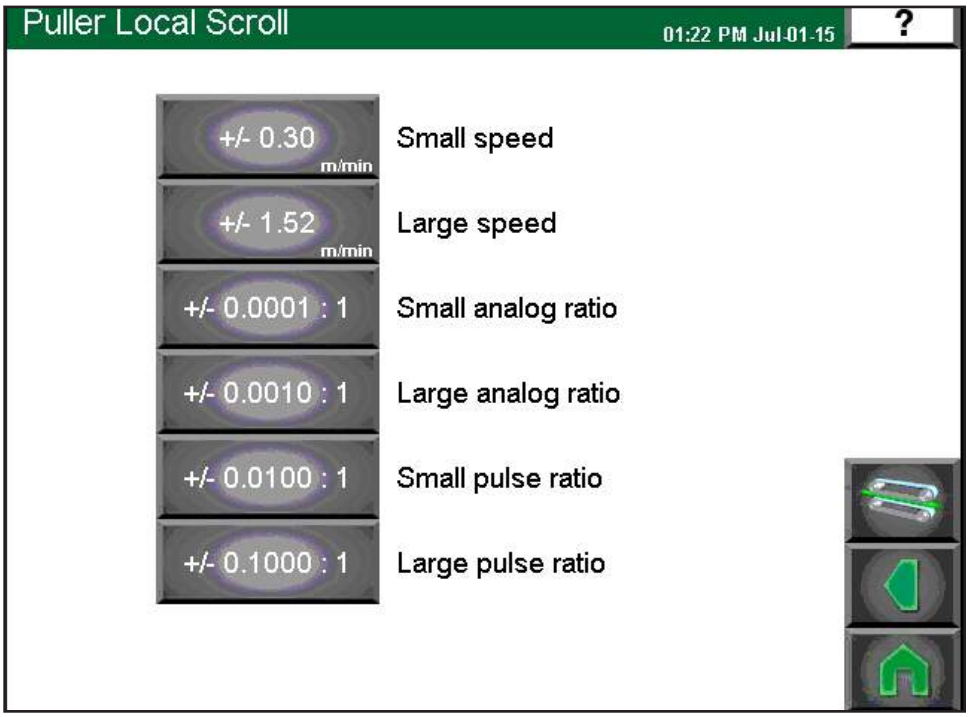


Puller Menu Page

The menu page is the root page for screen navigation.

(Continued)

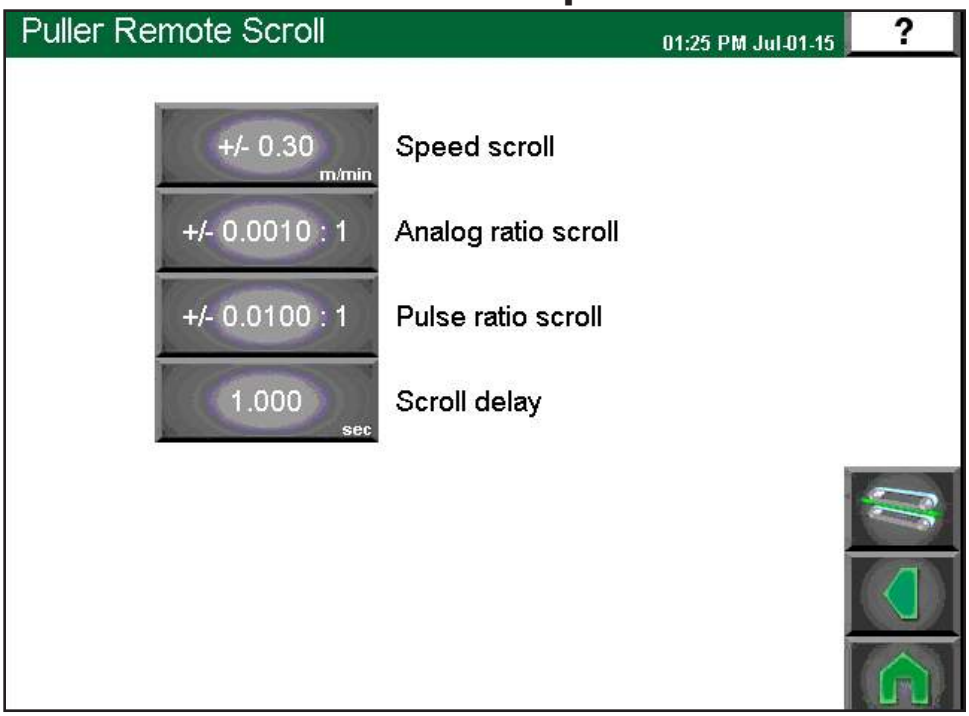
Control Function Descriptions



Puller Local Scroll

This page allows access to the puller local scroll parameters. The puller speed can be adjusted by using the small scroll and large scroll buttons on the screen. The scroll increments able to be set on this screen. This screen is also used to set the ratios for the analog and pulse speed settings.

(Continued)

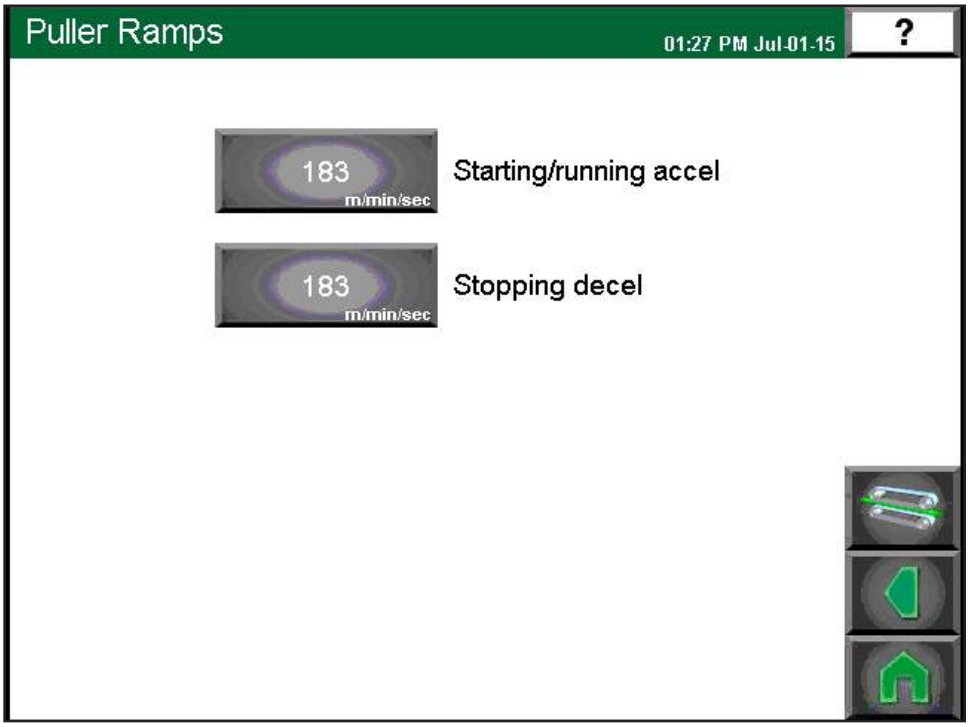


Puller Remote Scroll

This page allows access to the puller remote speed scroll parameters. The puller speed can be adjusted by means of dry contact closures provided by the customer. The speed of the puller can be adjusted up or down by these contacts. The amount of speed adjustment can be set by these parameters.

(Continued)

Control Function Descriptions



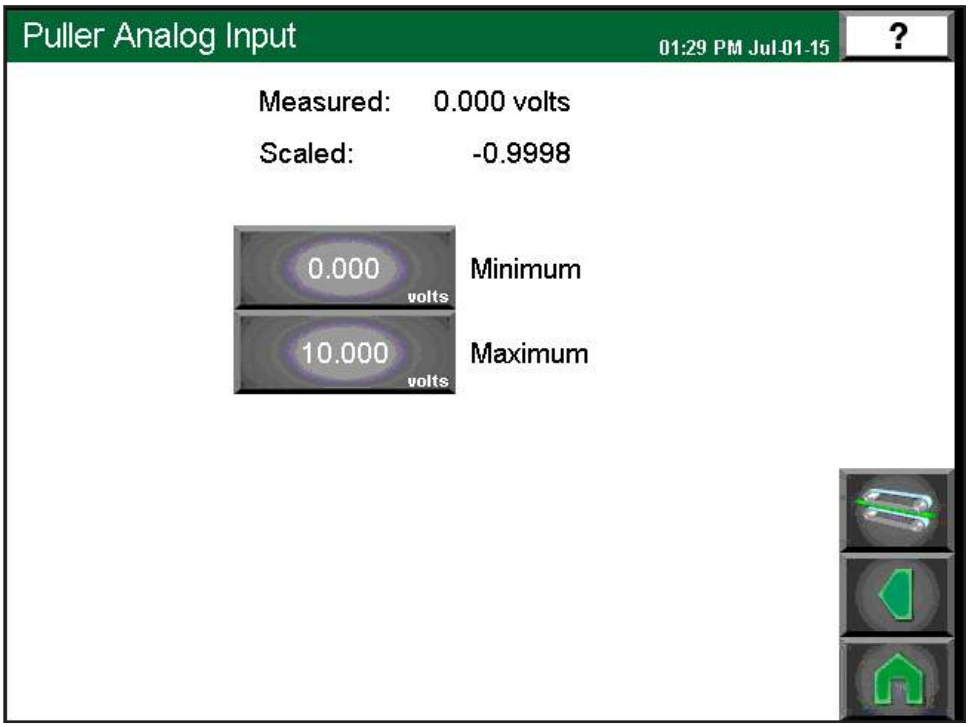
Puller Ramps Page
This page allows access to the puller acceleration and deceleration parameters. The acceleration and deceleration controls how quickly the puller will change from one speed setting to another.

Acceleration: This parameter controls the rate at which the puller accelerates up to speed.
Deceleration: This parameter controls the rate at which the puller decelerates to a stop.

(Continued)

Puller Analog Trim Page

This page allows access to the analog trim parameters. The puller speed can be trimmed by a voltage at the analog input. The value of the +/- trim amount and on/off status can be changed here.

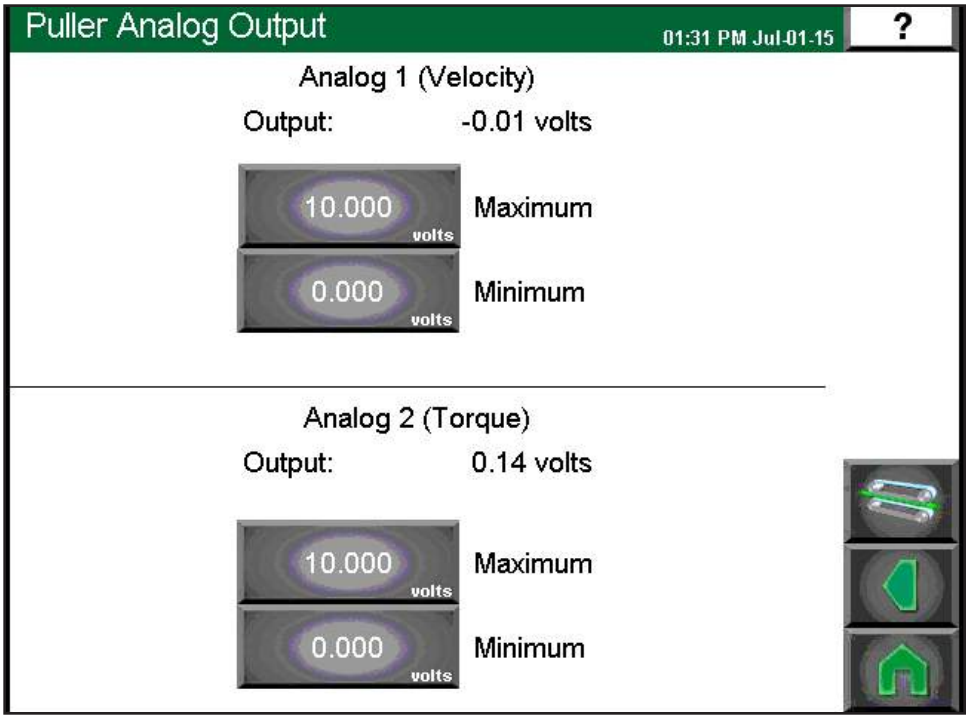


Puller Analog Input Page

This page allows access to the puller analog input scaling parameters. The puller speed can be controlled by a voltage at the analog input provided by the customer. These parameters can be adjusted to match the actual minimum and maximum analog value provided.

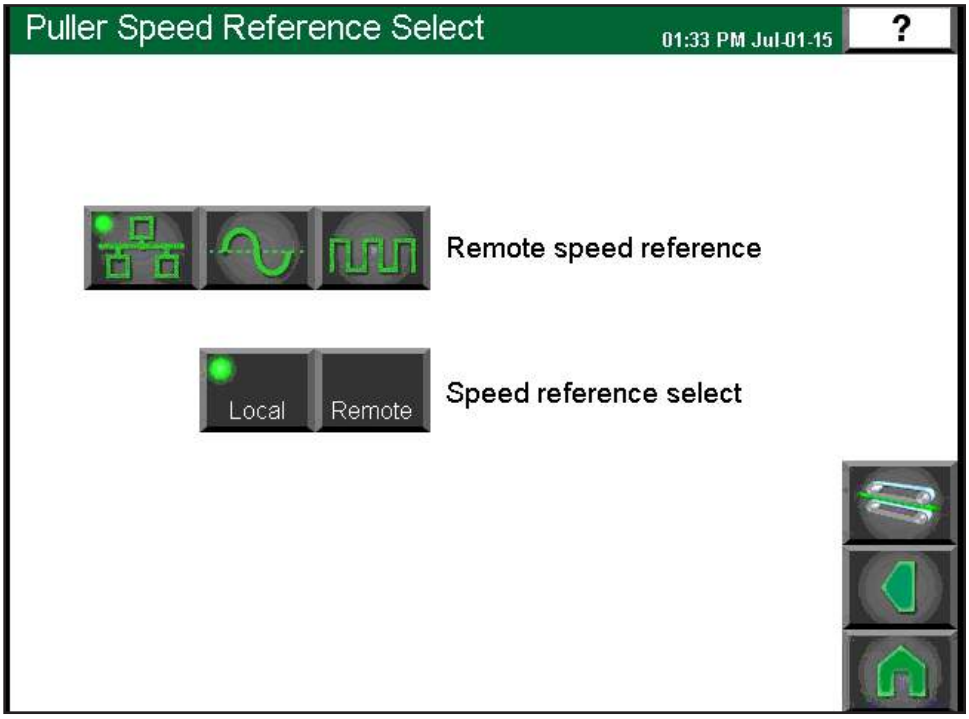
(Continued)

Control Function Descriptions



Puller Analog Output Page

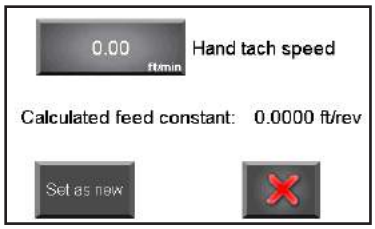
This page allows access to the puller analog output scaling parameters. The puller provides two 0-10vdc analog outputs, one is proportional to actual puller speed, the other proportional to motor running torque. These parameters can adjust the minimum and maximum voltage of the analog outputs.



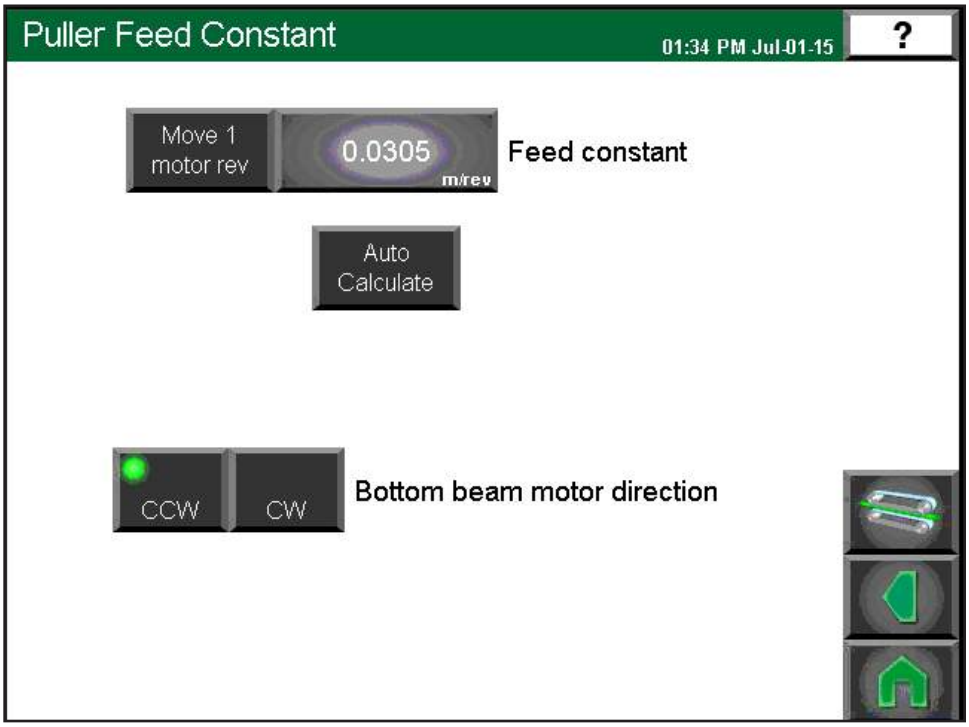
Puller Mode Reference Page

This page allows you to select the mode for the puller. Modes can only be changed when the puller is off.

(Continued)



Auto Calculate Pop Up



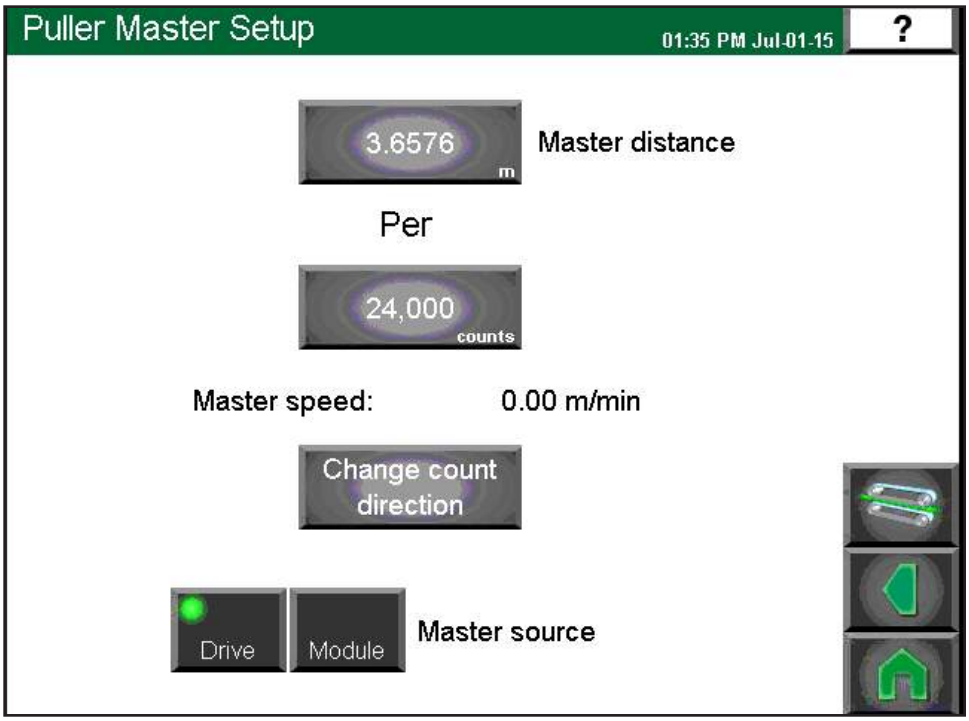
Puller Feed Constant Page

This page allows access to the puller feed constant parameters. The feed constant scales the speed units (i.e. ft/min) to motor rpm.

Feed Constant: This parameter scales 1 motor revolution to the selected units of measure.
Auto Calculate: The Auto Calculate will determine the feed constant setting using Hand Tach data.

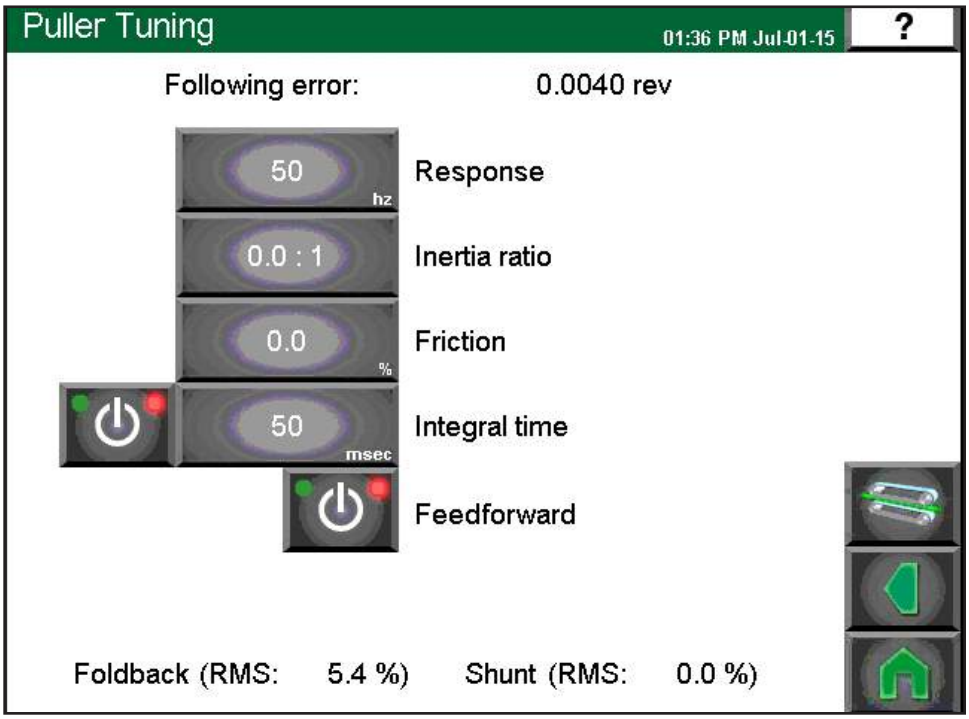
(Continued)

Control Function Descriptions



Puller Master Setup Page

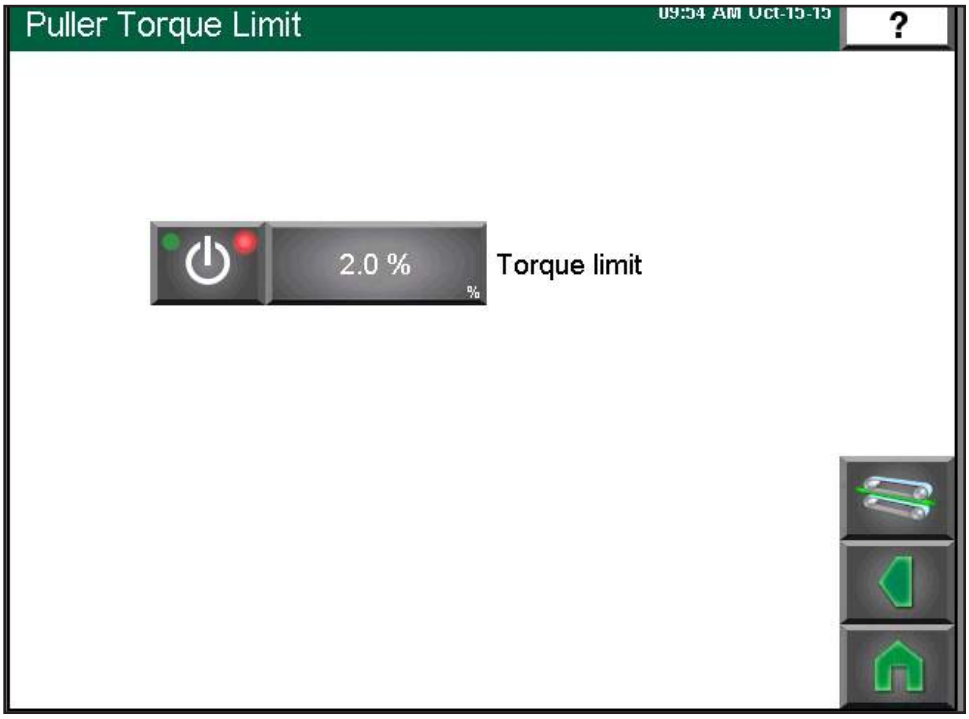
This page allows access to the master encoder input scaling parameters. The puller speed can be controlled by a quadrature encoder input signal provided by the customer. these parameters scale encoder pulses to puller speed.



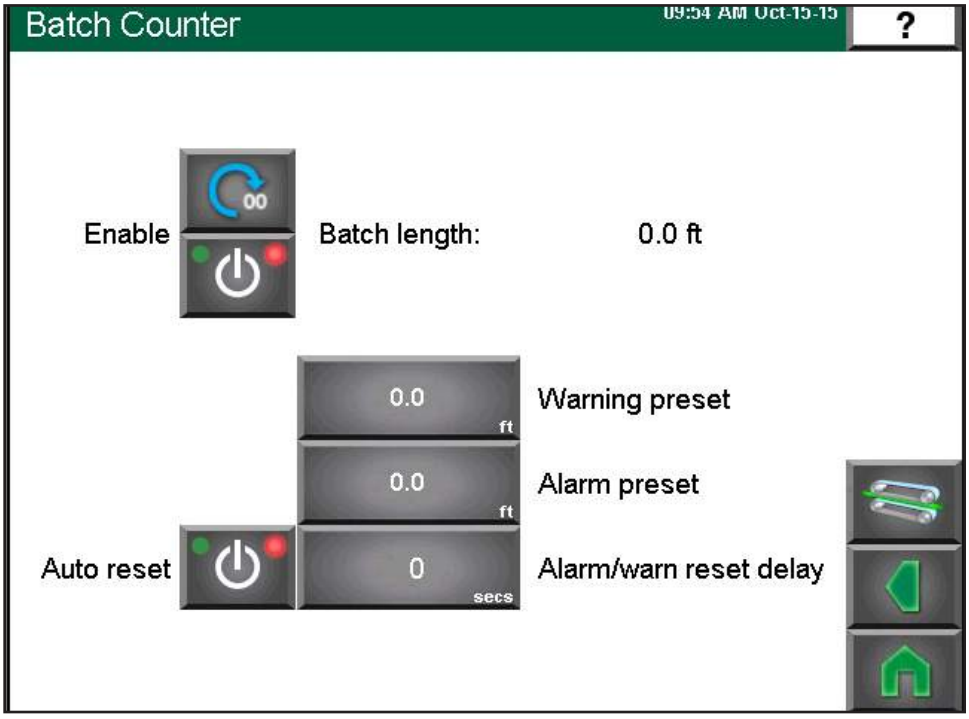
Puller Tuning Page

This page allows access to the puller servo tuning parameters. These parameters will affect how tightly the puller servo controls the speed of the servo motor. These parameters are adjusted at the factory and generally do not need to be adjusted by the customer.

(Continued)



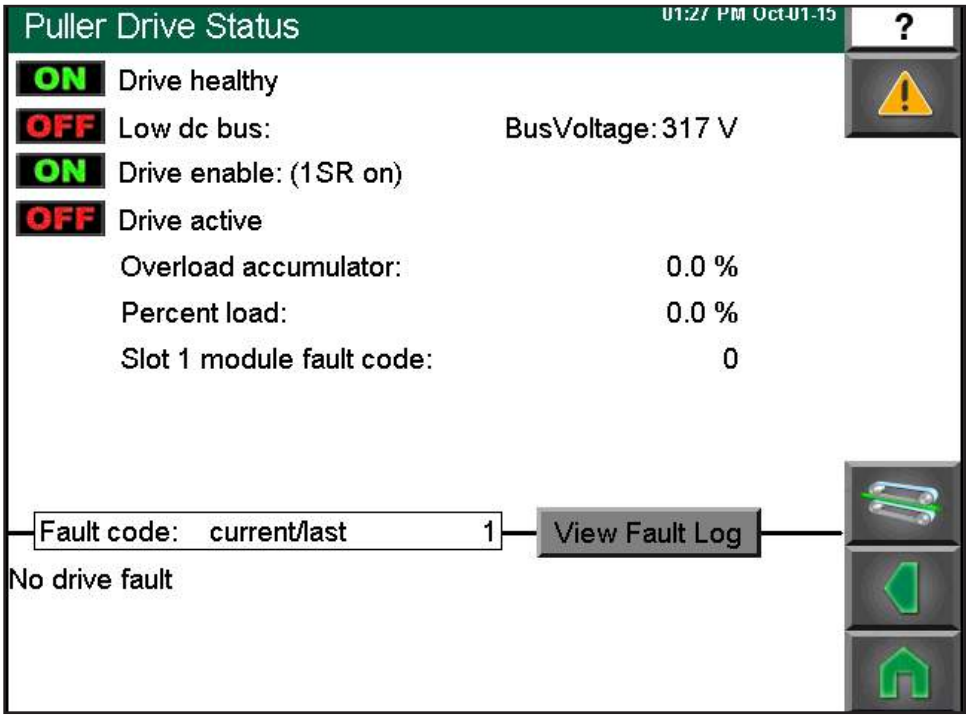
Puller Torque Limit Page



Puller Batch Counter Page

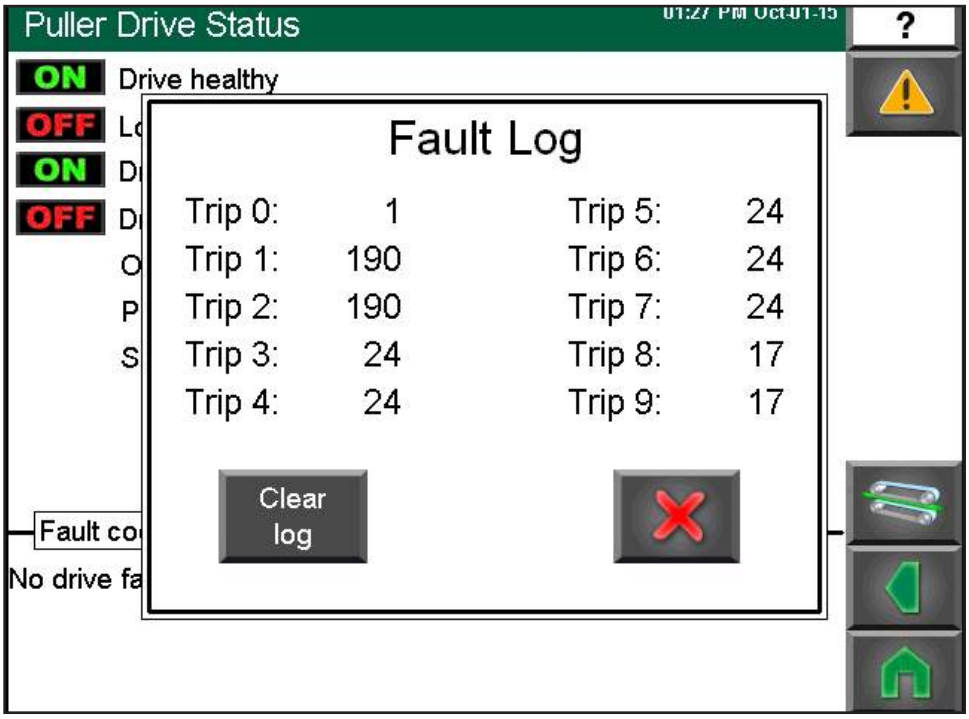
This page allows for viewing and setting batch counts, batch warnings and alarms.

(Continued)



Puller Drive Status Page

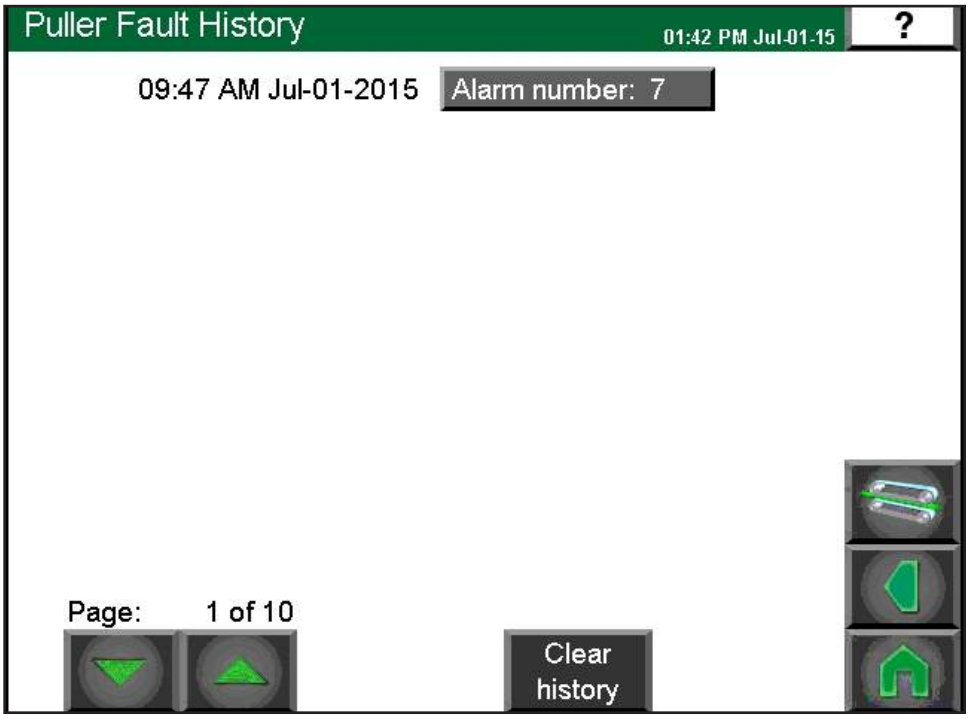
This page allows access to the puller servo drive module status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.



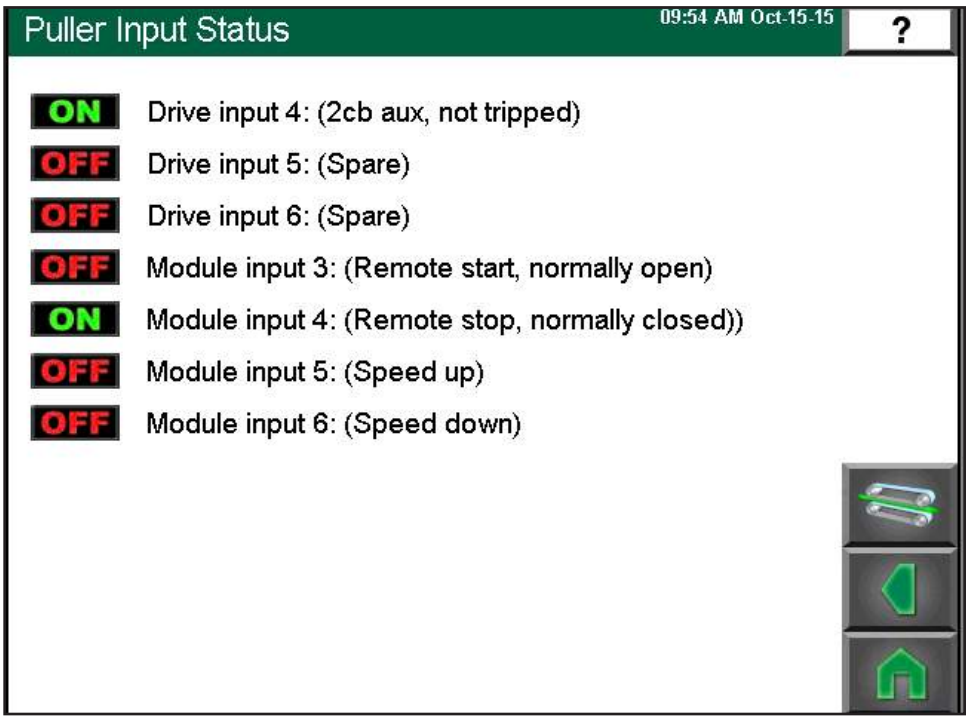
Puller Drive Status View Fault Log Page

This page is used for troubleshooting. This is a log of all faults.

(Continued)



Puller Fault History Page

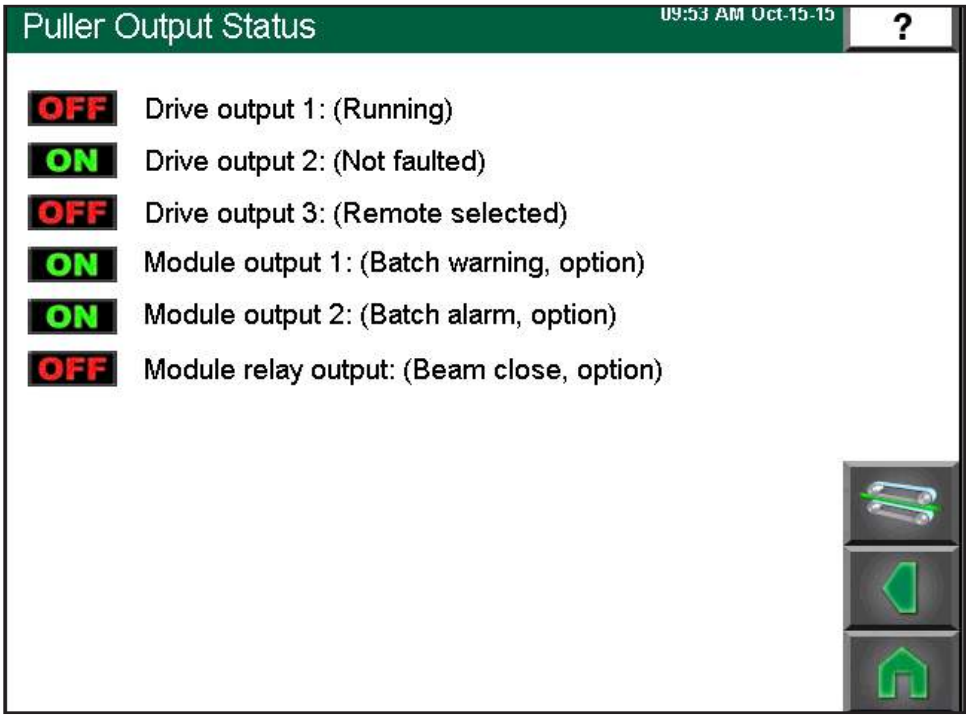


Puller Input Status Page

This page allows access to the puller servo control digital input status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.

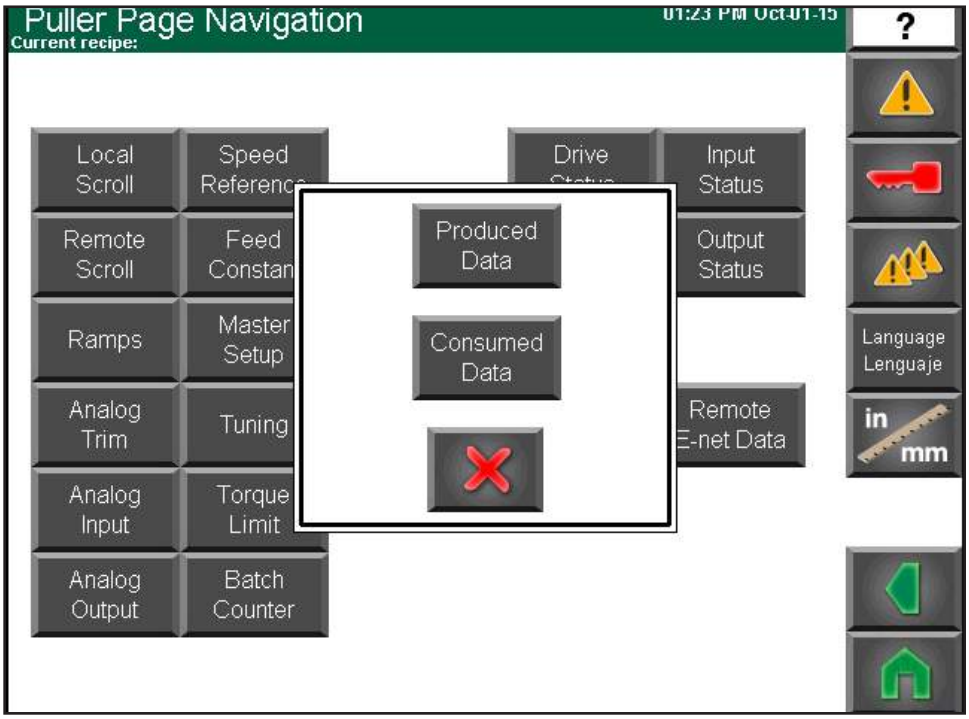
(Continued)

Control Function Descriptions



Puller Output Status Page

This page allows access to the puller servo control digital output status. The information displayed on this page would be used to help troubleshoot problems encountered with the puller.

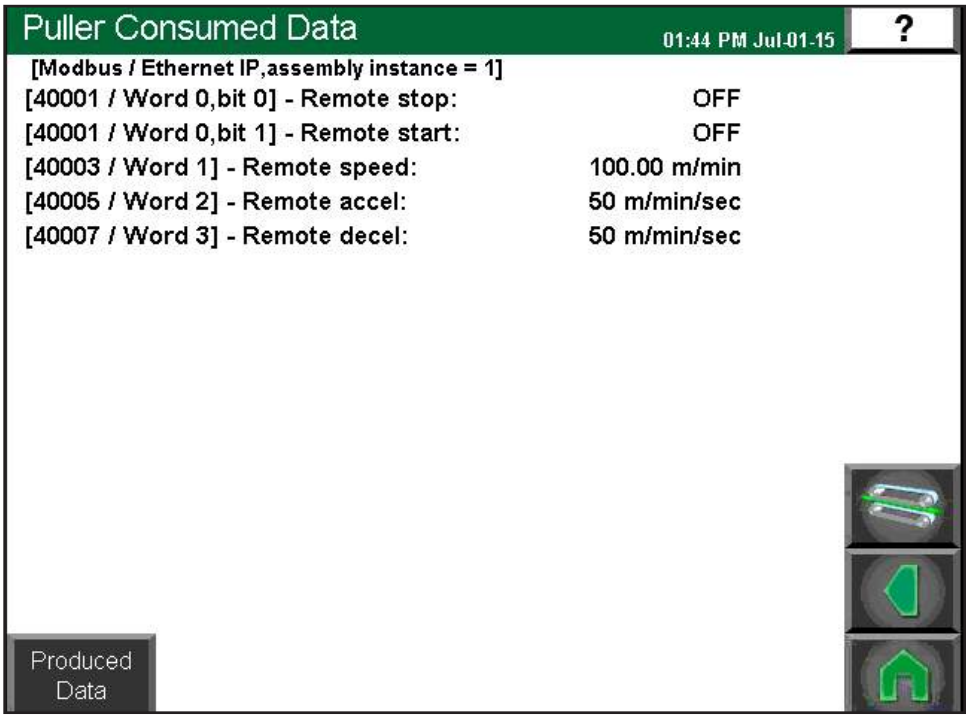


Remote E-net Data Status Page

This page allows access to the puller remote Ethernet data information. This information would be used to troubleshoot the remote Ethernet communications.

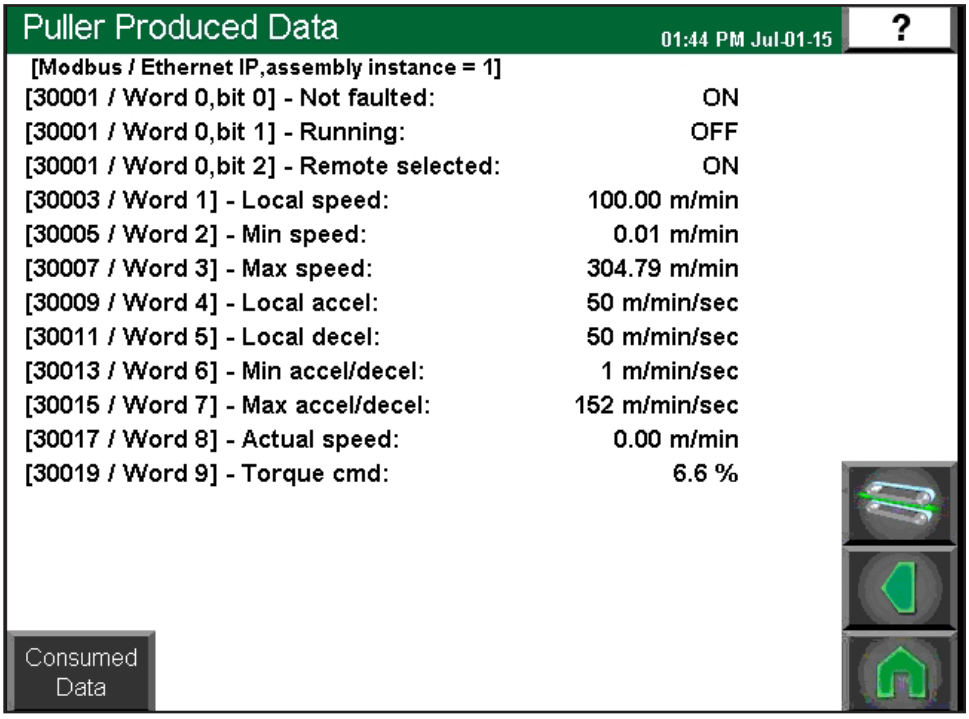
(Continued)

Control Function Descriptions



Puller Consumed Data Page

This page shows the data values sent to the puller from the remote ethernet source.



Puller Produced Data Page

This page shows the data values available for the remote ethernet source to read.

Operation - Optional Software

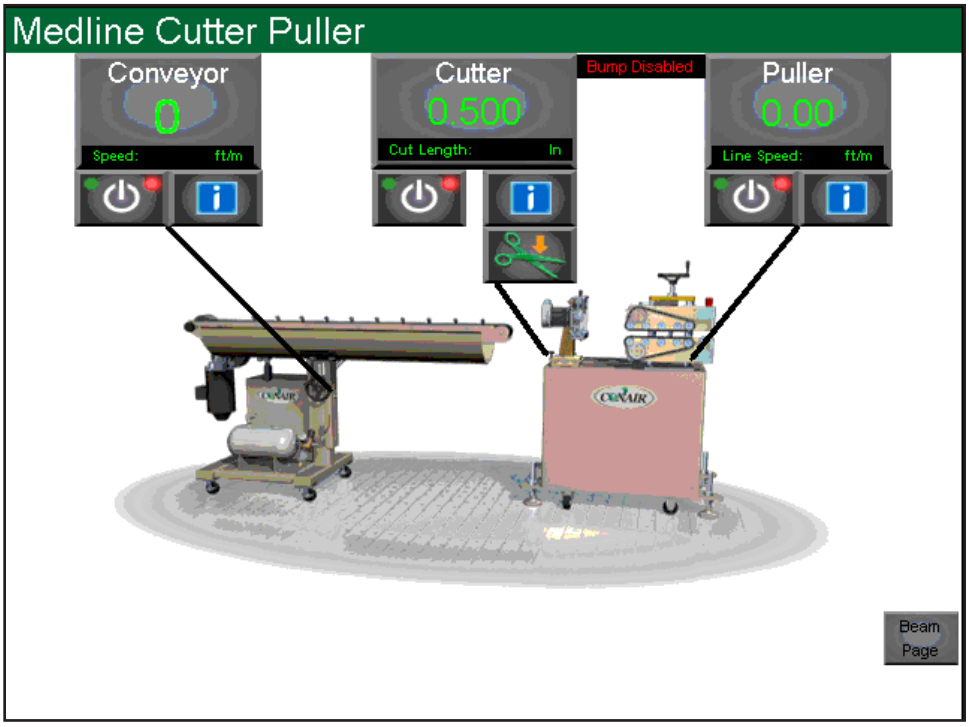
Combination Puller / Cutter - Touch Panel

Introduction

The Conair MedLine Combination Puller / Cutter uses a common Red Lion G310 color touch screen operator interface. Touch screens provide a user-friendly interface to the machine. Information can be shown while maintaining an easy-to-read and easy-to-use environment.

On the left-hand side of the panel are seven general-purpose buttons and a Menu button. These are not used in the application. Touch screen buttons that are used by the application appear on the screen. In many cases, the appearance or text on switches will change to show its state (e.g. on or off).

At power up the Flash Page appears briefly followed by the Main Page.



NOTE: This section is for machines with the optional Bump/Taper Tube software installed. *See Section 4a for the Standard Software.*

Using the Main Page

The Main Page appearance is affected by the modes that have been selected for the Combination Puller / Cutter.

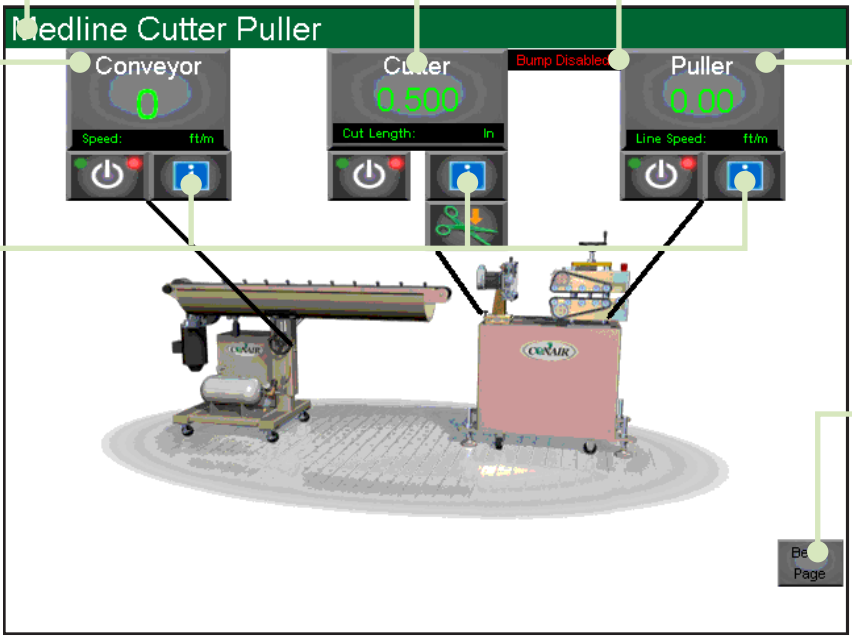
In the Main Page example puller and cutter are set to Bump Mode
.

Screen Name
Alphanumeric characters display the name of the current screen.

Cutter Controls
Turn the Cutter on and off; set the cut length and mode.

Bump Status
Displays the current status of the Bump Tube (if equipped).

Conveyor Controls
Turn the Conveyor on and off; set the speed (if equipped).



Puller Controls
Turn the Puller on and off; set the line speed.

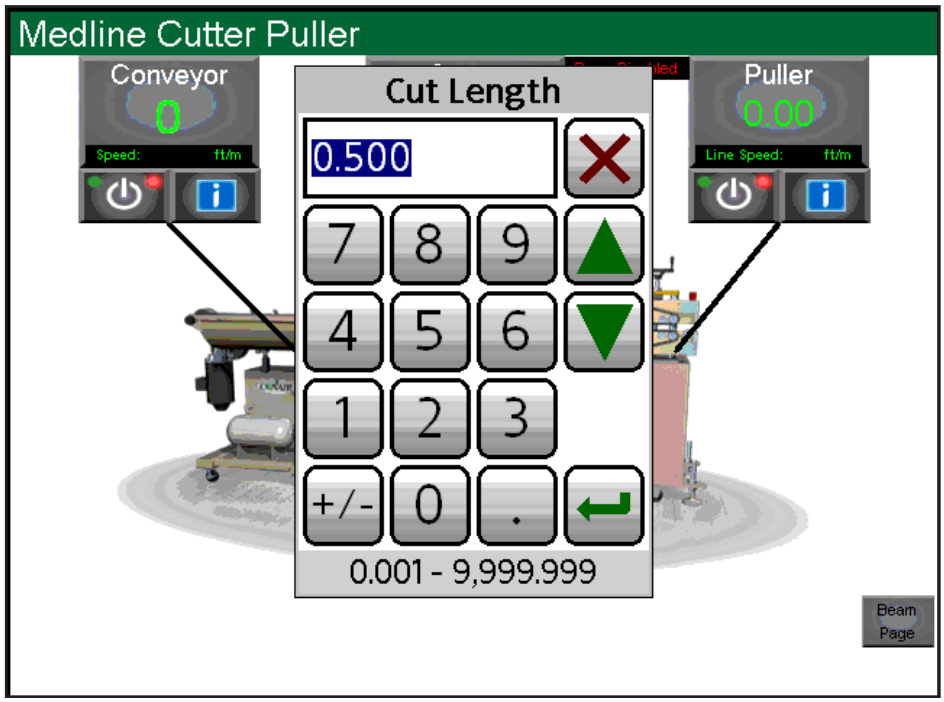
Information Buttons
Press to get more detailed information and settings.

Beam Page Button
Press to get more detailed information and settings for the Beam.

(Continued)

Using the Main Page (continued)

Keyboard Method



Above is a sample of a pop-up keyboard that is seen after pressing the Length window. Pressing the puller speed window would show the puller speed.

To enter a new setting:

1. **Press the window showing the setting you wish to change.**
2. **Enter in your new value on the pop-up key pad.**
3. **Press the "Enter" key on the pop-up key pad**, once the desired value has been entered.

A title appears at the top of the pop-up keyboard to confirm which preset is being modified. Please refer to the section "Walk-through example – How to Change the Length". The explanation given in that section applies to changing any preset.

If the pop-up is accessed by mistake press "Exit" to remove it. Also, if an incorrect value is entered press "Exit" to retain previous value.

Using Remote Scrolling

The speed of the puller can be changed by remote control. For example, an automated diameter gauge could alter the puller speed in order to maintain diameter. Raise and Lower inputs are available for remote operation. A simple three-wire integration is required. LED's show the input condition at the raise and lower terminals. Green means the input is active, Gray means the input is off.

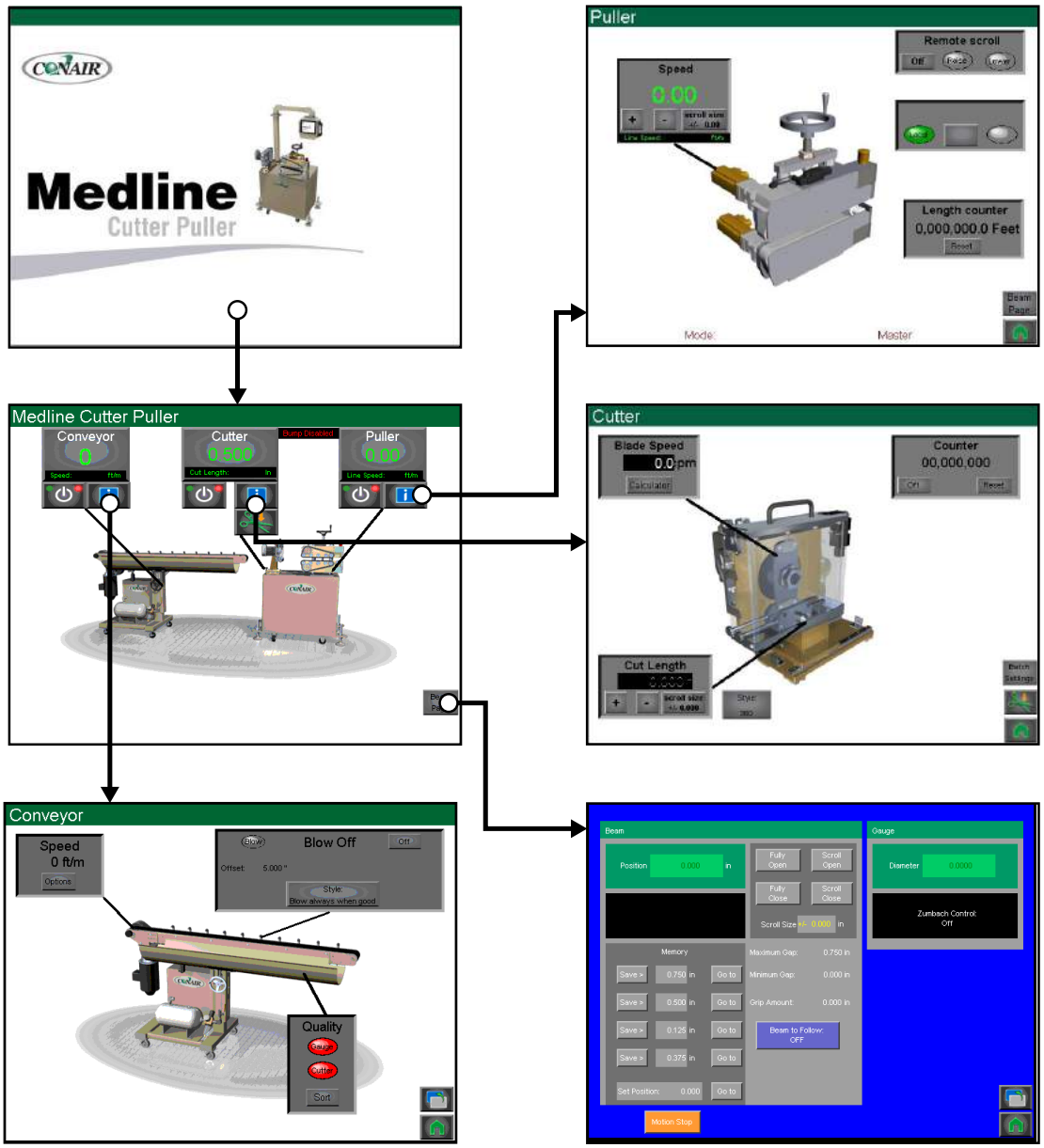
Remote Scroll amount is a user preference. This may be set in Menu Selection – Scroll section.

On/Off is used to enable or disable the remote. The light next to this switch illuminates when Remote Scroll is on.

NOTE: If the remote gauge has a manual/automatic selector then the remote option at the puller can be permanently enabled.

Control Function Flow Charts

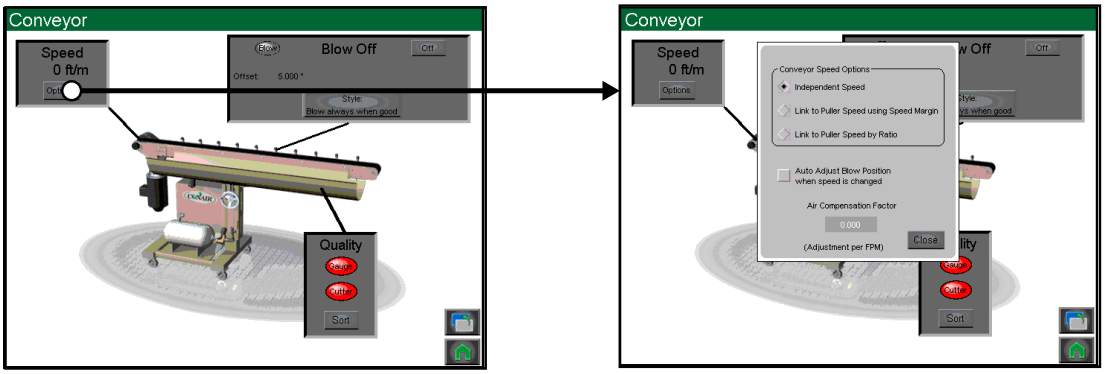
Home



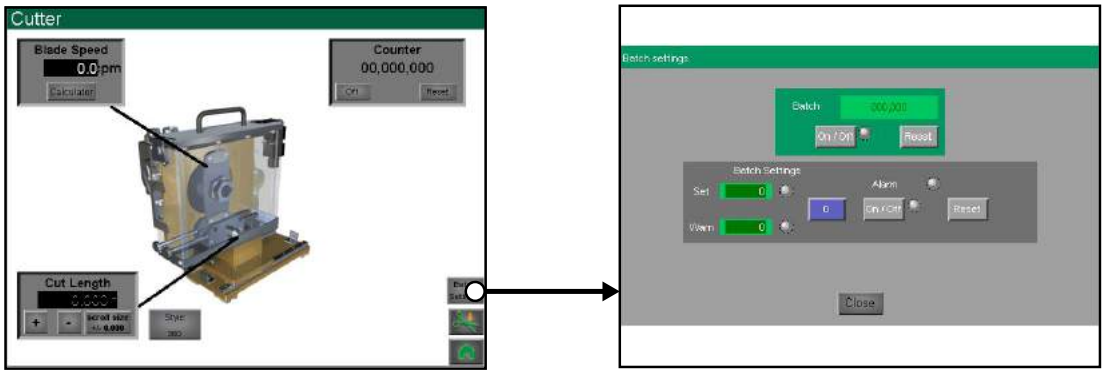
(Continued)

Control Function Flow Charts

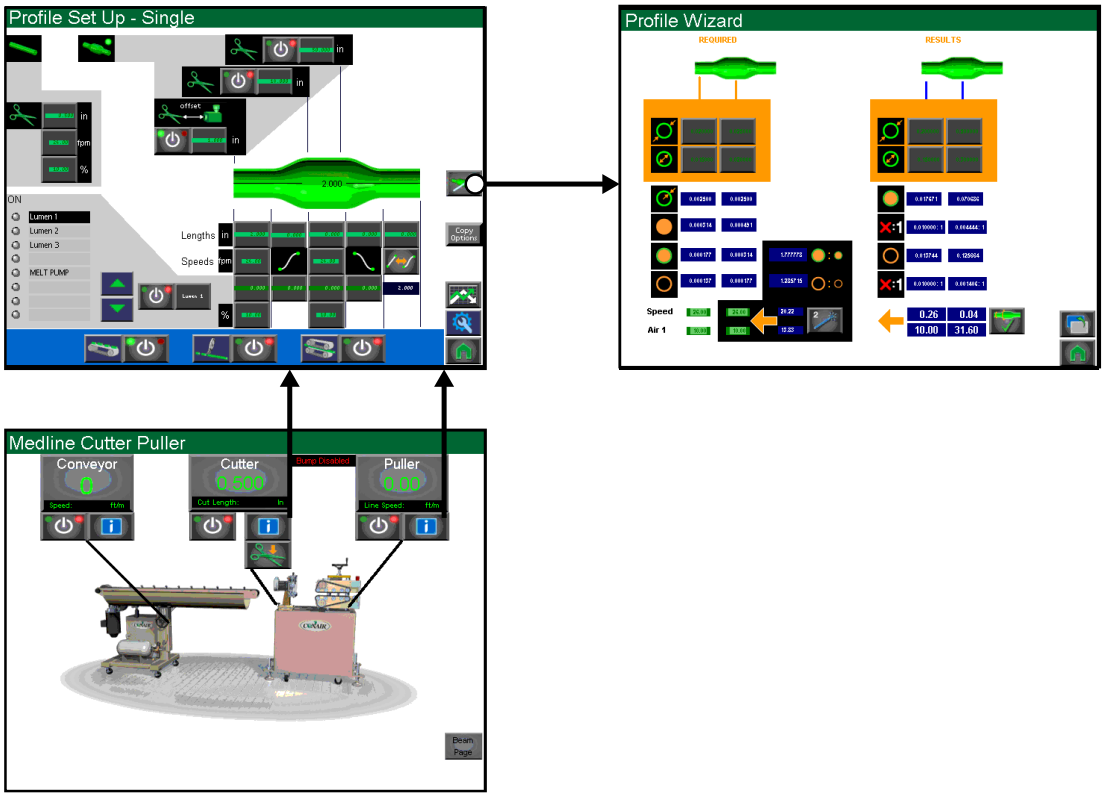
Conveyor



Cutter

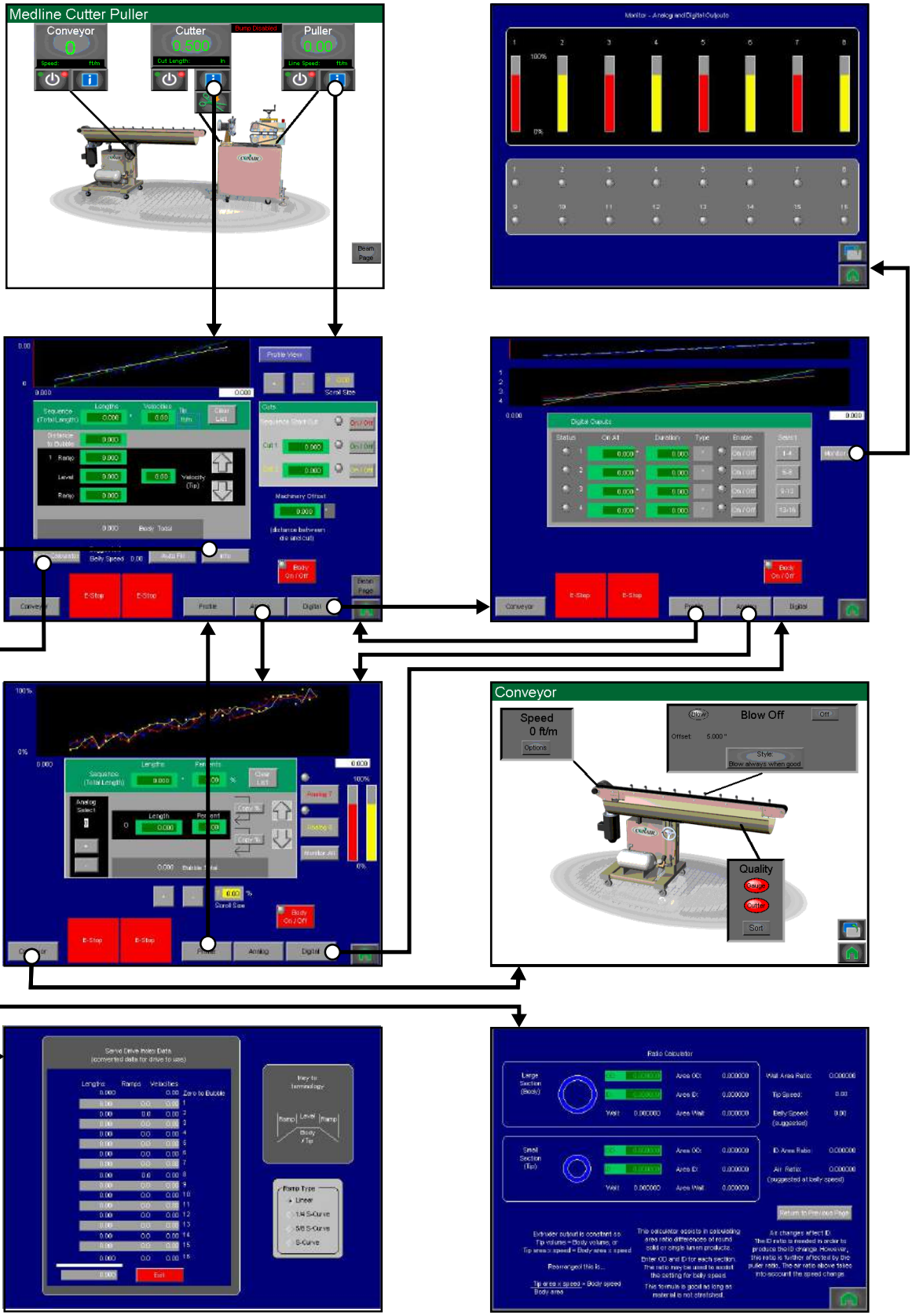


Profile



(Continued)

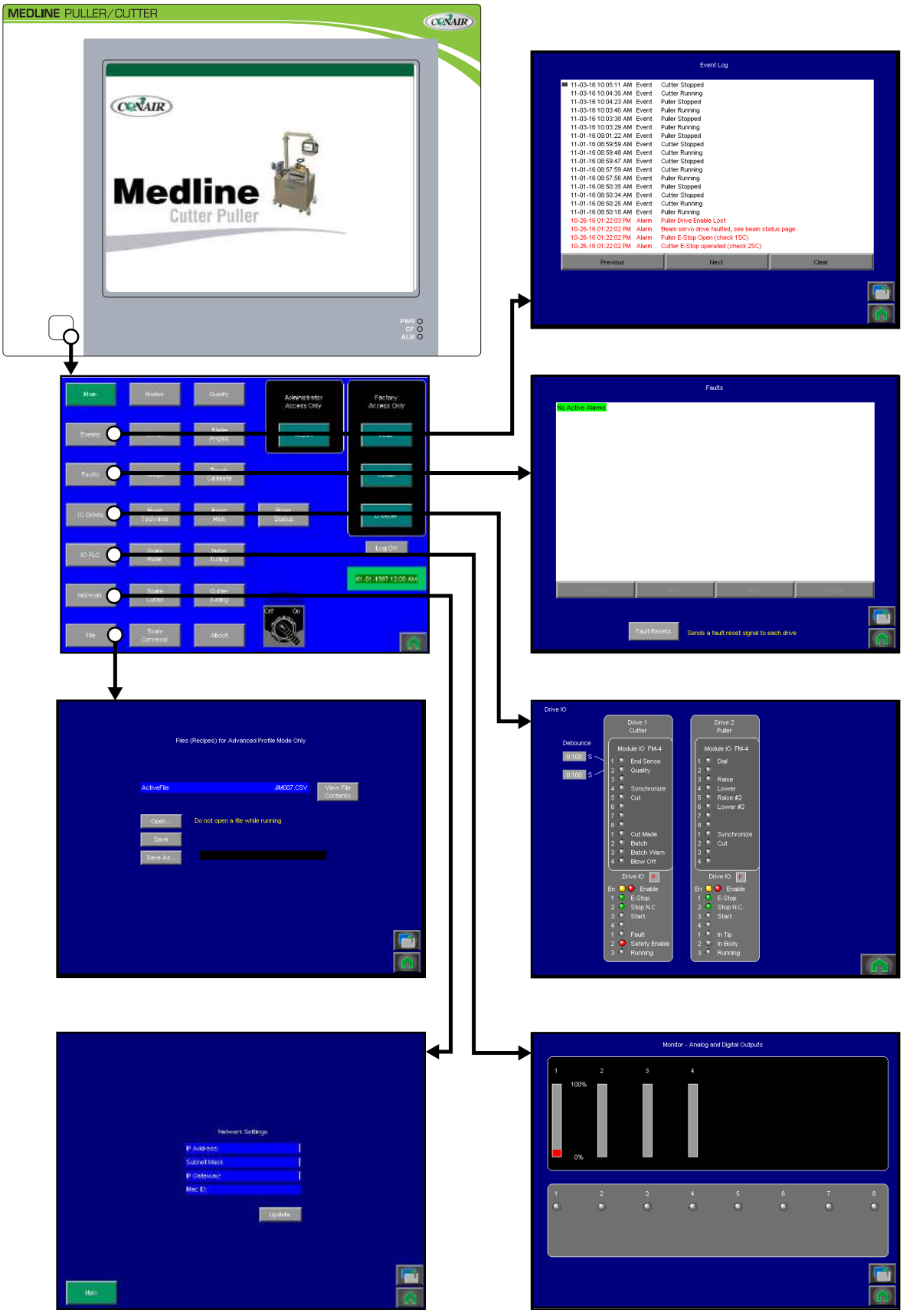
Control Function Flow Charts



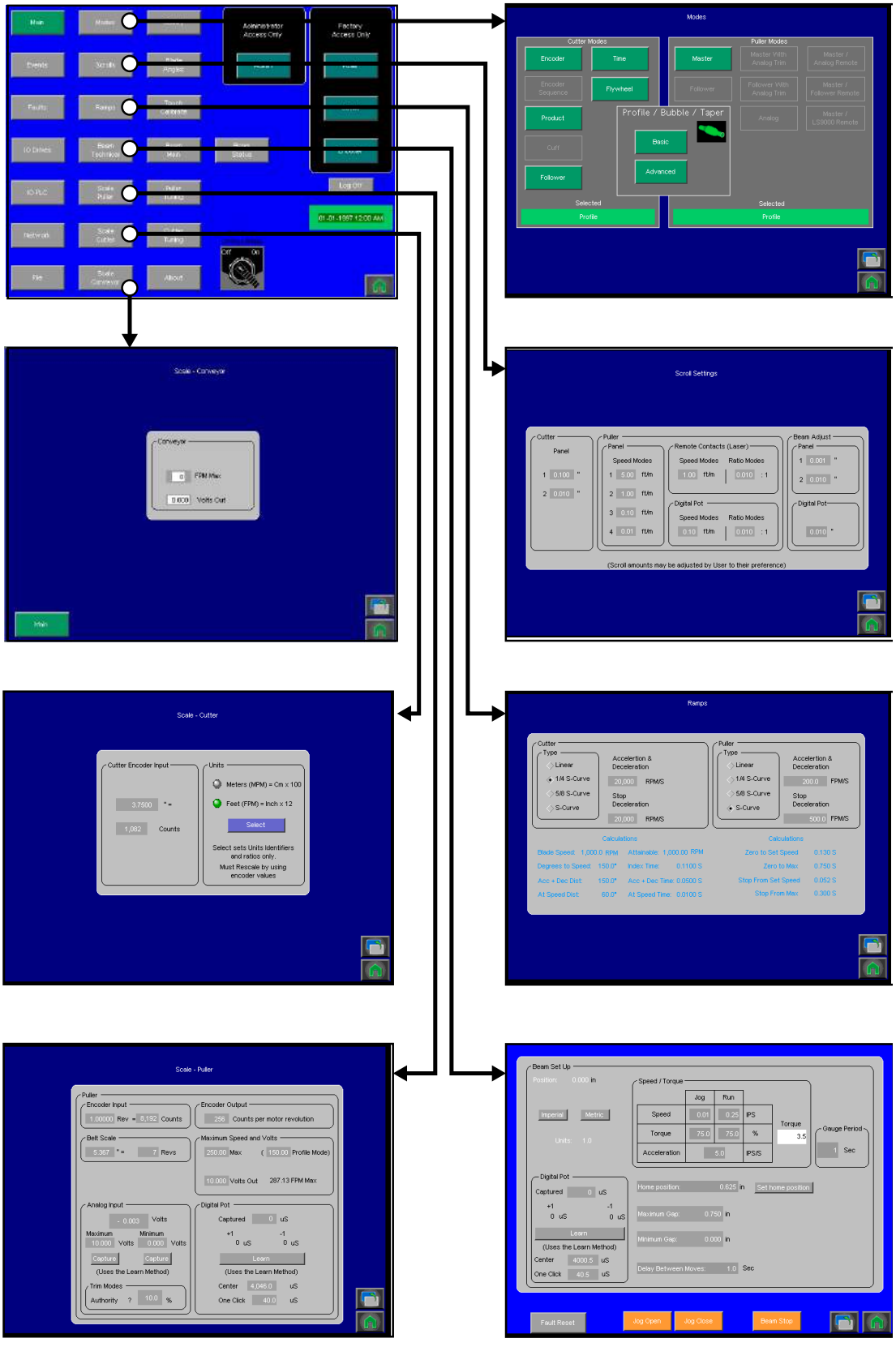
(Continued)

Control Function Flow Charts

Menu

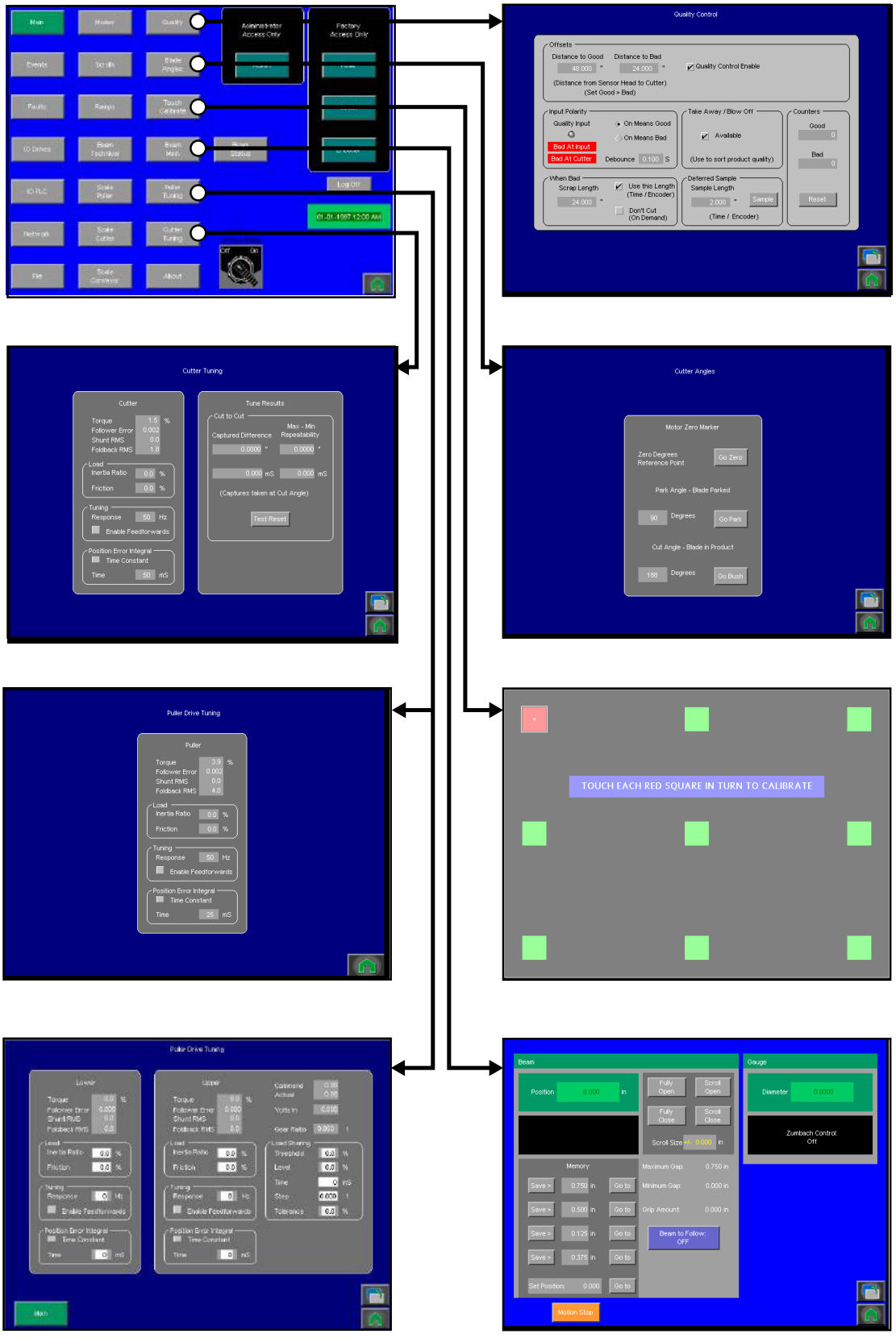


Control Function Flow Charts

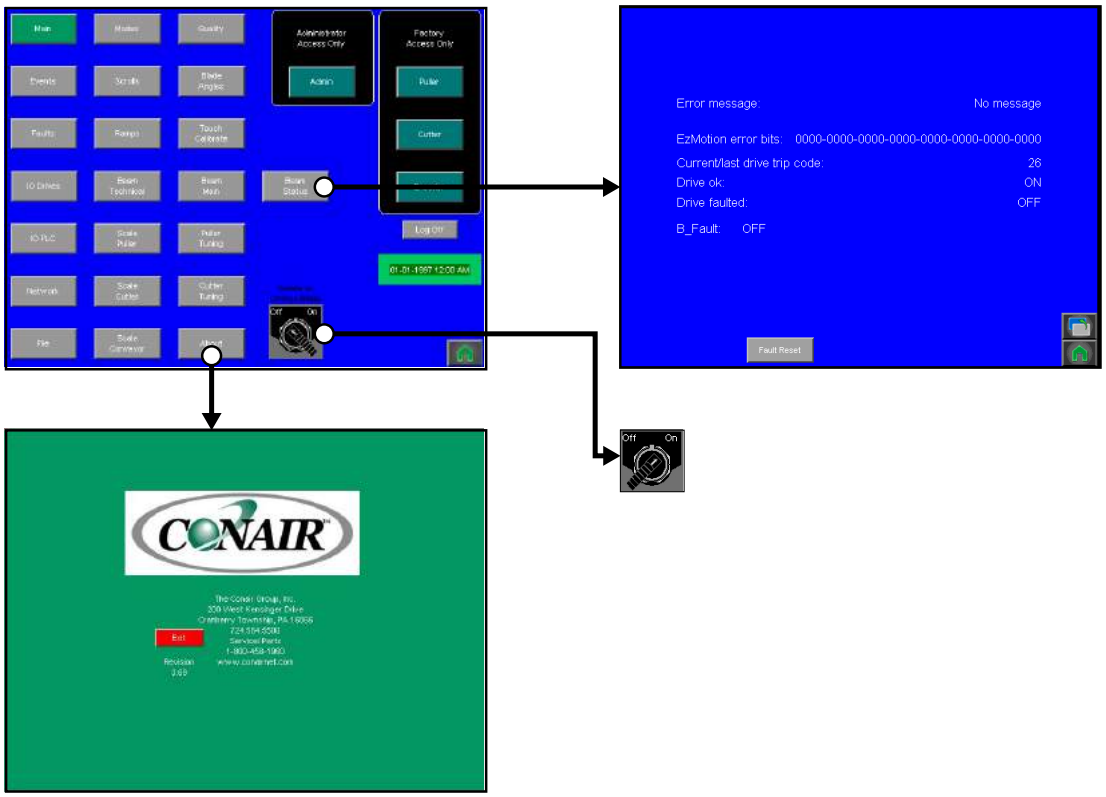


(Continued)

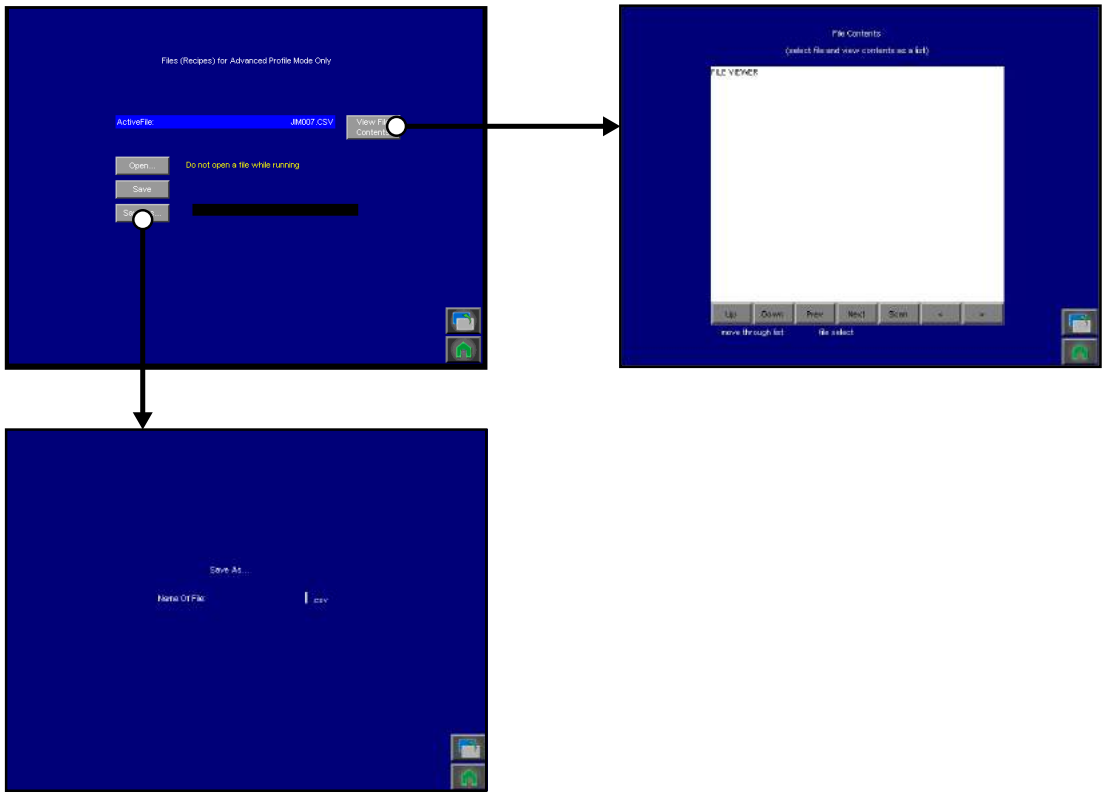
Control Function Flow Charts



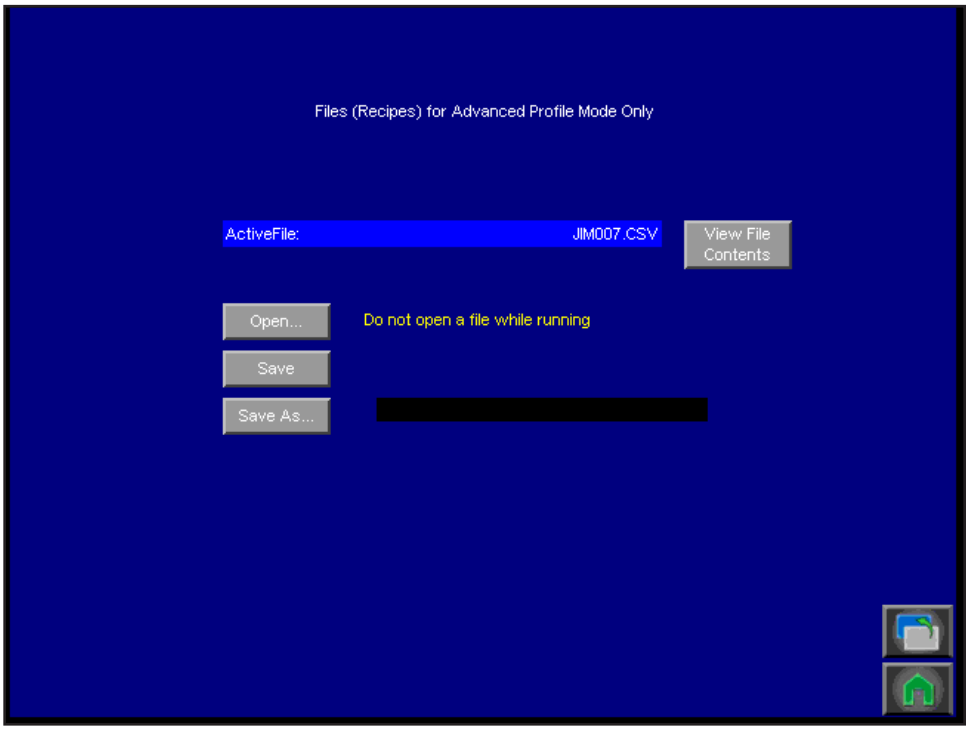
Control Function Flow Charts



File



Using Files Pages



This page is only for files that are saved to the compact flash card.

Files

You can reopen a saved file by using ‘Open”; save data by overwriting the file that is currently open by using ‘Save’; or create a new file with ‘Save As...’ but then will be prompted to enter a new filename. Page shows the current file name that is in use as “Active File”. The view contents button provides viewing access to saved files and a way to scroll through the data.

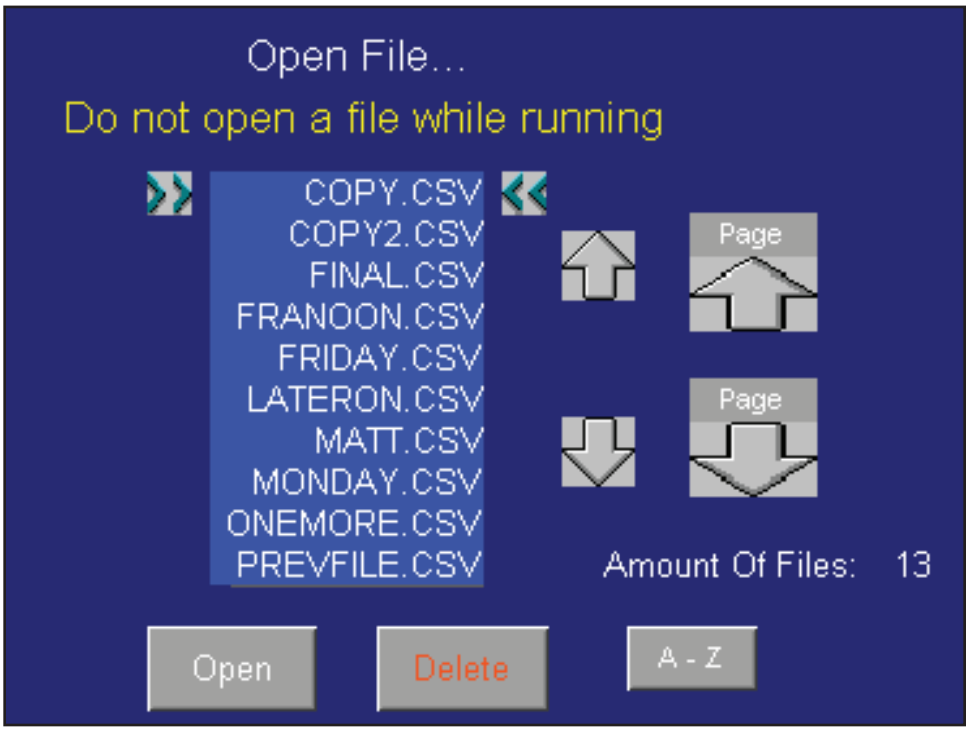
The same data can be read remotely via Ethernet or USB and may be uploaded to a computer. *Refer to “Configuring the Network Settings” in this Section of the manual.*

If you press Menu - Network you will see the Network page showing IP address of HMI. Password is set via the Log On button.

(Continued)

Using Files Pages (continued)
Opening a File

Open – Press “Open” from the “File Page” to get to the “Open File…” page.



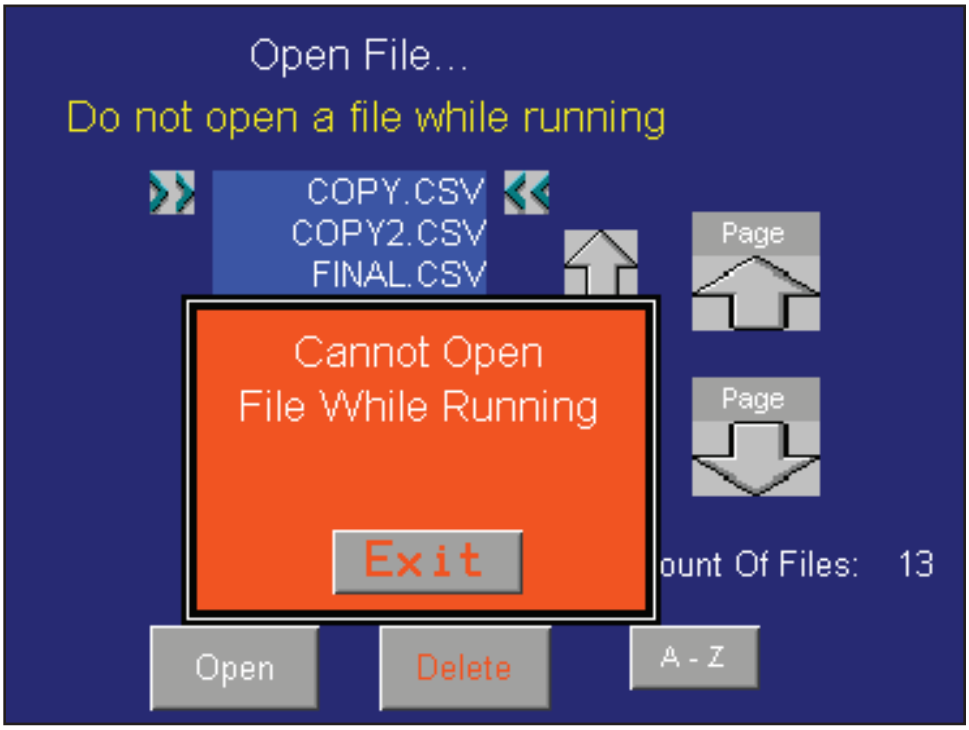
Files are listed in alphabetical order. The “A-Z” and “Z-A” buttons provide options to show files in alphabetical order or reversed alphabetical order.

Open - A file may be opened by pressing its name directly or can be selected first by using the up/down arrow buttons, then opened by pressing the “Open” button. For example, pressing the area occupied by the filename “MONDAY.CSV” will open that file. The alternative is to use the arrow buttons first to highlight the filename followed by a press of the “Open” button. The double chevron images on either side of the filenames are used to highlight files when used with the arrow (select) buttons.

Ten files are shown in the initial view of the File Open window. Page up and down buttons are used to go through the list ten items at a time. The smaller arrow buttons are used to maneuver through the displayed portion of the list one item at a time. If there are fewer than ten files Page up and down buttons do not appear.

(Continued)

Using Files Pages (continued)



! **IMPORTANT:** While the machine is running you cannot open a file.

Delete - A file may be deleted by using the arrow buttons to select the file you want to delete and then pressing the "Delete" button. A red warning appears detailing which file is about to be deleted with options to keep or discard the file.

Exit - To exit from the "Open File…" page press "Exit". The current file that is active will remain in use.

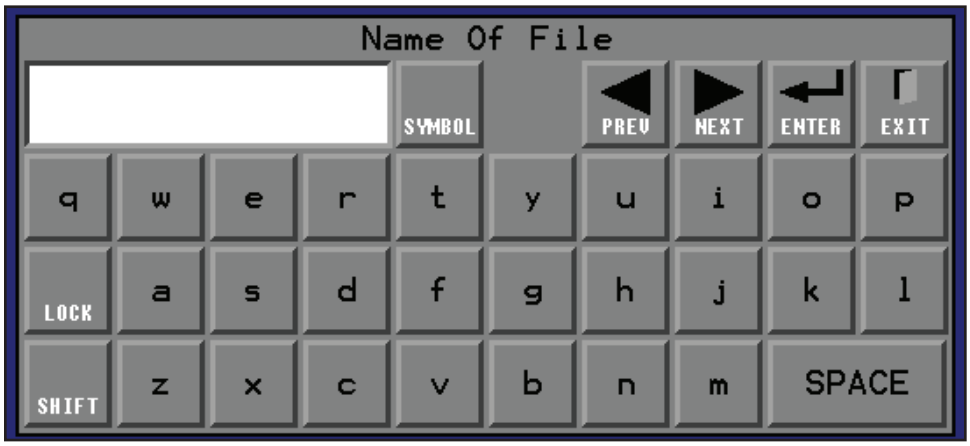
Saving a File

A file may be saved using "Save" or "Save As…" buttons.

Save – This is used to save values to the current file that is open.

Save As… - This should be used when a new filename is required. An area is provided to enter the filename. Filenames must comply with the 8,3 DOS operating system convention. There is no need to enter the .CSV extension. This has already been filled in.

Using Files Pages (continued)

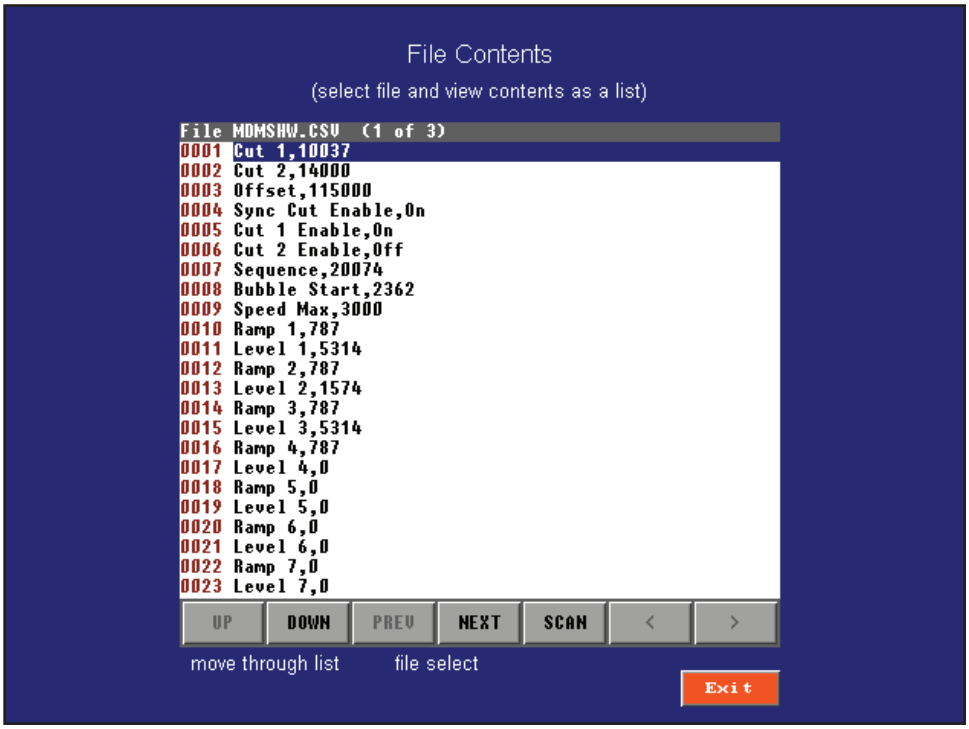


NOTE: A computer style keyboard is provided for entering a new filename. Key in the preferred name followed by "Enter". "Exit" can be used to escape from this page.

Exit - To exit from the "File" page press "Exit". The current file that is active will remain in use.

File Contents – The contents of files can be viewed using the File Contents feature. Press "File Contents" to get to the File Contents page.

Using the File Contents Page



"Up" and "Down" – These buttons are used to move through the list. "Move through list" message is underneath these two buttons to clarify the use.

MedLine Puller / Cutter Control Instructions Puller Menu Screen

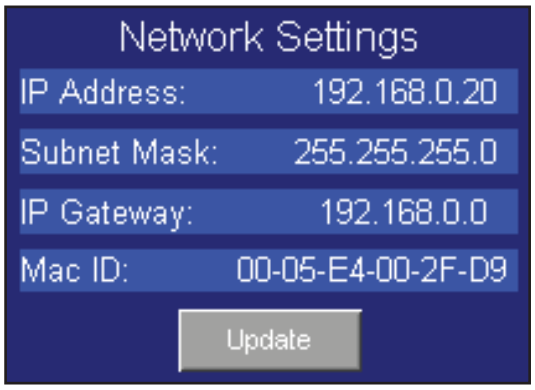
(<) and (>) – These buttons have no function in this application. The list consists of three columns - the line number, variable name and variable value. These columns fit on the screen without the need to scroll sideways. (<) and (>) are used to move between columns when there are many columns to move between..

“Prev” and “Next” – These buttons are used to select files to view. Files are selected in date order – newest first. “File select” message is underneath these two buttons to clarify the use.

“Scan” – This button is not used in this application.

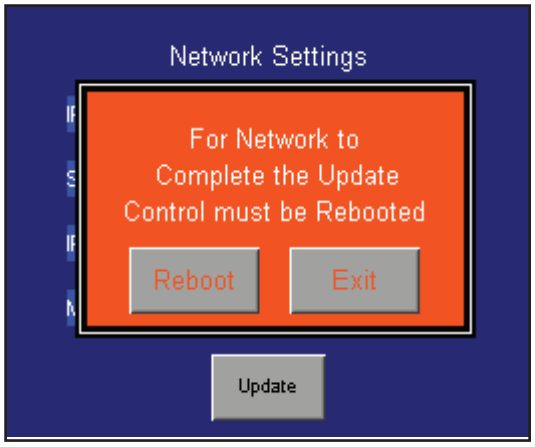
Configuring the Network Settings

The touch panel has Ethernet capabilities. For Ethernet to function correctly the control must be set to conform to the current network. An example is shown. The control must be rebooted for new settings to take effect. This can be achieved by power cycling the control or by using the Update function.



The Update button reboots the panel. A warning is given to ensure the operator is fully ware of what is about to happen.

The options are to “Reboot” or “Exit”. An interruption to the program happens during the reboot. Do not reboot while the machine is running. Network configuration is typically done once only at installation.



Changing the Password

This feature is provided to change a password. The user can access and change their own password only. Factory personnel have the option to rewrite any user password.

Log Off

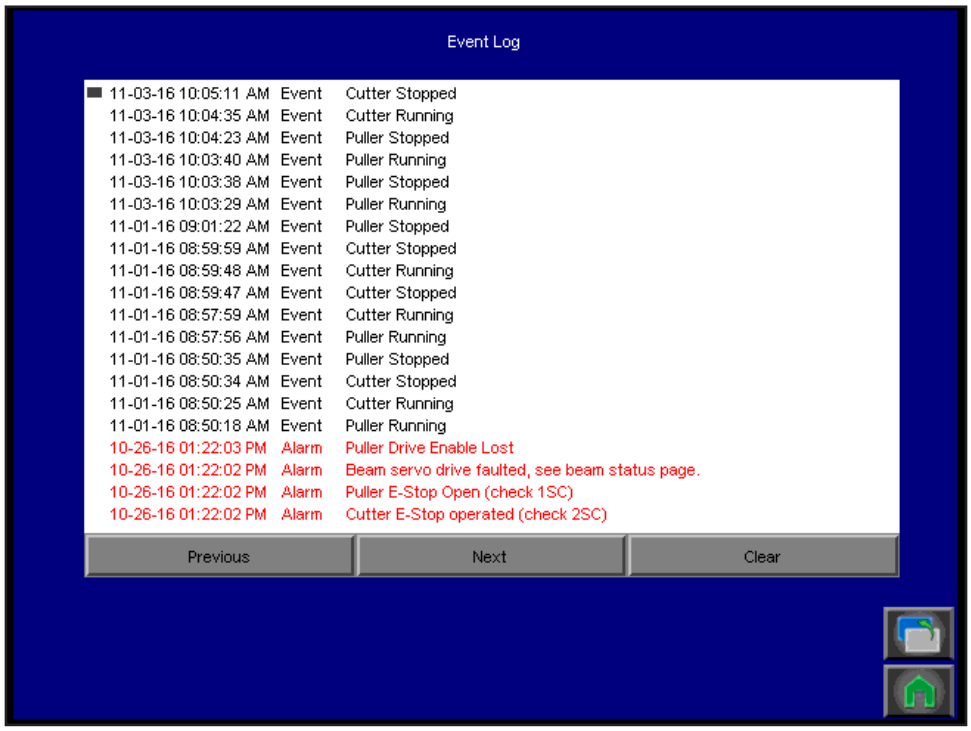
An operator may log off by using this button. This same button appears on other pages.

! **IMPORTANT:** Only personnel with maintenance rights can access this page.

✎ **NOTE:** The panel has the ability to record events to the compact flash memory card. Currently, this feature is disabled. Contact a Conair Representative if you require this feature.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

Using the Events Page

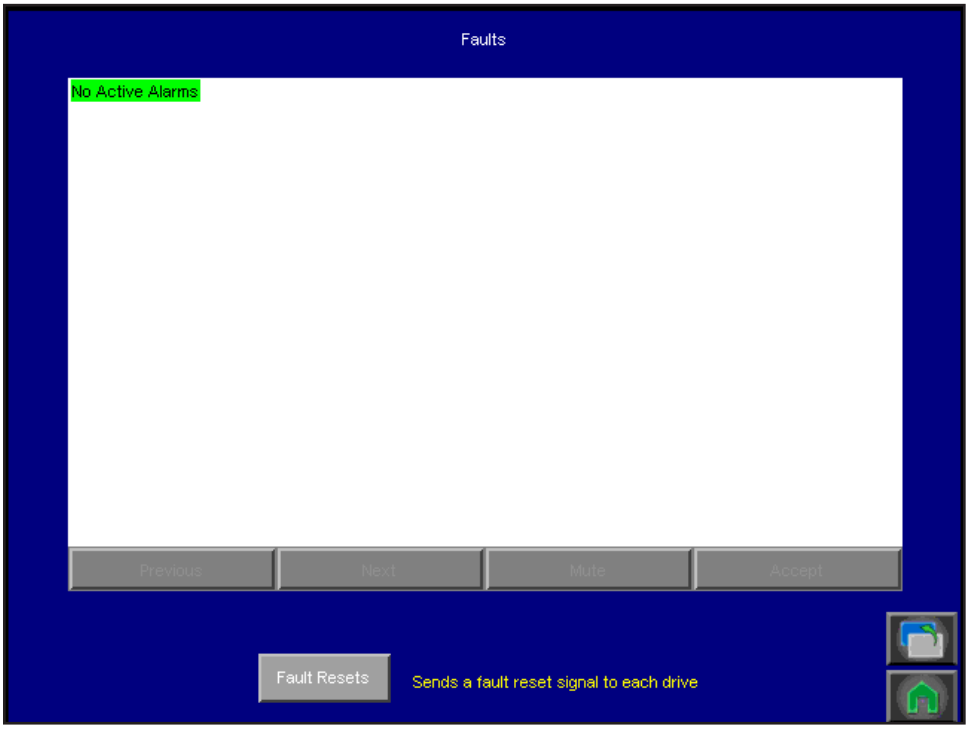


The Events page is used to record changes in activity. Cutter and puller events are being recorded in the example. A variety of different events are recorded and time stamped.

As the list grows “Previous” and “Next” buttons become active to allow movement through the list.

The “Clear” button can be used to erase the list. User must have administrator rights to do this

Using the Faults Page



! **IMPORTANT:** Only personnel with maintenance rights can access this page.

✎ **NOTE:** Diagnostics characters on the drives may be viewed through the door window of the lower electrical cabinet. The IO page also shows diagnostic characters.

✎ The panel has the ability to record faults to the compact flash memory card. Currently, this feature is disabled. Contact a Conair Representative if you require this feature.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

If a fault occurs the screen will flash and an alarm will sound from the touch screen. Some faults clear automatically, others need maintenance attention.

When a fault takes place this page indicates which drives are involved and explains the fault. Drive programs have a check and clear routine for faults in their start up routines. Sometimes pressing “Stop”, followed by “Start” will be enough to clear a fault. There is also a master Fault Resets button on this page. By pressing this button a fault clear signal is sent to every drive.

“Previous” and “Next” buttons are available to move through the list. An individual fault can be acknowledged by highlighting it with the “Previous” and “Next” buttons, followed by a push of the “Accept” button.

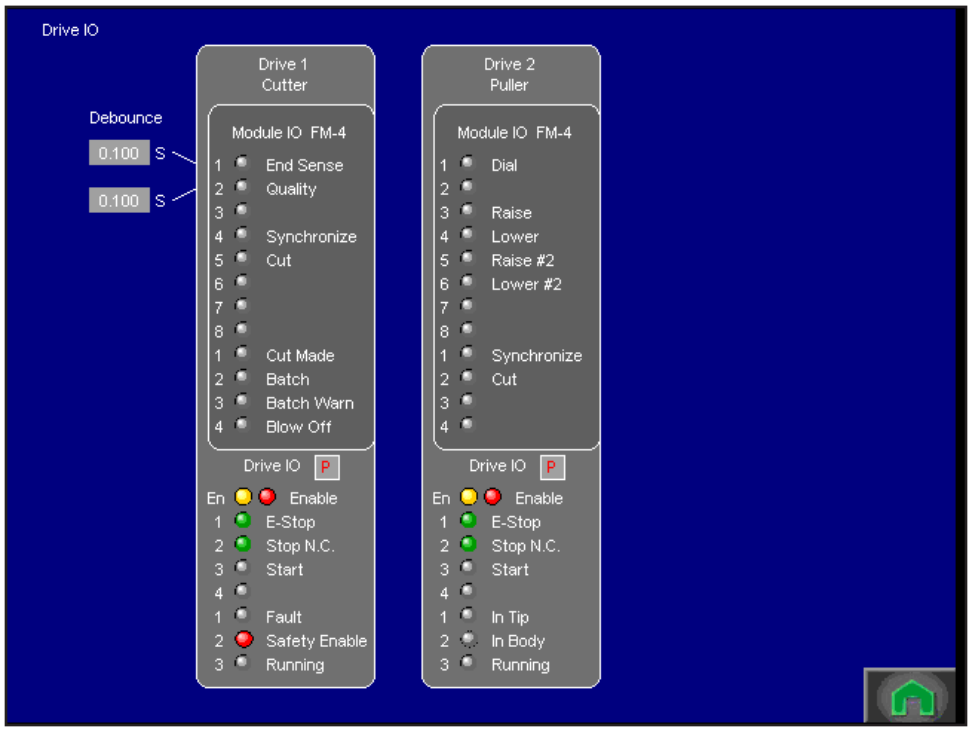
“Mute” will leave faults showing but will clear the sounding alarm.

When all faults are cleared the sounder is silenced.

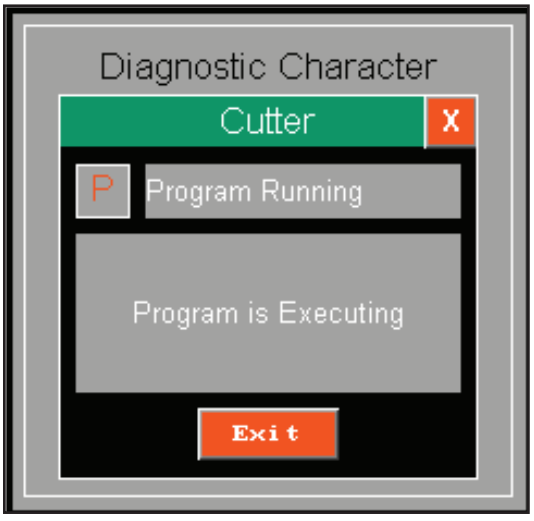
! **IMPORTANT:** Only personnel with maintenance rights can access this page.

✎ **NOTE:** The drive has 4 inputs and 3 outputs. A further 8 inputs and 4 outputs are available on the FM-4 program module. Please refer to the Control Techniques drive and FM-4 manuals that came with you machine for additional information. Also, please refer to the schematics that came with your machine when tracing and diagnosing issues.

Using the IO Page



Each drive has an additional input designated as a drive enable. This input is shown using a yellow light. The actual Drive Enable (used by the drive) is shown as a red light. Drive Enable (red light) could be off due to a fault even when the Drive Enable input is on.



Diagnostics Character

Drives include a diagnostics character on the front of every drive. A copy of the character is shown on this page. In the sample all drives show a 'P' which means programs are running. Press any diagnostics character on the touch screen to show a basic and detailed pop-up description of the code.

Descriptions shown on the pop-up match those found in the Control Techniques manuals.

IO Page showing pop-up description of Cutter's Diagnostic Character.

Remove this descriptive pop-up by pressing the Exit button or X in top right hand corner of the screen.

Debounce

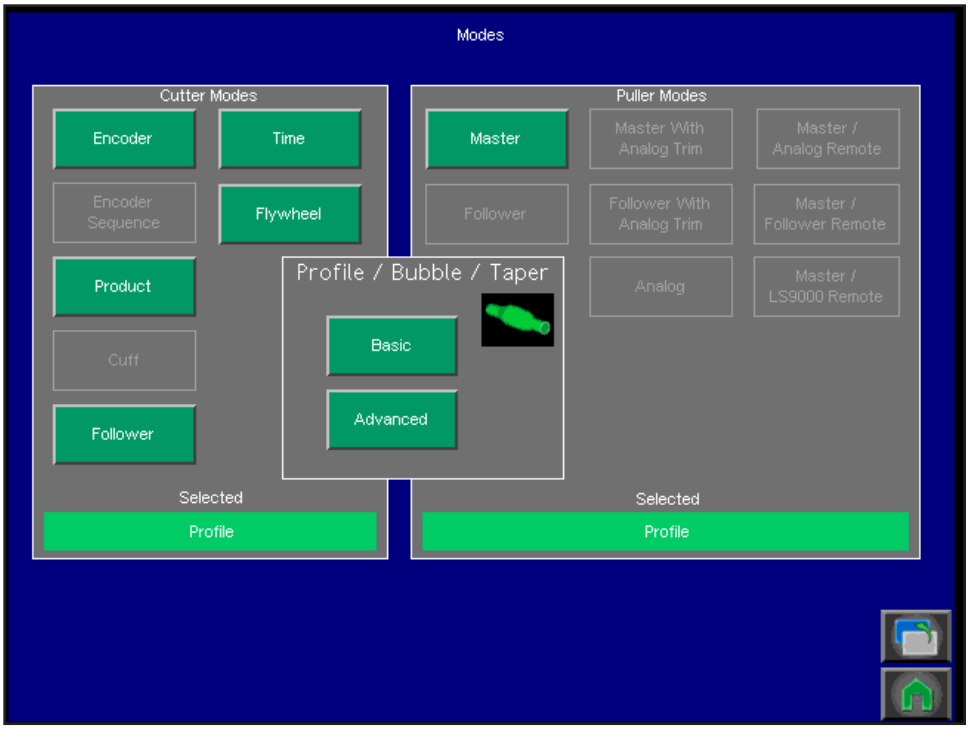
The Cutter has two inputs with adjustable filters. These are 1 - End Sense (used by Product mode) and 2 - Good / Bad. Debounce filters are in seconds to 3 decimal places. When relay or switch contacts are used these should be filtered between 0.005 and 0.100 seconds. When the signal input is from a transistor or solid-state driver set the debounce to zero.

Configuring the Menu Selections

The Menu selections are labeled:

- Modes
- Scroll
- Encoders (for Factory use only)
- Ramps
- Scale
- Angles

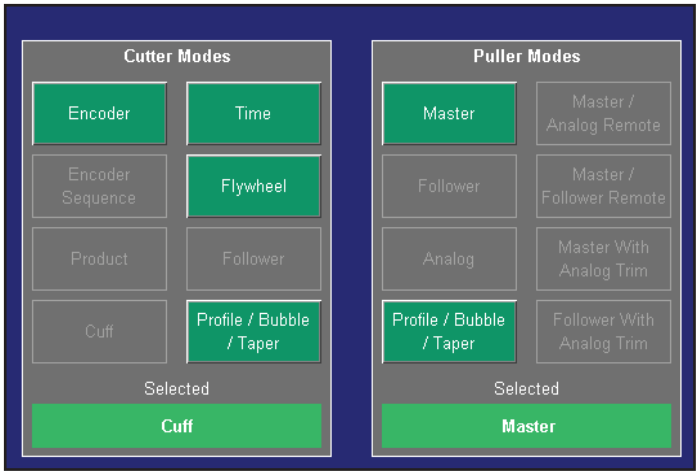
Modes Page



NOTE: Modes Page sample for a combination Puller / Cutter with all options.

The Cutter and Puller have up to eight modes available each. Unavailable modes are grayed out. The current selection is shown at the bottom of each selector and is also shown at the bottom of each control on the Main page. In the sample the cutter is in Cuff mode and the puller is in Master mode.

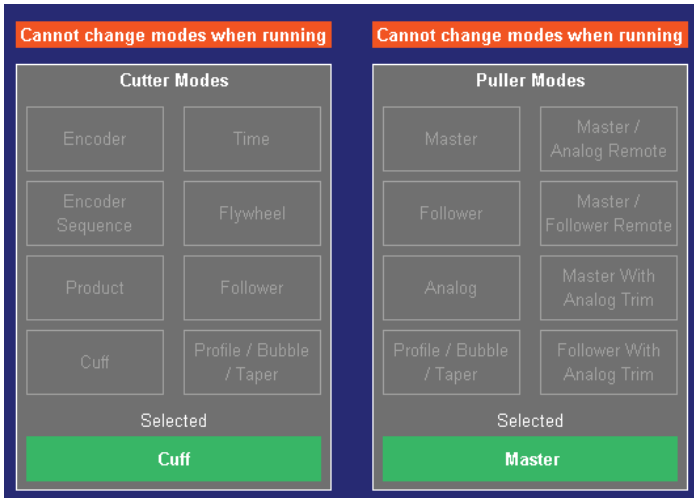
Controls Sample with fewer modes



Modes may be changed while the machine is stopped. All options are blanked out while the machine is running. In addition, a red warning message for each control is shown to explain “Cannot change modes when running”.

(Continued)

Configuring the Menu Selections (continued)



Warning messages shown on Modes page when running

Mode Page Descriptions - Puller Modes

Master Mode

When the Puller is in Master mode it directly controls the speed of the extrusion line. In this instance the Puller is the Master. Sensors may be included in the extrusion process to monitor the product and auto-correct the speed, such as in an automated diameter size process. Auto-corrections are made to the same preset that the operator uses.

The operator may key in a new value at the Main Page to control speed. Alternatively, the operator may use the (+) and (-) buttons on the Main page with any one of four user-preferred scroll amounts in order to trim speed to the required level. In a typical application the operator uses both coarse and fine methods. The key in method would be used first to set the approximate coarse speed. Afterwards, the speed is nudged up or down using the (+) and (-) buttons using a fine scroll increment to achieve the exact speed that is desired.

Remotes

Two versions of Remote are available that also act on the set speed. One method uses wired raise and lower contacts (a 3-wire system). Contacts can be controlled manually (by remote buttons) or can be from an automated diameter gauge. The change amount for each contact closure is a user-preferred setting and is available on the Set up 1 Scroll page. The programmed change (up or down) is made when the remote contact changes from open to closed. While a contact remains closed a further programmed change will be made every half second.

Another style of Remote is a type that uses a digital rotary potentiometer. A digital potentiometer can be rotated continuously in either direction. It can be turned fast or slow. It has a similar feel to a 10-turn analog potentiometer but has no mechanical limits and is unaffected by electrical noise. Clicks of the dial (36 clicks per revolution) can be programmed to any increment size on the Set up 1 Scroll page. For example, the smallest click could be programmed to make a 0.01-FPM change (0.36-FPM per full revolution).

(Continued)

Configuring the Menu Selections (continued)

Follower Mode
The Puller may follower an upstream source such as an Encoder mounted on another Puller or a Puller with an Encoder output built into the motor. The source must be a quadrature encoder. When the puller is in Follower mode the operator does not set speed. Speed adjustments such as those needed to match the Puller mechanical differences or product shrinkage / slippage can be made using Ratio. When scaled correctly a 1.000:1 ratio should provide an exact Puller follow.

NOTE: In Follower Mode an OD gauge control is used to make ratio changes.

Analog Mode
In most cases Analog is a Follower mode. A voltage such as a 0 to 10-volts is applied to set speed. A 10-turn potentiometer could be installed right at the Puller in which case Analog would be a local Master mode.

NOTE: In Analog Mode an OD gauge control is used to make ratio changes.

Switchable Modes
Two of the modes listed are known as switch-able modes. These have dual possibilities using a mixture of the modes already discussed. The Puller can be started up in one mode and then switched to another. A selector switch appears on the Main page in the Puller section whenever Master / Analog Remote or Master / Follower Remote modes are selected. In addition, indicator lights show which of the two modes are selected. Master in this configuration is referred to as Local.

NOTE: An OD gauge control will affect speed or ratio as determined by the state of the local / remote selector switch.

Bumpless Transfer
A feature known as “Bumpless Transfer” is included for switch-able modes. This ensures that no speed change occurs when switching from remote to local. In this situation the actual velocity is copied into the local (master) set point to ensure they match. That way the local control is already at the correct speed and so no further change is required. Bumpless is not available when switching from local to remote.

Trim Modes
Two of the modes available are known as Trim modes. These are summation modes where two signals are added together to form the puller speed. Master with Analog Trim uses the speed set by the operator plus an analog correction. An analog position or loop sensor senses the product and provides the speed correction.

Follower with Analog Trim acts in a similar way. It uses a quadrature encoder to match Puller speeds with an analog input to tune the ratio. This is done to balance speeds due to mechanical differences and product effects.

The Analog Trim portion is typically used to make small changes of a few percent.

A Trim on/off switch appears on the Main page in these modes. It is available to enable or disable the analog Trim input. Trim should be disabled while starting the line.

Profile / Bubble / Taper Mode
This is a special mode that is used to sequence through a set of velocity changes in order to make a product with varying diameters. It is similar to Master mode except it has many set points (Master mode has one set point). This mode is used with the matching mode on the Cutter.

(Continued)

✎ **NOTE:** The small diameter portion of the profile may be referred to as tip or tube. The large diameter may be referred to as bump, body, bubble or belly.

In this mode the operator sets velocities and distances. Two distances are provided for every velocity. The first distance is the length used to make the speed change. Other names for this portion are the transition, ramp or the gradient. After this portion there is a steady state distance. Names for this second portion are maintained, steady and level. The programmed velocity is maintained throughout the second distance portion.

Analog and digital outputs are included with Profile / Bubble / Taper mode. These may be used to assist production. For example, it is typical to use air to assist at the extruder die for support of the profile. If a simple puff of air is required then the digital outputs are perfect for this to open and close a valve quickly. A more complex product would use the analog option.

Mode Page Descriptions - Cutter Modes

Time Mode
Time mode is used to set a time interval between cuts. For example, a setting of 1.000 will ensure that one cut is made per second. Time can be set using thousandths of a second resolution.

Encoder Mode
Encoder mode is used to set product length using distance obtained from an encoder. In the combination Puller / Cutter an encoder is built into the puller motor. This encoder is used to provide length information to the cutter. Encoder mode is typically scaled in inches to three decimal places.

Encoder Sequence Mode
This is variation of Encoder mode that has up to four lengths available. Lengths occur in a sequence using lengths 1 through 4. The sequence then repeats, cutting each length once. Encoder Sequence can be used for production of simple kits. Options are for 2, 3 or 4 lengths. If a single length setting is required only the Encoder mode should be used.

Product Mode
This mode requires a sensor to trigger a cut. Options are available to cut using the rising, falling or both edges of the input. To prevent unwanted double cuts a Hold-Off preset is available that is used to ignore the sense input immediately after a cut. This helps to ignore the bounce that sometimes happens to the product when the blade hits it. Hold-Off is in seconds to 3 decimal places.

✎ **NOTE:** Flywheel mode can have multiple blades fitted. A circular or balanced arm style blade holder should be fitted for multiple blade positions.

Flywheel Mode
Flywheel mode is used typically to produce very short lengths. In this mode the blade spins continuously at a fixed RPM. The cut length is a result of RPM and line speed. The length area on the Main page uses a capture feature whenever the blade hits a certain angle, e.g. blade at cut position. The product length between two consecutive cut positions will be shown.

(Continued)

Configuring the Menu Selections (continued)

Follower Mode
Follower mode is similar to Flywheel mode where the blade spins continuously. However, in this mode the operator sets a length and the blade spins at the RPM needed to make that length. The cutter calculates a gear ratio based on length and puller speed. It then remains at that gear ratio. This mode is also known as Gear lock. The line speed should remain stable within ±5%. If the gear ratio required to make the product causes the blade to exceed the upper or lower RPM limits the cutter will come to a stop.

Cuff Mode
Cuff mode is used with corrugated style products that have cuff sections. It uses a sensor to detect the cuff on the upstream side of the cutter and the encoder to provide the cuts at an offset distance after detection. Cuffs and corrugations are produced in a mold block style puller. This machine is known as a Corrugator. Product exits the corrugator then goes into the combination Puller / Cutter. The cuff is detected and a cut is made at the required position within the cuff.

Cuff detection is usually made by a sensor built into the in-going cutter bushing. It looks at the cross section of product at the edge. The control must be programmed with details of the cuff such as if it is opening or breaking the light beam of the sensor. Also, the length must be sustained at a certain level before the section can be considered to be a cuff. The acknowledge length must be able to differentiate between cuff and corrugations.

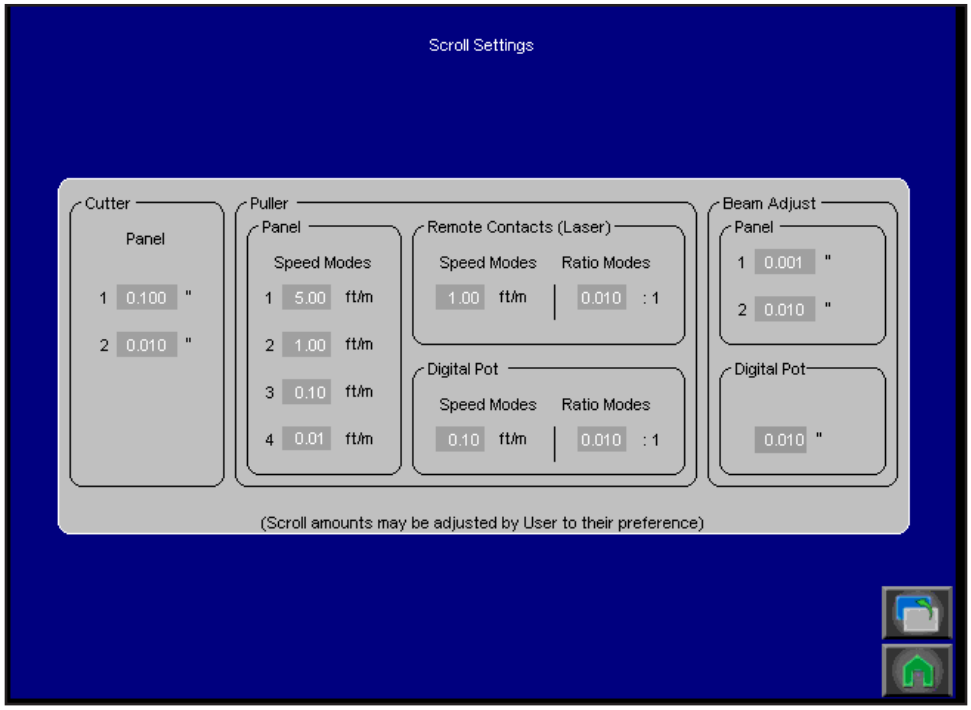
Once the cuff has been acknowledged up to three cuts may be made. The time from the blade's parked position to its cut position affects the first cut. A change in line speed will also affect this position. It is important to maintain a steady line speed. Cuts 2 and 3 are optional. Cut 2's distance is relative to Cut 1 and Cut 3's distance is relative to Cut 2. The maximum number of cuts per minute must not be exceeded in this exercise. Cuts that are attempted that are not allowed will simply be ignored.

Profile / Bubble / Taper Mode
This mode is used with the matching mode on the Puller. Cut distances are measured using the encoder but are synchronized to the profile sequence. Each time the puller starts a profile sequence it outputs a sync signal to the cutter and PLC's. The cutter uses the sync signal to load cut lengths into a queue. No cuts are made at this time. The physical distance (extruder die head to cutter) is used as the queue length. After this distance has passed the cut lengths are eventually removed from the queue. This is when the cuts are made.

Mode Page Descriptions - Basic
Basic bump/taper tubing is used for simple, single bumps per cut section of tubing.

Mode Page Descriptions - Advanced
Advanced bump/taper tubing is used for multiple, complex bumps per cut section of tubing.

Scroll Page Description



Scroll amounts are the user-preferred values that the operator chooses.

Cutter Scrolls - Panel

The (+) and (-) buttons on the Cutter control shown on the Main page can be used to add or subtract either one of these two values to the set length. These values are typically used to make fine correctional adjustments. The operator can switch between these two settings on the Main page.

Beam Adjust Scrolls - Panel

The (+) and (-) buttons on the Beam page can be used to add or subtract either one of these two values to adjust gap. These values are typically used to make fine correctional adjustments. The operator can switch between these two settings on the Main page.

Beam Adjust Scrolls - Digital Pot

A click made by rotating the digital potentiometer will add or subtract this distance to the belt gap. Clockwise increases the gap.

Puller Scrolls – Panel

The (+) and (-) buttons on the Puller control shown on the Main page can be used to add or subtract any of these four values to the speed set point. These values are typically set to a range that gives both coarse and fine control. An operator may use coarse settings to gradually bring the line up to speed during a start up. Finer selections would then be used when getting close to the desired line speed. The operator can switch through this list of settings on the Main page.

The values in this list can be set in any order. It is recommended that they be placed in a descending order for line set up where the operator wishes to begin with coarse settings and end with fine.

(Continued)

Scroll Page Description (continued)

Puller Scrolls – Remote Contacts

Two settings are available for remote contacts. One is used for speed modes such as Master mode. A contact closure will add or subtract this speed to the speed set point. The other scroll preset is used for ratio modes such as Analog or Follower. A contact closure will raise or lower the ratio by the value entered.

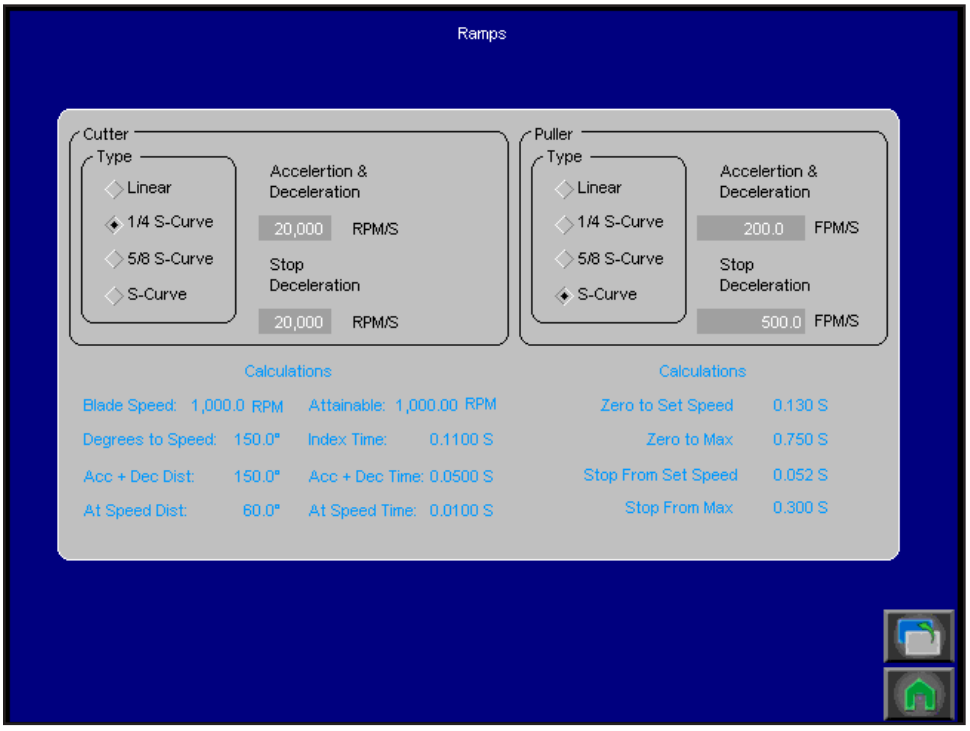
Puller Scrolls – Remote Digital Pot

Two settings are available for the remote digital pot. One is used for speed modes such as Master mode. A click made by rotating the digital potentiometer will add or subtract this speed to the speed set point. The other scroll preset is used for ratio modes such as Analog or Follower. Clicks of the digital potentiometer make ratio changes.

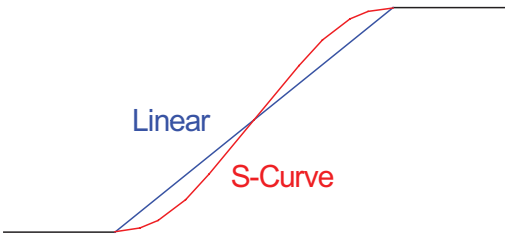
Encoders Page Description

The Encoder page is for factory personnel only. Information contained in this page will not be mentioned in this Operator Instruction Manual.

Ramps Page Description



NOTE: Similar options are provided for each portion of the machine. Ramps are acceleration and deceleration.



(Continued)

Ramps Page Description (continued)
Acceleration & Deceleration

Type
Four choices of ramp styles are available. S-Curves provide less wear on the mechanics by use of smoothing at the beginning and end of the ramp. The middle of the profile is linear but uses a steeper gradient to compensate for the smooth ends. No matter which option is chosen the time and distance for a speed change will be the same.

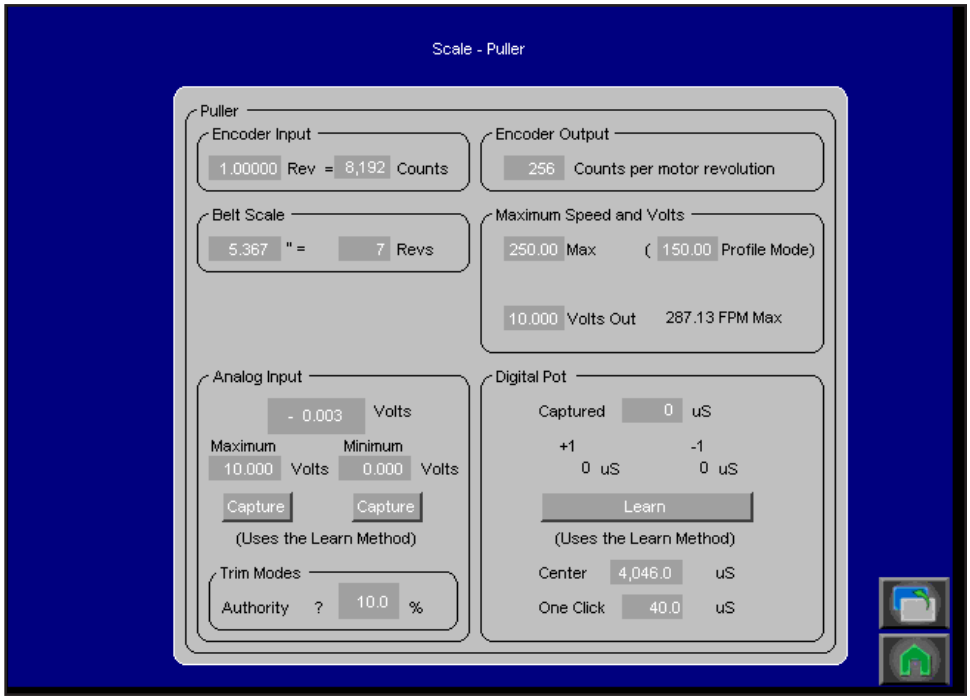
- Linear - rate of change is constant throughout the speed change
- 1/4 S-Curve - linear portion is 1.143 x average acceleration
- 5/8 S-Curve - linear portion is 1.455 x average acceleration
- S-Curve - linear portion is 2 x average acceleration

The acceleration and deceleration preset is the average rate of change that will be used for speed changes. For example, a puller set to 100 FPM will accelerate from zero in one second with a 100.0 FPM/S ramp.

Stop Deceleration
Stop deceleration is used to provide a quicker stop as a result of the “stop” button being pressed. The stop rate should be set larger than the normal ramp.

Calculations
Included at the lower portion of the page are sets of calculations. These have no effect on operation. They serve to provide information only.

Scale-Puller Page Description



This page is for scaling items relating to the Puller.
Puller Encoder Input is used to scale the input used by the Puller.

Scale-Puller Page Description (continued)

Cutter - Encoder Input

This section is used to scale the Encoder input used by the cutter. Two presets are used to set a distance and the amount of counts that make up that distance.

Puller - Encoder Input

This section is used to scale the Encoder input of the Lower belt for a Follower application. Two presets are used. In the example the amount of counts per motor revolution are used. The scaling shown in this example matches a similar style of puller. The motors on these pullers have 2,048 pulses per motor revolution on A and B channels. The system uses "quadrature x 4" meaning that the A and B channels are 90-degrees phase shifted. All four phase changes are counted for a total of 8,192 counts per motor revolution.

NOTE: For applications that do not have the Profile / Bubble / Taper mode any value may be set.

A 2,048-pulse quadrature encoder is built into the servomotor (8,192 counts using "quadrature x 4"). The drives have the motor Encoder as an output on the 44-pin 'D' connector. Scaling is provided to set the amount of pulses that are outputted per motor revolution for each channel. Any integer number between 1 and 2,048 inclusive may be set.

In this application the output on the 44-pin 'D' connector is used by a PLC (or multiple PLC's) for the Profile / Bubble / Taper mode. The PLC's can accept a maximum frequency of 20KHz. A motor at 5,000-RPM maximum with a 2,048 pulse per revolution encoder will output 170,667 Hz. This far exceeds the capability of the PLC. 256 pulses per revolution are used (Divide by 8).

Puller – Belt Scale

NOTE: Belt Scale is also affected by belt gap.

The relationship of belt distance per motor revolutions may be set here. A Puller with a 16:1 gearbox moves the belt 6.672" per 10 motor revolutions. The processor calculates the maximum speed that the Puller can make based on the scale that is entered and details it has for the motor. The result is shown as absolute FPM Max in the Maximum Speed and Volts section.

Puller – Maximum Speed and Volts

This section is used to set maximum speed. The Puller can be limited to any speed up to the absolute maximum shown in FPM Max. A separate maximum is available for Profile / Bubble / Taper mode. Maximum for this mode is typically less than for other modes.

An analog output is available that can be used to remotely monitor speed. In the example 250 FPM will generate 10 volts DC.

Analog Input

A balanced analog input is provided at the 44-pin 'D' connector of the drive. A voltage may be applied here up to ±10 volts. The value is shown in large characters on the Scale page. This readout acts as a voltmeter. If the maximum and minimum voltages are known already they may be entered in the maximum and minimum presets in this section.

A learn method is also available that allows the maximum and minimum voltages to be entered by the press of a "Capture" button. To learn the maximum voltage set the input voltage to the desired maximum voltage then press the "Capture" button that is beneath the maximum preset. Use the procedure again with a different voltage to learn minimum.

In Analog mode it is typical to have the speed range controlled by zero to 10 volts.

(Continued)

Scale-Puller Page Description (continued)

Puller – Encoder Output

In Trim modes it is typical to set maximum to 10 volts and minimum to 5 volts. 5 volts would then be the middle point of the scale where no speed correction is made. With this scaling 10 volts would provide the maximum speed increase and 0 volts would provide the maximum speed decrease, 5 volts (center) would do nothing.

Trim Modes - Authority

The plus and minus analog corrections should be scaled to provide minor speed corrections. It is typical to have 0 to 10 volts provide ± 5% speed change

Remote Digital Potentiometer

The remote digital potentiometer uses a 4-millisecond wide carrier pulse. The pulse width is modified by clicks of the potentiometer. Positive rotation adds 40 microseconds per click. Negative rotation subtracts 40 microseconds per click.

Calibration can be made by using the Learn feature. For calibration, it is necessary to learn the time for one click clockwise and one click counterclockwise. The “Learn” button will place the result in the proper box. Center and One Click are results of the learn feature but will also accept keyed in values.

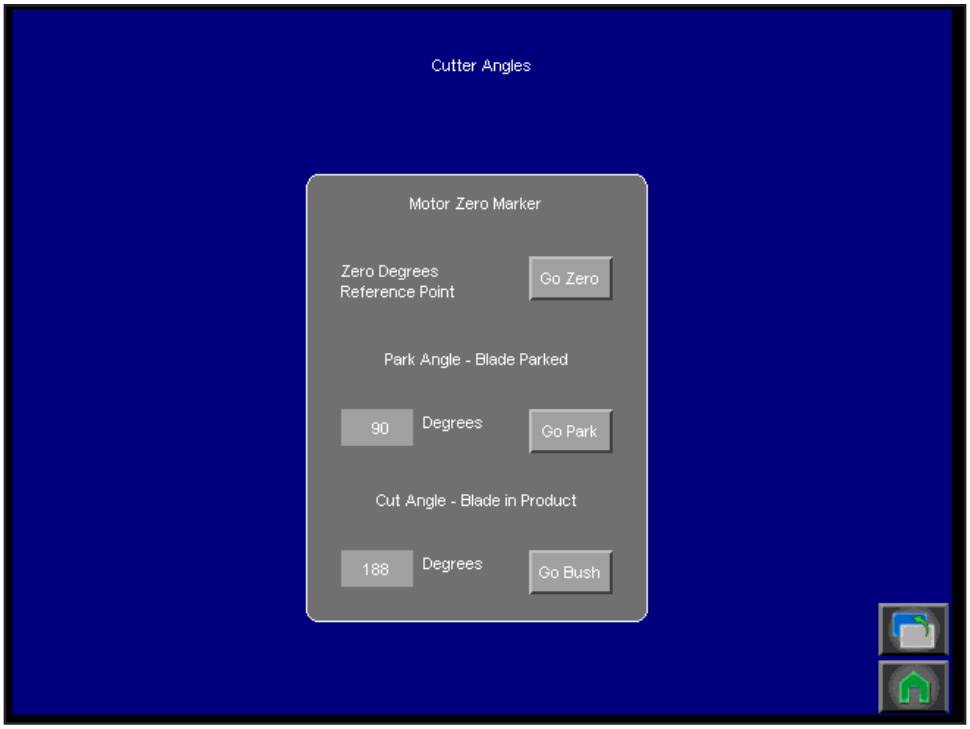
Scale Units

This section changes the measurement identifiers and speed / distance ratios for all pages. It DOES NOT switch the scaling measurements between English and Metric. The drives use the scale value and ratio. It is important these be set correct for the machine.

When set to English - dimensions are in inches and speeds are in FPM. The relationship between feet and inches is 12 (1 foot = 12 inches).

When set to Metric – dimensions are in centimeters and speeds are in MPM. The relationship between centimeters and meters is 100 (1 meter = 100 centimeters). When changing between English or Metric make sure the scales are readjusted to suit.

Angles Page Description



Positional servomotors need a reference point. This position is known as Home or Zero. On a Cutter the Home reference must occur at one point within the 360-degree turn of the blade arm.

- Reducer - If the motor has a gear reducer, a proximity sensor is used to detect a target (usually a bolt) that is mounted on the blade arm.
- No Reducer - The internal zero marker that is built into the motor is used.

Once the zero angle is known the next tasks are to decide where the blade should park and which angle puts the blade into the product.

Park Angle

Park Angle is the place to park the blade. It is typical to park the blade 60 to 180 degrees before the cut position. Acceleration can be checked on the calculation section of the Ramps page to ensure the blade can reach the speed in the angle provided.

Cut Angle

Cut Angle is the position where the blade is in the cutter bushing. The center of the bushing or blade just entering the bushing can be used.

This position is used for captures as used in Follower mode and for Repeatability testing.

“Go Zero”, “Go Park” and “Go Bush” buttons are available to force the blade to each position so that the angles may be checked. The puller must be running as this provides the “Cutter Drive Enable” but the cutter must be stopped. With this configuration the buttons will function.

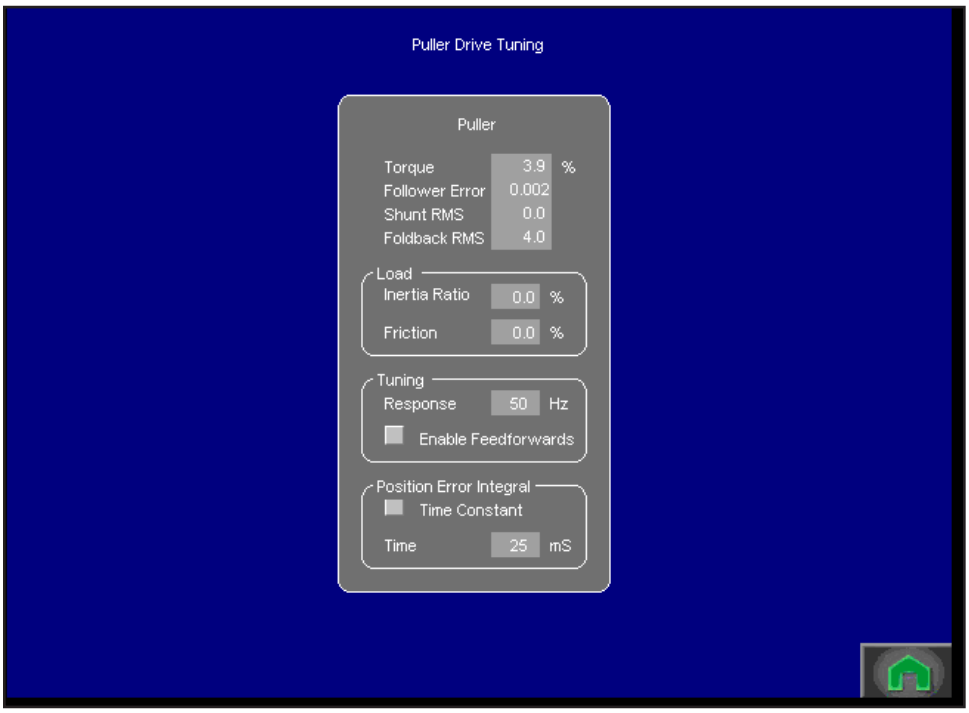
Configuring the Menu Selections

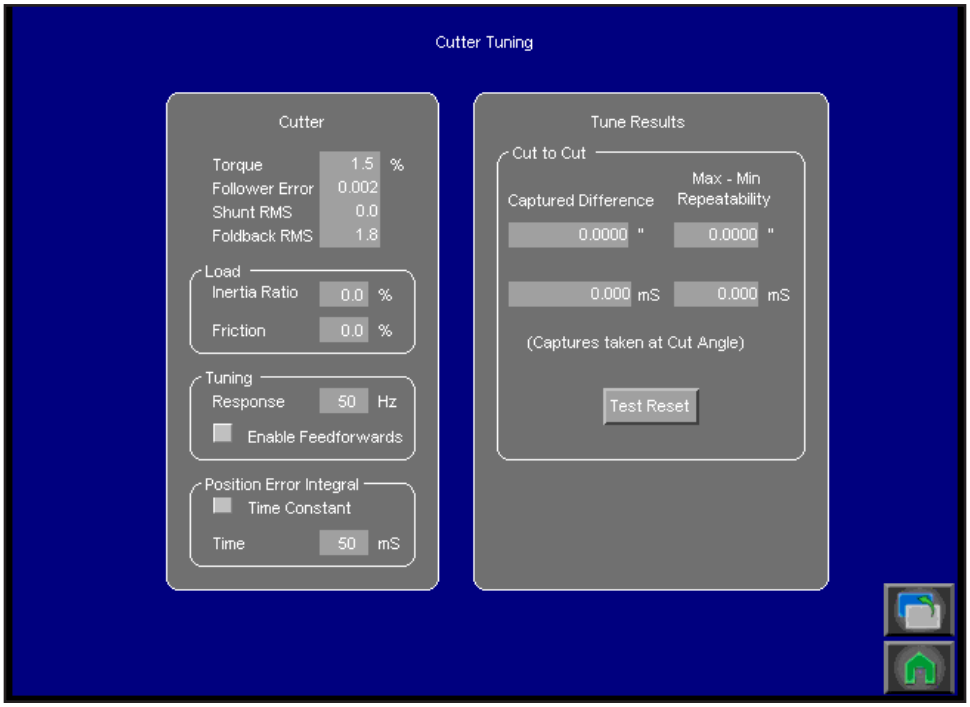
The Menu Selections are labeled:

- Puller Tune
- Cutter Tune
- Quality
- Puller (for Factory use only)
- Cutter (for Factory use only)

! **IMPORTANT:** Only personnel with maintenance rights can access these pages.

Puller Tune and Cutter Tune Pages

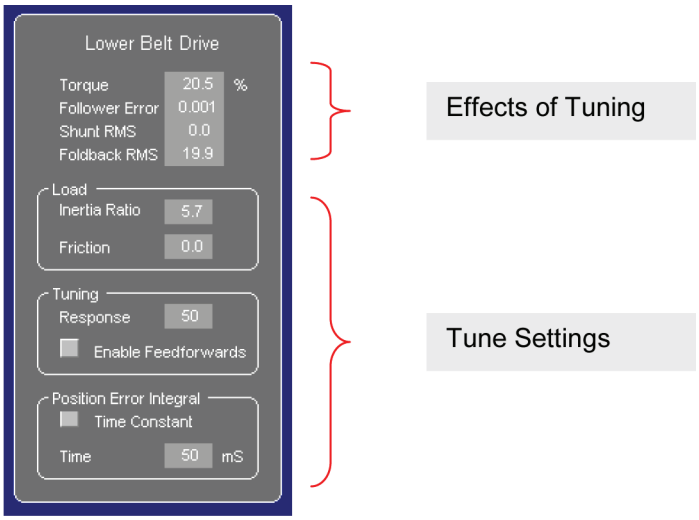




(Continued)

Configuring the Menu Selections (continued)

Each drive has a set of presets with similar functions. A description for any parameter in this section applies to all drives. Please refer to Control Techniques documentation for additional information.



Common Tuning Controls

There are four values and two check boxes that are used to tune each drive. These values are Inertia Ratio, Friction, Response and Time Constant. Check boxes to enable Feedforwards and Time Constant are provided.

The four values in the top section are Torque, Follower Error, Shunt and Foldback. These values are read-only and help to show the effects of tuning.

If a drive is too tightly tuned it will be more accurate but may consume more power. Likewise, an under-tuned drive will use less power but will not be as accurate.

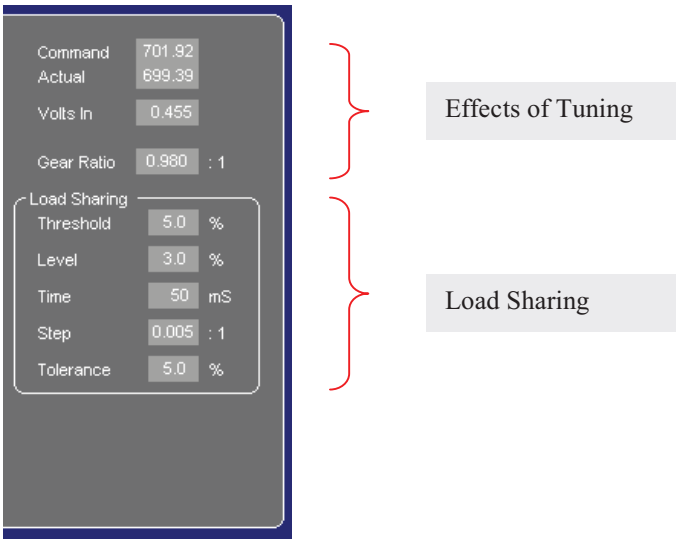
Upper Belt – Additional Controls

The control for the upper belt includes additional controls that are there to help balance the load between the two belts. Since motors, gearboxes and belts are similar it is expected that gear ratio should always be 1.000:1. However, there are always mechanical differences. If these are not compensated for one drive will end up pulling the entire load and the other will act as a brake. The system here attempts to keep a 1:1 gear ratio but checks the torque for each puller drive and modifies gear ratio in order to keep the torque similar.

Adjustments that provide load sharing are at the lower section of the control display. The read-only values are at the top section of the control.

(Continued)

Configuring the Menu Selections (continued)



Upper Drive - Torque share parameters

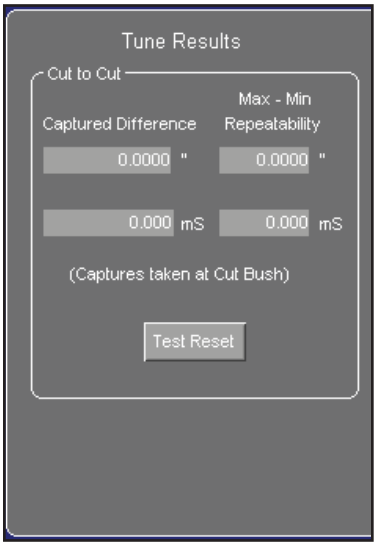
Threshold - Each drive must exceed the set value before the program begins to make adjustments.

Level - Once both drives exceed the Threshold the Level of difference is checked next. If the difference is great enough the Top Belt must either increase or decrease ratio.

Time - Updates will occur at this time interval.

Step - This setting controls the change that will be made to the Gear Ratio.

Tolerance - This is the maximum variation that is allowed. Gear ratio should barely vary when set correctly.



Command & Actual - These values show the commanded and actual RPM's for the belt drive motor.

Volts In - The upper belt drive obtains the torque from the lower belt drive as an analog value. This is shown as Volts in.

Gear Ratio - Aim to keep Gear Ratio at 1.000:1. This should be allowed to change. It is recommended this stay within a maximum variance of 1%.

Tuning the Cutter – Additional Controls
The right-hand side of the Cutter Tune page is used to test repeatability. The tester is permanently enabled. "Test Reset" may be pressed at any time to begin a fresh test. For example, after changing any tune value the test may be reset to begin a fresh test. Repeatability is shown in length and time formats. Length is the most important. However, if time is fluctuating excessively this could indicate poor puller or cutter repeatability.

Cutter Drive - Tune Results / Repeatability

(Continued)

Configuring the Menu Selections (continued)

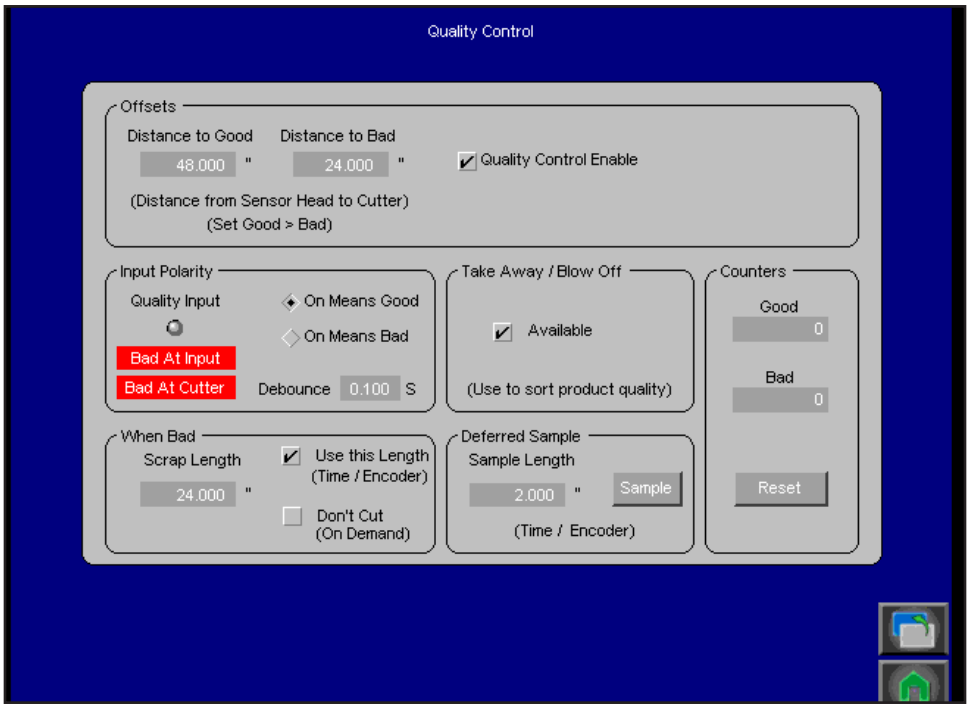
Captured Difference

Captured Difference shows the length that the drive captures each time the blade enters the cutter bushing. It should match the set length very closely. However, this test cannot factor in slippage or shrinkage of the product.

Max – Min Repeatability

This value is the difference between the maximum and minimum values that were captured by Captured Differences.

Quality Page Description



Quality is used with a product measurement control. A laser and/or ultrasonic gauge is mounted upstream of the Cutter and used to monitor product. This may check size, wall thickness and defects. While product is Good it sets an output to a state that means good. The output will change to Bad for out of tolerance product.

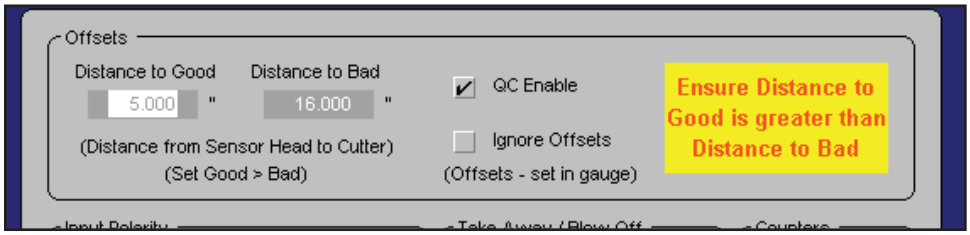
Offsets

Some gauges delay their good / bad output by using programmed offsets. The Cutter also has the ability to delay this function. Two values can be entered. These are the distance from gauge to cutter plus and minus an overlap. “Distance to Good” is the distance between gauge and cutter plus a distance more. This ensures an extra distance is rejected. “Distance to Bad” should be set less than the distance between gauge and cutter to ensure product is treated as bad sooner.

When offsets in the cutter are used the “Distance to Good” should be set greater than the “Distance to Bad”. If values are set incorrect a warning is shown.

(Continued)

Quality Page Description (continued)



QC Enable – This should be checked when Quality Control is being used. Uncheck if not required.

Ignore Offsets – This should be checked when the remote gauge sets the offsets. The Offsets presets on this page are then ignored.

Input Polarity

The meaning of an open or closed contact from the gauge may be defined in this section. An open contact should mean Bad if possible. This would provide a failsafe condition in the event of power at the gauge failing, or a relay failing or a cable being unplugged.

An active input can be set to mean Good or Bad. This section includes an indicator to show the state of the input with the meaning of this state shown underneath. The message will be “Good At Input” or “Bad At Input”. When Quality Control is enabled the offsets in the cutter will affect the second message “Good At Cutter” or “Bad At Cutter”. Both messages are color-coded. They have a green background when good and a red background when bad.

Debounce – This is a filter that can be used with the Good/Bad input. Set this to zero when the source is transistorized. Use a filter value if the source is a volt-free relay contact. Relay contacts bounce when they turn on and off and if not filtered correctly can confuse the electronics that captures the position. A typical value for a relay contact filter is 0.050 seconds.

When Bad

This section has a Scrap Length that may be used for situations when the product is bad. This setting is available for Time and Encoder modes. The scrap length should be set twice as long as good lengths to help differentiate them from one another.

Use this Length – Check this box when the scrap length is required. If unchecked the length cut is the length that is set on the Main page. It will cut at the same length whether good or bad.

Don’t Cut – Check this box when Bad must perform no cuts. This option is available for all On-Demand modes. The first cut after product becomes good is not counted.

Take Away / Blow Off

This section contains one check box. Check this box when the Combination Puller / Cutter is being used with a Take Away / Blow Off Conveyor. When this box is checked the Total and Batch counters increase when good pieces are blown off the conveyor. If unchecked, pieces are counted as they are cut. The Blow Off section on the Main page has three options. There are Blow always when Good, Blow always when Bad and Blow for a time options. The quality at the cutter affects each of these options.

(Continued)

Quality Page Description (continued)

Deferred Sample

This feature is for the Time and Encoder modes only. It is used to obtain a fixed sample length for quality assurance purposes. The button is used to request a sample. This sample length will be inserted in between the normal cut-to-length sequence at the next opportunity. For example if lengths are set to 12” and sample is set to 2” there will be one 2” length produced after pressing the “Sample” button. This will be inserted after the next 12” cut is made, i.e. pieces either side of the sample will be at normal length.

The sample length can only be made if the blade has time to do it.

Counters

Good and Bad counters are provided. The reset in this section resets both counts together. These counters are affected by the quality state of the product at the cutter.

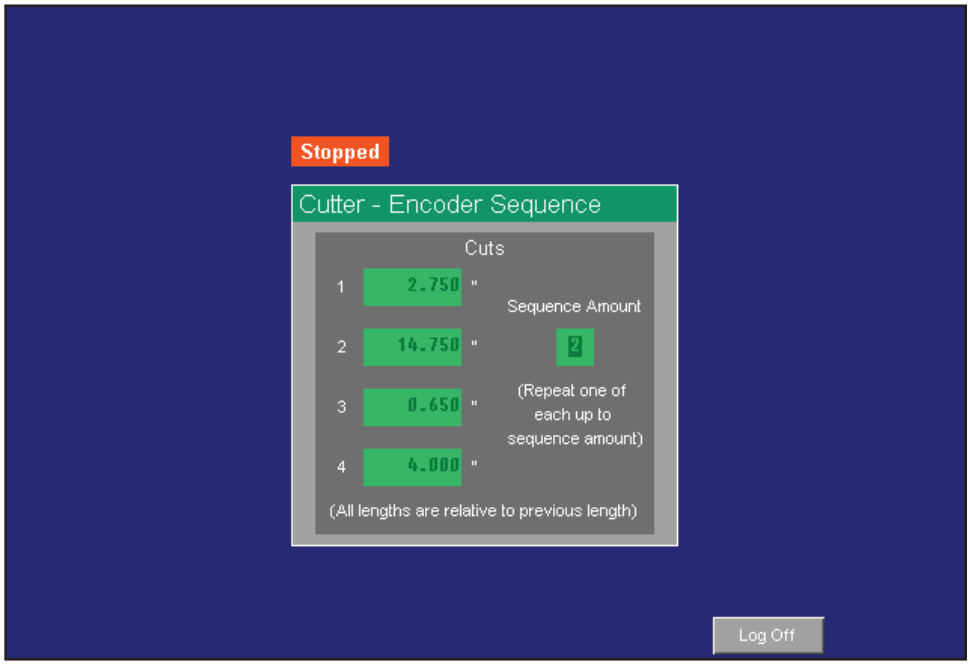
Factory Pages Description

These pages are for factory personnel only. Information contained in these pages will not be mentioned in this manual.

About Pages Description

Press the “About” tab in order to show contact details for The Conair Group. The About page appears as a pop-up in the center of the screen. A version number is shown. Please provide version, model and serial numbers when discussing issues with Conair service. Press the “Exit” button to remove this pop-up.

Encoder Sequence Page Description

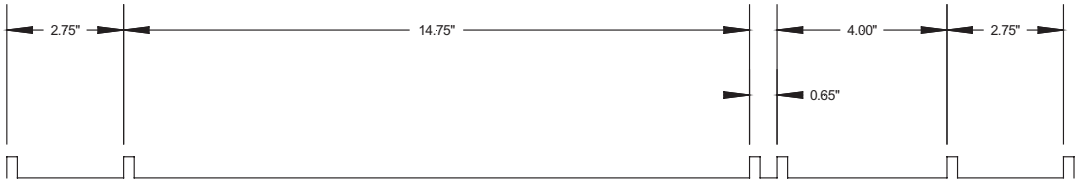


Encoder Sequence mode is a variation of Encoder mode that has up to four lengths. Please refer to Cutter Modes section for mode description.

A “Sequence Settings” button replaces the single Length preset that appears on the Main page when this mode is selected.

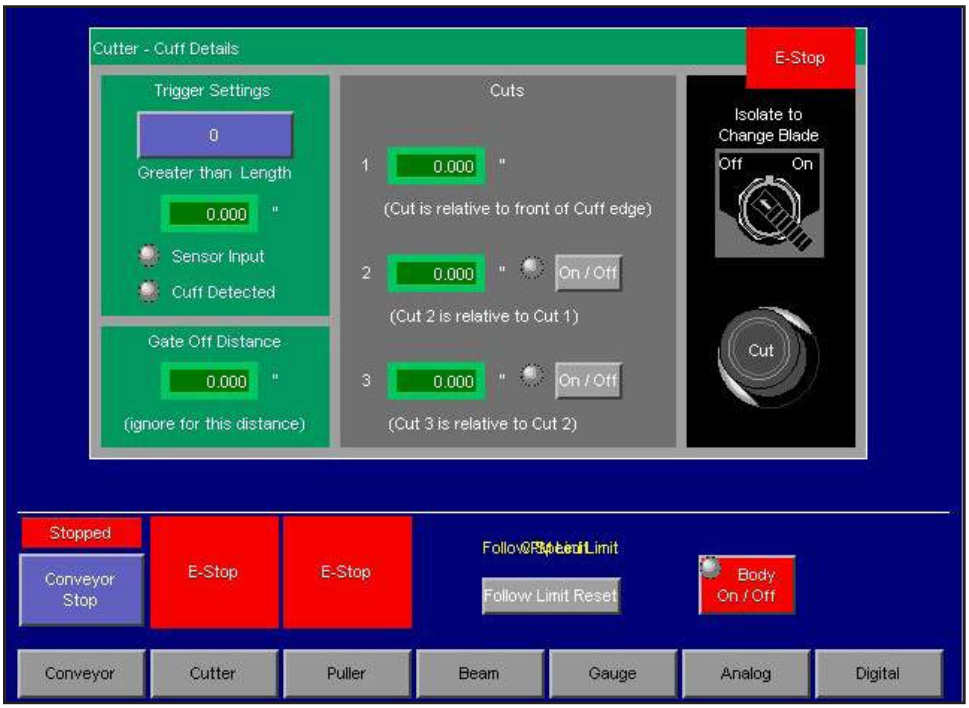
The four lengths and Sequence amount are shown on a secondary page. In the example Sequence Amount is set to 2 which means Lengths 1 and 2 will be produced alternatively. Lengths 3 and 4 in this example will not be made.

Encoder Sequence is available for kit applications.



Encoder Sequence Sample with Sequence Amount set to 4

Cuff Page Description



Cuff is a special mode that is used for corrugated products that have a cuff section. This mode can also be used to synchronize cuts to print marks that are printed on the product upstream of the cutter. The sensor detects the ink mark (image or text). Refer to Cutter Modes section for mode description.

A “Cuff Settings” button replaces the single Length preset that appears on the Main page when this mode is selected.

Trigger Settings

This section is available to define the Cuff shape. A length at a sustained logic level must be met in order for the section to be considered a Cuff. Choices for level are to “Look for Sensor Off” or “Look for Sensor On”. The cutter will be able to differentiate between a cuff and a corrugation by their lengths.

Two indicators are included in this section. One shows the state of the sensor input, the other provides an acknowledgement that a Cuff was detected (turns on when Cuff is acknowledged and turns off when Gate Off Distance ends).

Gate Off Distance

This preset is used to disable the sensor once a Cuff has been detected. There is no need for the system to remain in a search state while a cuff is being processed. The value set here should be less than the actual distance between cuffs to ensure the sensor is active and looking for the next cuff before it arrives. Set a value between 80 to 90% of the actual length between cuffs.

The Gate Off period provides an additional benefit – since the sensor is off for 80 to 90% of the time there is less chance to interpret a product deformity or false sensor signal as a cuff.

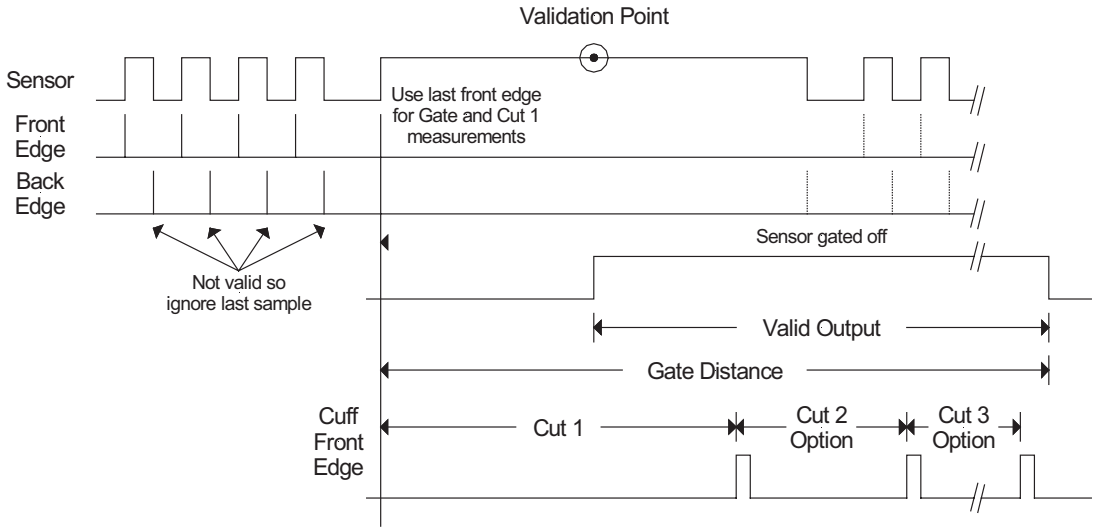
(Continued)

Cuff Page Description (continued)

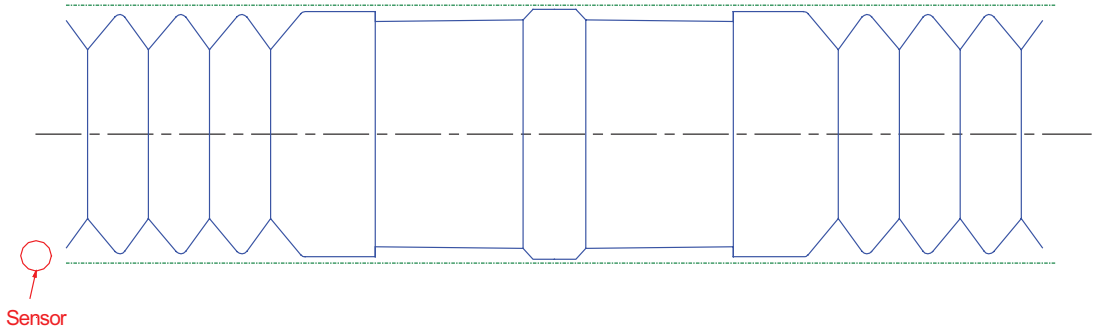
Cuts

Up to three cuts may be made from one Cuff. Cut 1 cannot be disabled. Cuts 2 and 3 are optional and are generally used for cutting out scrap sections. The Total and Batch counters count the first cut only. Use the counters as Cuff counters instead of cut counters.

Example for a High Cuff
All dimensions are in distance units

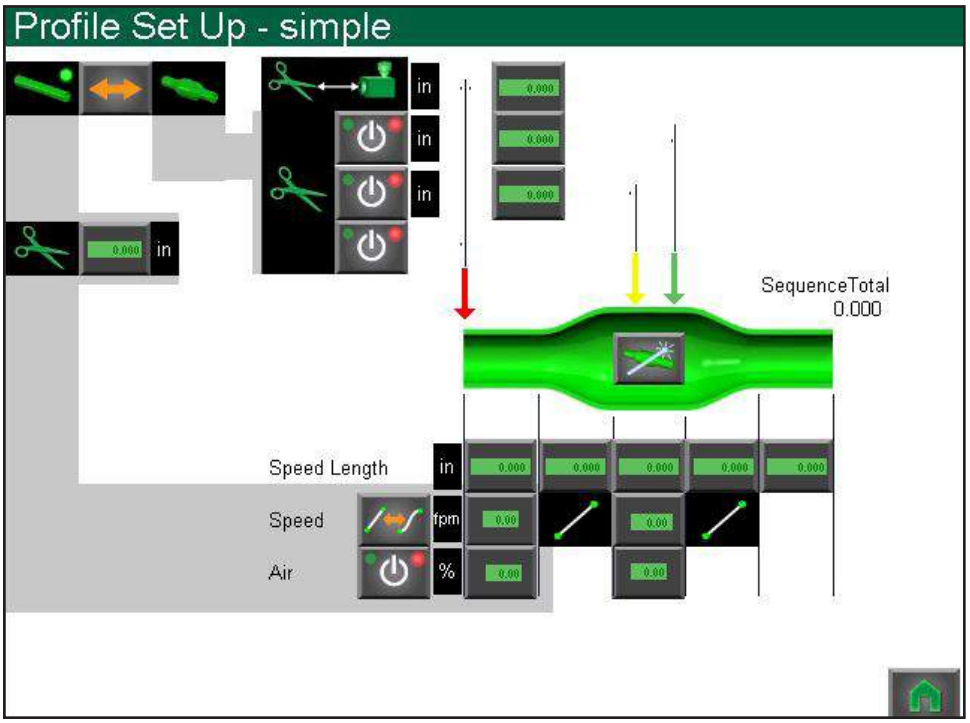


Example Timing Waveforms



Cuff / Corrugation Sample passing through a Cutter bushing

Profile / Bubble / Taper Mode - Profile Page Description



Profile / Bubble / Taper is a special mode that uses a velocity profile to create a product with a varying diameter. Please refer to the Puller and Cutter Modes section for mode description.

A “Profile Settings” button replaces the single Length preset that appears on the Main page when this mode is selected.

Puller

The Puller section has similar options that are on the Main page. The footage counter, remote scroll and belt gap are discussed in the Main page section.

The velocity set here is used to vary the line speed while “Body On/Off” is off. The value also sets the maximum (tip) velocity when making Profile / Bubble / Taper products.

If the “Body On/Off” button is turned off the puller runs at a fixed speed using the velocity value set here. This value may be adjusted using the keyboard or scroll methods and the remotes can change the speed.

If the “Body On/Off” button is turned on this section becomes locked out. The value shown for speed is the actual speed only (cannot be altered). The scroll buttons disappear and a (Read only) message appears.

Sequence (Total Length) – This defines the entire length of the Profile / Bubble / Taper product including any portions that are to be scrapped.

Cut Enable On/Off – This is used with Profile / Bubble / Taper products when “Body On/Off” button is turned on. When enabled a cut is made at the beginning of the sequence. This cut is the cut that would normally occur in the center of the tip section.

(Continued)

Profile / Bubble / Taper Mode - Profile Page Description (continued)

Distance to Bubble – This value is the distance from the Sequence cut to the start of the bubble. The speed at both ends of this length remains at the tip velocity.

Cutter

Location Offset is available to set the physical distance between extruder head and cutter. This preset is important to ensure that cuts synchronize with the bubbles in the product.

Additional Cuts 1 and 2

These positions provide two extra cuts. There are three possible cuts total. (The Sequence cut is also available. This occurs at the start of the each sequence when enabled. The relative position for this is zero, so does not have a preset.) All three cuts have individual "On/Off" buttons so that each cut is optional. All cut "On/Off" buttons are color-coded to match the cut marks that appear on the Velocity graph on the Velocity page. This helps the operator ensure the right preset is adjusted when a cut is incorrectly placed.

Body Off Cut

This is the length used to cut the product while "Body On/Off" is off. This value is ignored when "Body On/Off" is on. The Location Offset is ignored when this cut length is being used.

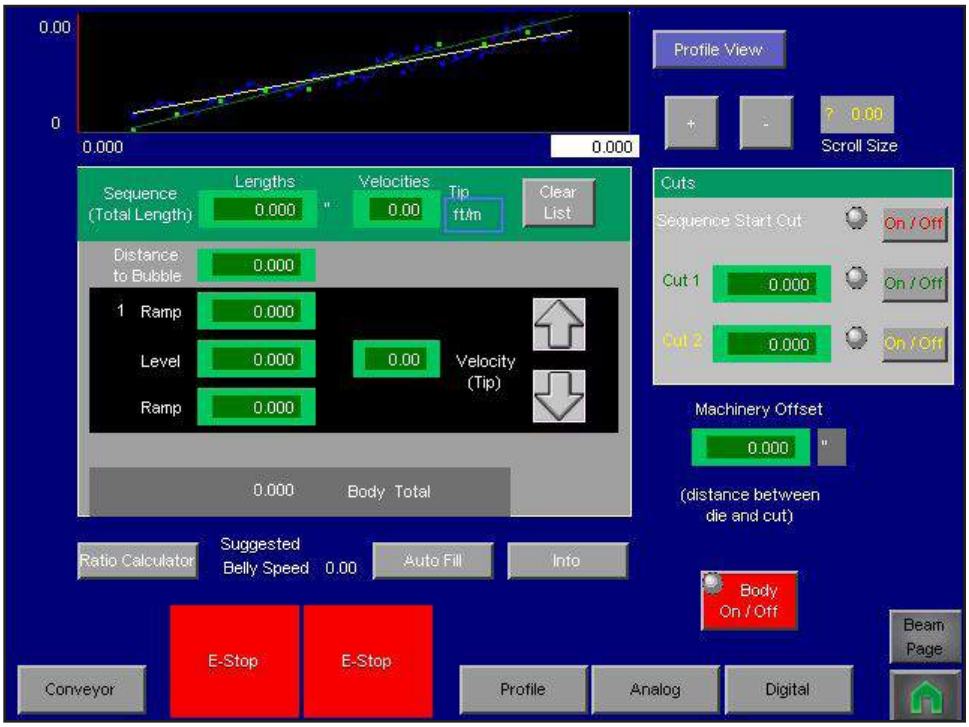
Buttons

The following two buttons are discussed here only.

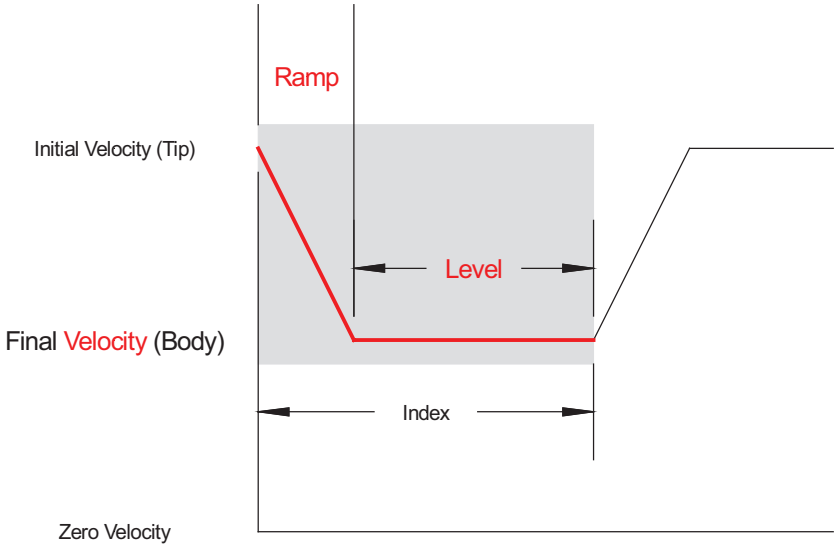
Body On/Off – This button is on each page in this section. They are in the same place on every page – the lower right-hand corner. It is used to enable or disable the Profile / Bubble / Taper mode. When off the puller runs at a fixed speed – set in the Puller velocity section on this page and cuts at the length set in the "Body Off Cut" section. This configuration is exactly the same as Puller = Master mode and Cutter = Encoder mode. Body is forced to off at each start-up. This button is also available on other pages in this section.

Log Off – This button is available on the Menu Page and is used to log off the current user. If no one is logged on then that option becomes log on.

Profile / Bubble / Taper Mode - Velocity Page Description



The velocity page has a scrollable list of presets for setting a velocity profile. Up and down arrow buttons are used to step through the list. There are three values required for every index section. These are labeled Ramp, Level and Velocity.



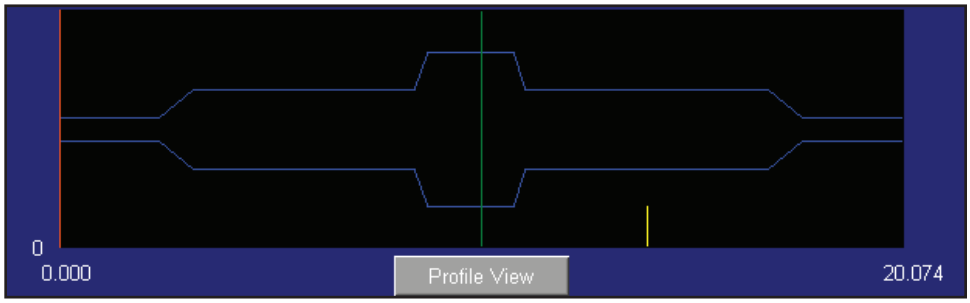
An Index consists of a Final Velocity and Ramp and Level Lengths

Every index has two ramps (a front edge ramp and a back edge ramp). The back edge ramp is also the front edge ramp for the index that follows, i.e. indexes 1 and 2 share a ramp (this is the transition between the two velocities).

Above the list is a scaled graph. The view can be a simulation of the profile or a velocity graph. The two choices are selected by use of the “Profile View” / “Velocity View” button.

(Continued)

Profile / Bubble / Taper Mode - Velocity Page Description (continued)



Profile View

The graphs include the cut positions as vertical lines going through the product. These are color coded to match the colors on the Cut On/Off buttons on the Profile page. When a cut is enabled the line is drawn from the top of the graph to the bottom. When a cut is disabled the line is truncated. In the example above two cuts are enabled as shown by the red and green lines. The third cut shown by the truncated yellow line is off.

Sequence (Total Length) - This is a copy of the same preset that is on the Profile page.

Tip Velocity - This is a copy of the same preset that is on the Profile page. When tip is adjusted all occurrences of that value in the list are updated.

Ramp Length - This is the length used for the speed transition (velocity change) for this index.

Level Length - This is the length that will be maintained at the set velocity for this index.

Velocity - This is the target velocity for the index to be achieved at the end of the front edge ramp. Target velocities may be higher or lower than the previous velocity. The front edge ramp can be used for increasing (ramp up) or decreasing (ramp down). If the velocity is the same as the tip velocity on the top line a (tip) message appears. If the velocity is less than tip the label will be (body).

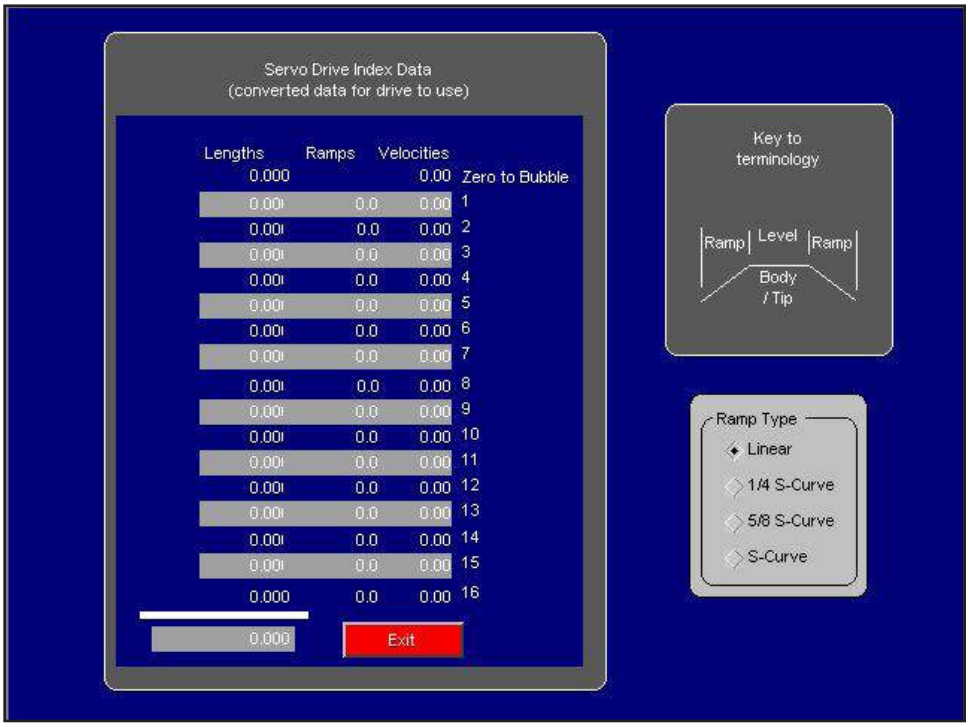
Bubble Total - A running total of the bubble length is shown here. When creating a profile the bubble begins immediately after the “Distance to Bubble” distance.

Clear List - This button resets all lengths to zero except Sequence length. In addition, all velocities are set to the Tip velocity.

(Continued)

Profile / Bubble / Taper Mode - Velocity Page Description (continued)

Ramp Type

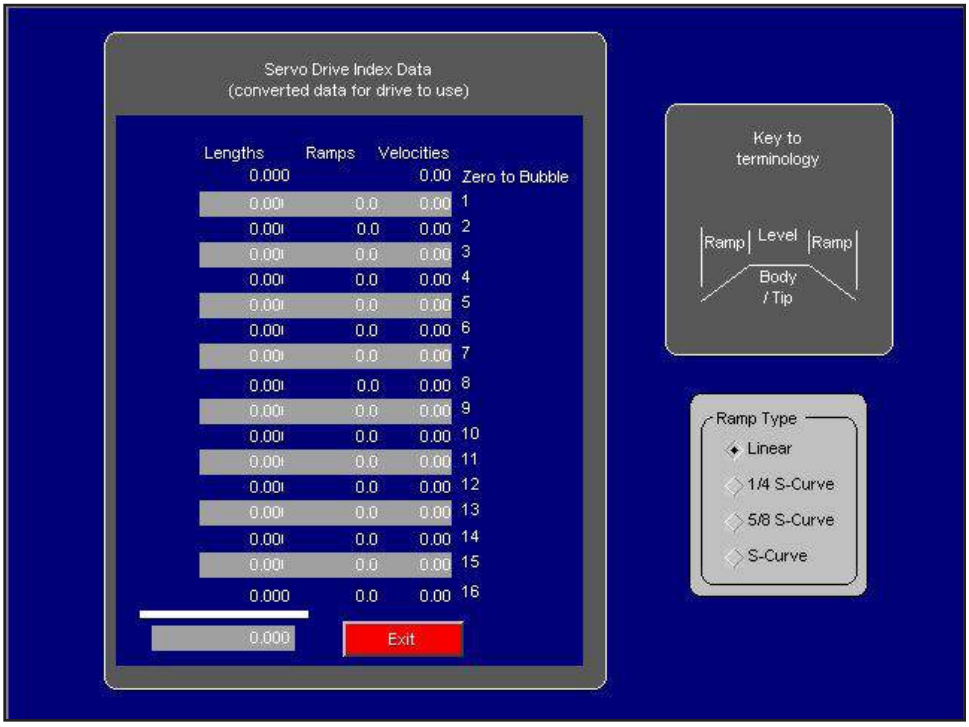


The “Ramp Type” button is used to show the list of ramp types on a pop-up page. The popup contains a copy of the ramp types that are on the Set Up 1 – Ramps page. Please refer to the Set Up 1 – Ramps page section for a description. An S-Curve type may be used to provide rounding of the profile and so reduce the amount of points needed to create the product. Ramp Types may be changed while the machine is running so that the ramp effects may be tested.

(Continued)

Profile / Bubble / Taper Mode - Velocity Page Description (continued)

Key



The “Key” button provides a pop-up page that helps describe the aspects of the index.

Drive Data

The drive receives the information that the operator enters but in a different way. A pop-up is shown after pressing the “Check Drive Data” button. This shows a list of the values that are downloaded to the drive. The operator can ignore data on this page. It is mainly used for diagnostics purposes.

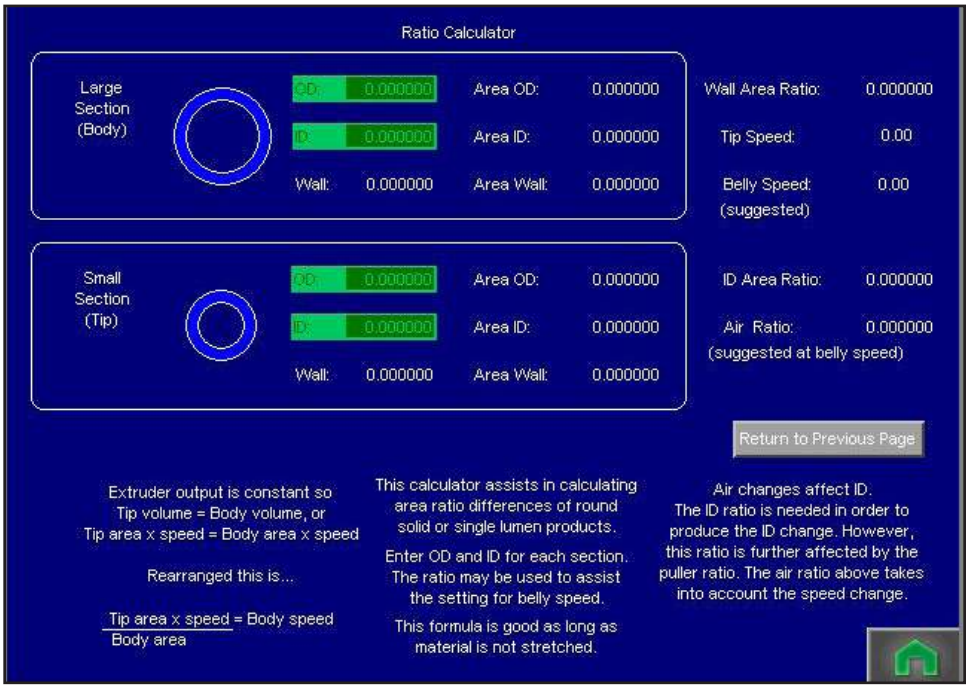
Drive data is formulated as follows:
Velocity = Final Velocity
Length = Ramp Length + Level Length

$$\text{Ramp} = \text{absolute}\left(\frac{(\text{Final Velocity}-\text{Initial Velocity})\text{x}(\text{Final Velocity}+\text{Initial Velocity})}{2\text{x Index Length}}\right)$$

(Continued)

Profile / Bubble / Taper Mode - Velocity Page Description (continued)

Ratio Calculator



The extruder emits a constant volume so the ratio of speeds to make a product will be the inverse ratio of the wall area. This calculator assists in calculating the area ratio of round solid or single lumen products. Enter the OD and ID for each section. Four dimensions are required.

The ratio is used with the tip speed to find belly speed. In the example above diameters of the product were entered and an area ratio of approximately 2.6:1 was calculated. If the tip speed is 30 FPM, then the belly speed needs to be 11.49 FPM.

The calculated value does not factor stretch of the material that occurs when air is used. Use the calculated result to get close to the speed required and vary it individually after as required.

Autofill

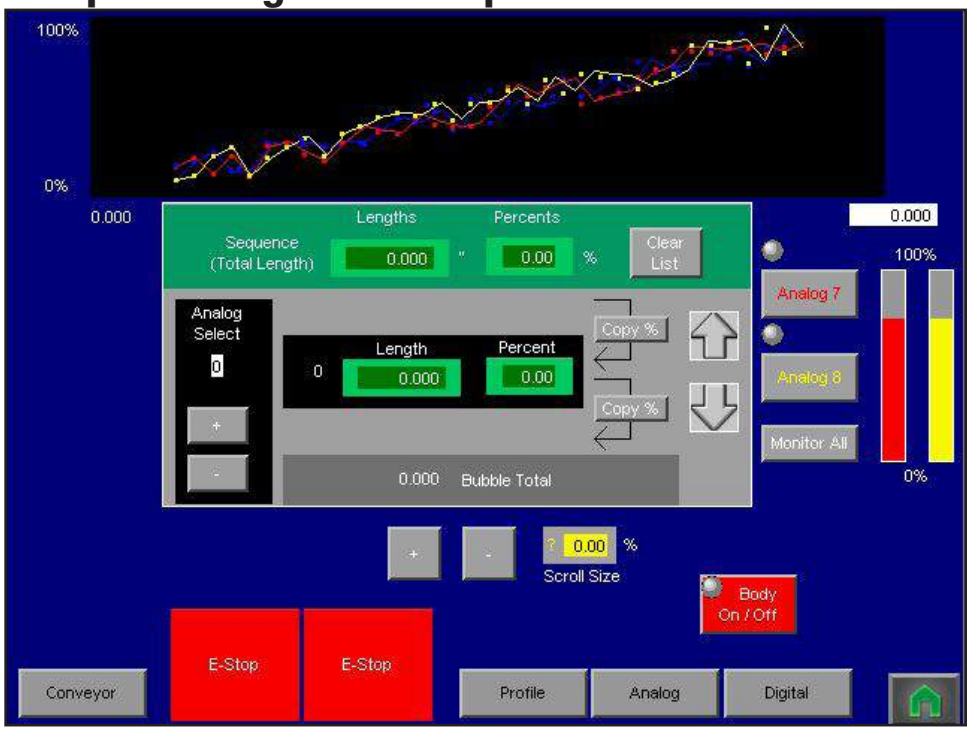
This button is used to automatically fill the result of the ratio calculator in to the velocity box to the left on the Velocity page.

Zoom

All graphs have a length zoom. Press the graph to zoom in, press again to zoom out. If the point pressed is before the start of the bubble the zoomed image fills from zero (start of the sequence on the left) to the distance of the pressed position (on the right). If the point pressed is after the start of the bubble the zoomed image has the start of the bubble on the left and the position representing the pressed position on the right.

Setting the dimensions on the horizontal axis will also change the zoom.

Profile / Bubble / Taper Mode - Analog Outputs Page Description



This page is for setting up analog profiles that occur in synchronization with the velocity profile. The velocity waveform appears in the graph area as a blue trace to aid the placement and sizing of the analog waveforms.

Analog is an optional feature used with Profile / Bubble / Taper mode. In some cases bubbles are created using digital air valves (on or off). When analog is provided a PLC will be included for every two channels of analog. Options are none or 2, 4, 6 or 8 channels of analog.

Two analog outputs are available in the sample. Analog 1 is drawn using a red trace and analog 2 has a yellow trace. A list of lengths and percents are provided for each channel. There are 32 points. Each length and percent pairing is used to define a point on the graph in a typical x, y fashion. Lengths define the distance from the previous point. Percents relate to the level of output for each point. Zero to 100% is used. In most cases this will correspond to a 0-10 volt DC output (0 to 5 volt DC or 4 to 20 mA are other output choices).

Sequence Length (Total Length)

This is a copy of the same preset that is shown on previous pages.

Percents (In Top Line)

This sets a base percent / voltage for situations where the channel is turned off or for when the puller is stopped. This is also the minimum for the channel.

Clear All

This button copies the Percent value on the top line to all of the percents in the list. In addition it sets all lengths in the list to zero. Sequence length is not affected.

(Continued)

Profile / Bubble / Taper Mode - Analog Outputs Page Description (continued)

Bar Graphs

These reflect the state of the analog outputs. The bar will ebb and flow while the Puller is running.

Analog Select

In the sample Analog channel 1 is selected. The list of points is filled with data for this channel. If a different channel is chosen the list contents change and Analog Select shows which channel is selected. Channels may be selected by entering the channel number in the box provided or by using the (+) and (-) buttons. For two lumen systems Analog Select can be 1 or 2 only. Eight channels is maximum but requires additional hardware.

Copy % to Next

Two buttons have this feature. They may be used to copy the percent value in the box above to the next box below.

Zoom

Zoom is available when working with the graph. Please refer to Velocity section for a description of zoom.

Profile / Bubble / Taper Mode - Digital Outputs Page Description

Digital Outputs are available in groups of four. 4, 8, 12 and 16 digital outputs are possible. A PLC or PLC's provide the digital outputs.

Four digital outputs are shown in the sample (1 to 4). A digital output can be on or off. These are typically used to operate pneumatic valves. The digital graph is shown below the profile graph. The waveform shows what will happen to the outputs when the Puller runs.

On At

Each digital output has an On point. This is the distance from the beginning of the sequence to when the output turns on. In the sample Output 1 will turn on at 1" from the start of the sequence.

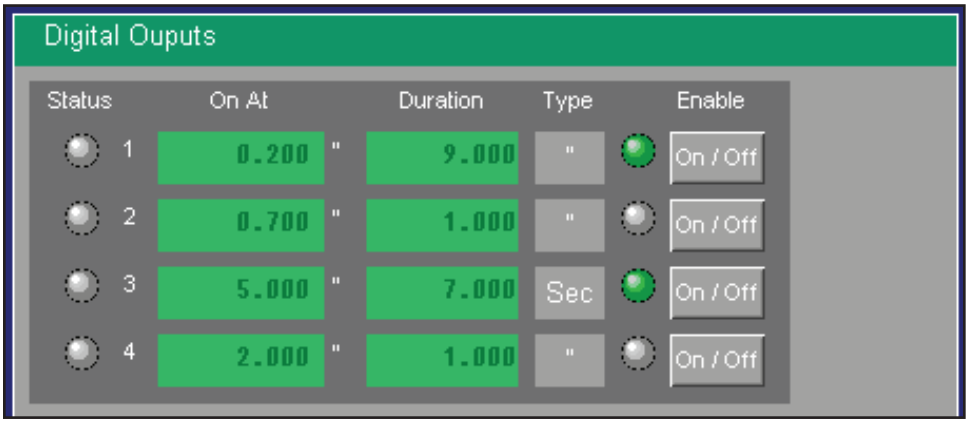
Duration

Each digital output has a duration. Duration is how long the output remains on. Distance or time can be used. In the sample output 1 has a duration of 2" which means it will turn off at 3" from the start of the sequence.

The graphical image shows duration as a positional off (distance only). A conversion from time to distance could be calculated but it would need to factor in all velocity changes and the transitions. For this reason duration is not represented graphically when time is chosen.

(Continued)

Profile / Bubble / Taper Mode - Digital Outputs Page Description (continued)



In this image Output 3 is enabled and set to time (seconds). The off point is shown graphically and is turning off at 12". The actual output is turned off after seven seconds.

Type

Type is used to define duration type. Options are distance or time.

Enable On/Off

The Enable switch is used to enable or disable the output. When disabled the output is forced to off. If the Puller is stopped all outputs are turned off. A green light shows if the output is enabled.

Status

Lights are provided to show the state of Digital Outputs.

Selector Switches

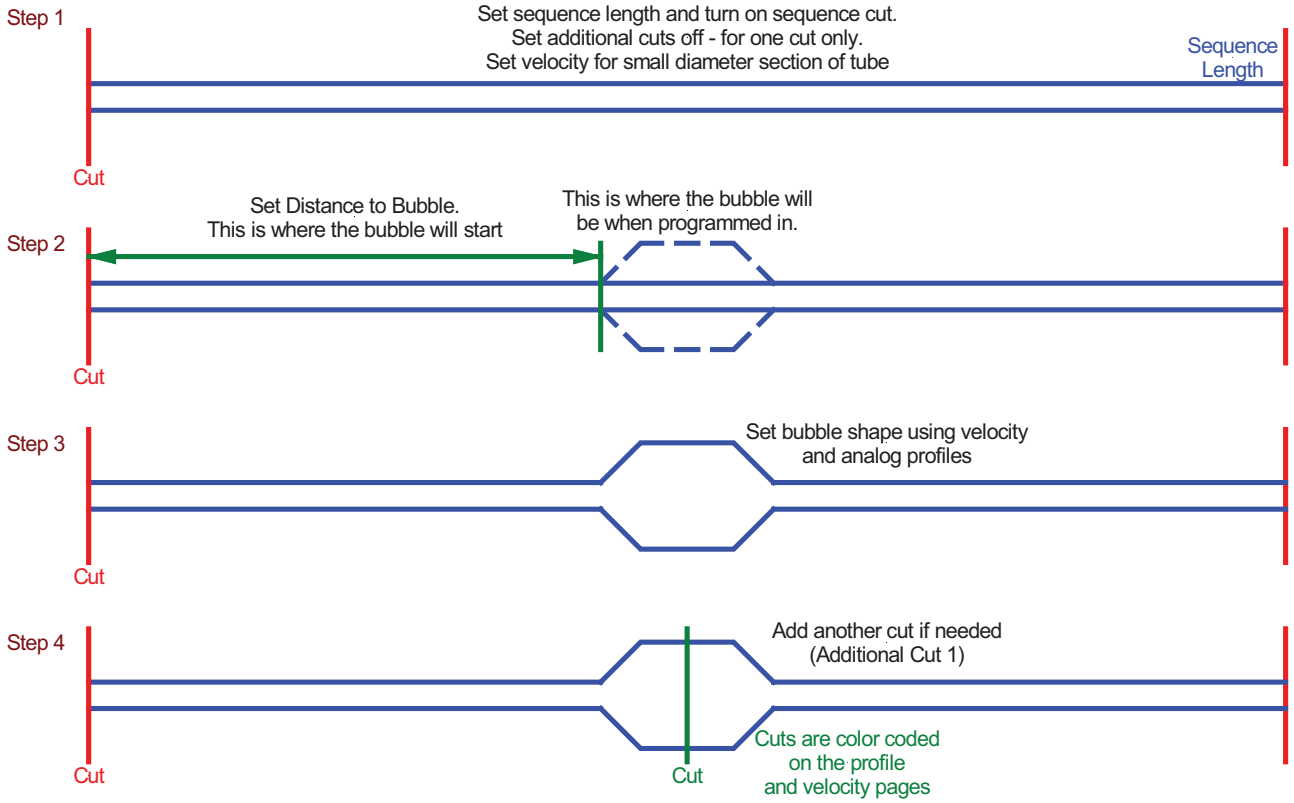
In the sample there are four digital outputs only. If there were extra channels available selector switches appear to the right of the Digital Outputs control. These have labels "1-4", "5-8", "9-12" and "13-16" when available.

Zoom

Zoom is available when working with the graph. Please refer to Velocity section for a description of zoom.

Profile / Bubble / Taper Mode - Gauge Control Page Description

At present the Gauge Control page has no function. This page will be used to set scroll (increment) values for each section of the product. There are scroll values for tip and body sections for Puller velocity and each of the analog outputs. Separate Raise and Lower inputs are provided so that a gauge may control the sections individually.



SECTION
5

Maintenance

Maintenance Features

The MedLine combo model needs regular, scheduled maintenance for peak performance. Among the features that require maintenance are:

- Puller belts
- Cutter blades
- Blade mounting hardware
- Cutter bushings
- The knife guard hardware
- Floor locks
- Lubrication
- Optional slide rail system
- Electrical cables, terminals and control lights
- Equipment alignment

Warnings and Cautions

To maintain the best performance of the Combination Puller / Cutter, it must be cleaned and inspected regularly. Maintenance includes a daily, weekly, quarterly, and semi-annual (every 6 months) schedule.

Use this maintenance schedule as a guide. You may need to shorten the time of the maintenance schedule, depending on how often you use the servo cutter, and the types of material flowing through it. Follow all precautions and warnings when working on the equipment.

WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

DANGER: Pinch Hazard

Never remove or disable safety devices to sustain production. Operating without these devices could lead to hazardous conditions that can cause severe injury. Take all necessary precautions when working around moving parts to prevent body parts and clothing from being pulled into the machine.

(Continued)

Warnings and Cautions (continued)

⚠ WARNING: Voltage hazard

This equipment is powered by alternating current, as specified on the machine serial tag and data plate.

A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in severe personal injury and erratic machine operation.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as routine maintenance. Only qualified personnel should perform troubleshooting procedures that require access to the electrical enclosure while power is on.

⚠ DANGER: Sharp Blades

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

CSC cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter Stop button activates a circuit that stops the knife.

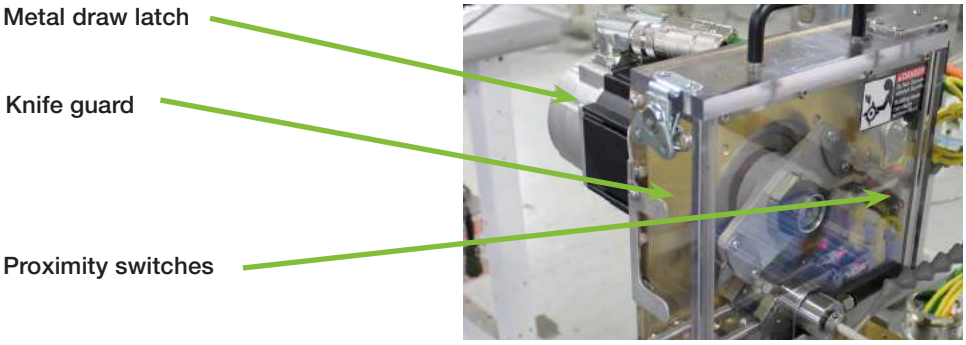
Preventative Maintenance Schedule

- **Daily**
  - ❒ **Checking puller belts for wear**
    If a belt shows sign of cracks, tears, or other damage, replace it. *See Replacing Belts, Section 5.*
  - ❒ **Checking puller belt tension**
    Check the belt tension. *See Testing Belt Tension, Section 5.*
  - ❒ **Checking belt gap**
    Check the belt gap. *See Checking the Belt Gap, Section 5.*
  - ❒ **Inspecting cutter blade(s)**
    Clean, sharpen or replace as needed. *See Inspecting the Cutter Blades, Section 5.*
  - ❒ **Inspecting the blade mounting hardware**
    Check the blade-securing bolt and the holding pins. *See Inspecting Blade Hardware, Section 5.*
  - ❒ **Inspecting cutter bushing screws**
    Check that the cutter bushing screws are secure. *See Inspecting the Cutter Bushing Screws, Section 5.*
  - ❒ **Checking the closure latch on the knife guard**
    See Checking the Closure Latch, Section 5.
  - ❒ **Inspecting unit alignment**
    Proper alignment with other equipment on the line is critical for optimum performance. Use a plumb line or laser to check for a straight line from the extrusion die to the cutter bushings.
  - ❒ **Checking floor locks**
    See Checking Floor Locks, Section 5.
- **Weekly**
  - ❒ **Cleaning the blade tray** *See Cleaning the Lubrication Tray, Section 5.*
  - ❒ **Lubricating shafts on slide rail system**
    See Lubricating the Linear Rail, Section 5.
  - ❒ **Checking shafts and grease fittings**
    Lubricate all shafts and grease fittings as needed. *See Checking the Grease Locations, Section 5.*
- **Monthly**
  - ❒ **Checking hardware on the knife guard**
    Inspect the hardware on the knife guard (fasteners on hinge and the clear blade guard window). Tighten as needed.
  - ❒ **Checking bushing holder proximity switches**
    Inspect the proximity switch set screws. Adjust as needed. *See Adjusting the Cutter Proximity Switches, Section 5.*
  - ❒ **Cleaning the clear blade guard window**
    Clean using glass cleaner or plain water. Other materials may cause premature loss of clarity or crazing.
  - ❒ **Checking the metal draw latch**
    Inspect the latch on knife guard for wear and proper tension. Readjust or replace as needed.

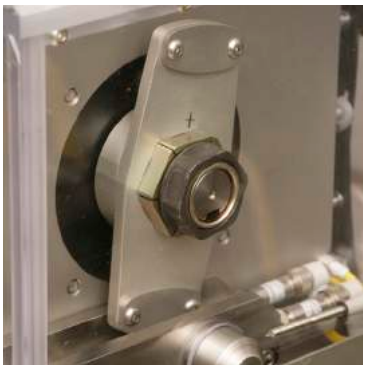
(Continued)

Preventative Maintenance Schedule

(continued)



- **Semi-annual (every six months)**
  - ❒ **Inspecting electrical terminals**
    Check all electrical terminals for tightness; adjust as needed. *See Checking Electrical Connections, Section 5.*
  - ❒ **Checking torque on Trantorque coupling device**
    Check the tightness (torque) of the Trantorque coupling device with a torque gauge. This device connects the cutter head to the Micron reducer shaft. *See Checking Torque, Section 5.*
  - ❒ **Checking all electrical cables**
    Inspect all electrical cables for cuts and abrasions. Replace as needed. *See Checking Electrical Connections, Section 5.*
  - ❒ **Inspecting control panel lights**
    Check to make sure no LEDs or lights are burned out on the control panel. Replace as needed.



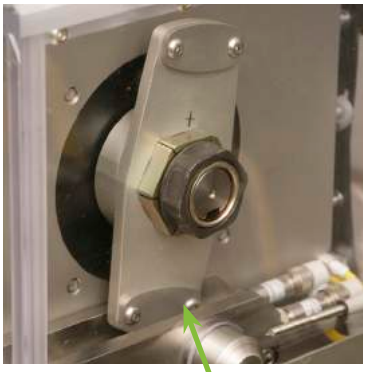
Inspecting Cutter Blades

Blades become dull over time depending on the material being cut, cut rate, blade speed, and blade material and thickness. Check blades regularly for sharpness as well as scratches, nicks, burrs, and material buildup. Clean, or replace as needed. *See Installation Section entitled, Installing Cutter Blades.*

DANGER: Sharp Blades

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.



Metal draw latch

Inspecting Blade Hardware

The blade-securing bolts should use both a lock washer and flat washer, and be tightened enough to fully compress the lock washer.

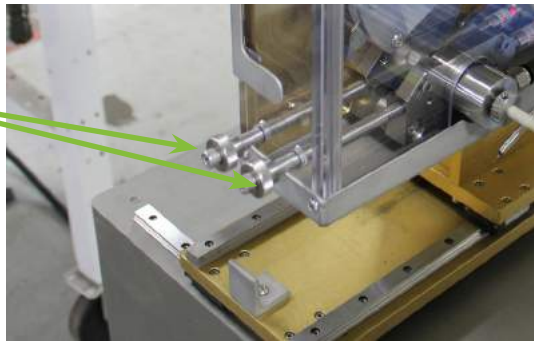
WARNING:

Do not operate the combination puller / cutter without washers and blade-securing bolt securely in place.

Inspecting Bushing Retaining System

Check the bush retaining system that secures the cutter bushings. If bushings move during cutting, cutting blades, and possibly the drive chain, could be damaged.

Bushing retaining system



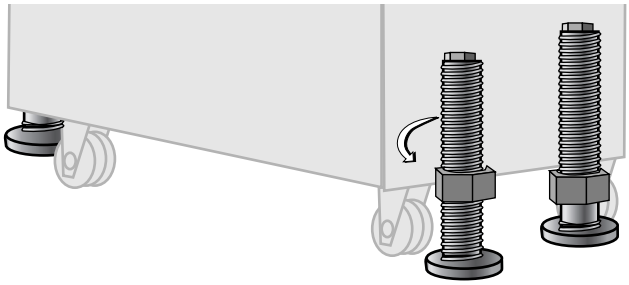
Checking the Closure Latch

Check the latch and adjust it so the knife guard closes completely. This prevents false triggering of the safety switch.


Latch

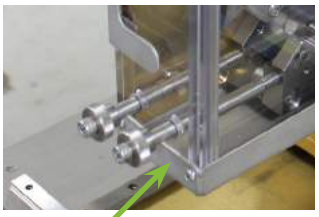
Checking Floor Locks

It is best to remove the weight from the casters for optimum stability during cutting cycles. Check to see if the floor locking mechanism is properly adjusted.



Cleaning Particulate Trap

The Particulate trap is built into the cutter assembly. Depending on cut rate and type of material and lubrication, the area will need to be cleaned on a regular basis. Open the knife guard and, using a shop vac or other similar equipment, remove all liquid and solids from the cutting chamber and around the bushings.


Particulate trap

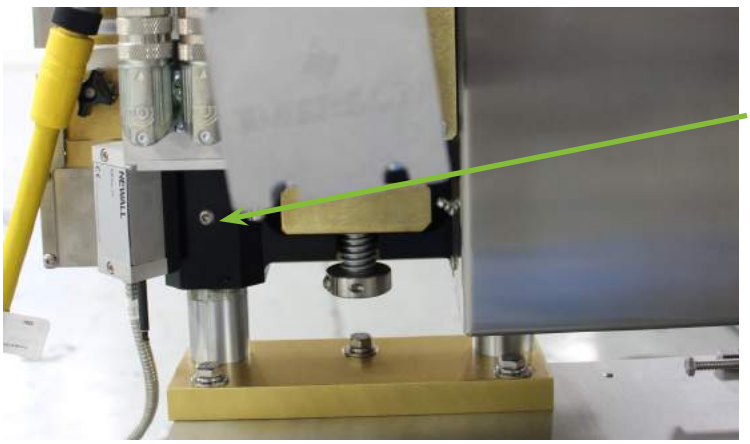
Lubricating the Linear Rail

Check the shafts on the linear rail system. Even though these rails are stainless steel, it is recommended that a light oil (silicon spray or similar) be applied to the shafts as needed. Wipe off any excess.


Linear rail

Checking Grease Locations

For Puller Model 1-12 and 2-12


Grease fitting

NOTE: Use regular grease for all locations except thread rods, vertical shafts, and vertical shaft drive boxes. For thread rods use FDA silicone or grease.

Bushing retaining system

Adjusting the Cutter Proximity Switches

Follow all warnings and cautions listed at the beginning of the Maintenance section of this User Guide.

1. **Be sure the main power is disconnected and the cutter is locked out.**
2. **Loosen the bushing retaining system** that holds the cutter bushings.
3. **Remove the cutter bushings.**
4. **Check the depth of the proximity switch face for each bushing.** It should be recessed no more than 0.010 inches, but should not interfere with the bushings themselves.

Proximity switch

NOTE: You can damage the proximity switch if you over-tighten

5. **Use a wrench to check the tightness of each proximity switch.**
6. **Replace cutter bushings and check for proper cutting blade alignment.** *See Installation Section entitled, Mounting the Cutter Bushings and Appendix C and D.*
7. **Plug in the power cord and turn the main power disconnect to the "ON" position** if all other maintenance is completed.

Checking Electrical Connections

WARNING: Electrical Hazard

Before performing any work on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

1. **Be sure the main power is disconnected and the cutter is locked out.** Always disconnect and lock out the main power source before opening the unit or servicing.
2. **Turn the main power disconnect to the off position** before opening the electrical enclosure on the back of the cutter, or the back of the control. This is a safety device to prevent you from opening the doors if the power is still on.

(Continued)

Checking Electrical Connections (continued)

3 **Open the electrical enclosure.**

4 **Inspect all wires and connections.** Look for loose wires, burned contacts, and signs of over-heated wires. Have a qualified electrician make any necessary repairs or replacements.

5 **Close the electrical enclosure door.**

6 **Inspect the exterior power cords.** Cords should not be crimped, exposed, or rubbing against the frame. If the main power cord runs along the floor, make sure it is not positioned where it could rest in pooling water or could be run over and cut by wheels or casters.

Main power safety disconnect

Testing Belt Tension

For Puller Model 1-12 and 2-12

1 **Turn the main power disconnect to the off position.**

2 **Remove the upper and lower polycarbonate belt guards:**

- **Remove the screws** attaching guards to unit (five each: front).
- **Remove guard.**
- **Remove the stainless steel Belt Entry Guard.** Remove the screws attaching the guard to the unit (four each: top and bottom). Remove guard.

3 **Remove entrance guards and stainless steel safety guards.** Remove screws (4 on upper and lower belts).

✎ **NOTE:** It is important to have the proper belt tension. Loose belts result in belt and product slippage; over-tightened belts result in distorted product and can lead to premature bearing failure.

Screw (10)

4 **Adjust belt tension**, if necessary. Adjust tension by turning the threaded tension rod.

5 **Fine tune tension:**

- **Lower the belts** to a gap of about 1/8" {3 mm}. *See Installation Section entitled, Adjusting Belt Gap.*
- **From the upstream end of the belts,** look down the length of the belts at the gap between the belts. If the gap is not even, adjust the tension until the gap is even and measures 1/8" {3 mm}. The shape of the gap should not be concave (over-tightened) or convex (too loose).
- **Check tension and readjust as necessary.**

Threaded tension rod

NOTE: On some models the beam is opened and closed with the HMI control.

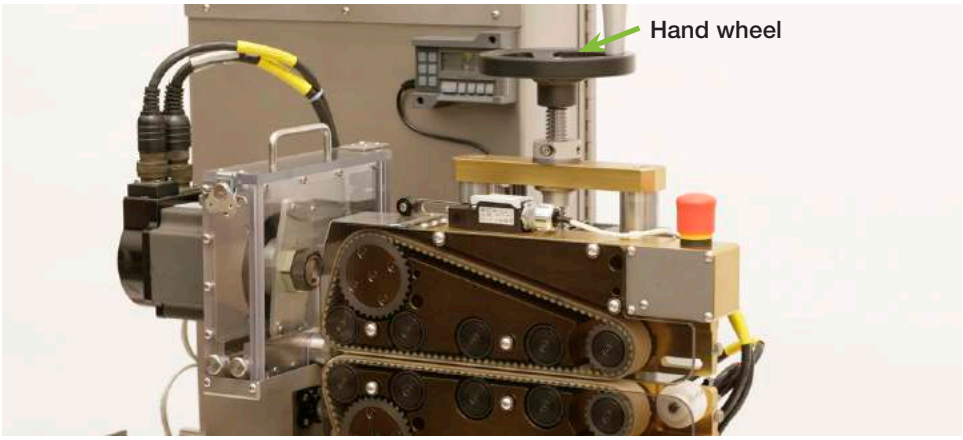
Checking the Belt Gap

For Puller Model 1-12 and 2-12

The upper and lower belt boom assemblies are controlled by a common threaded rod. Turn the hand wheel to move the belts up and down.

For Puller Model 1-12

The upper and lower belt boom assemblies are controlled by a common threaded rod. Turn the hand wheel to move the belts up and down.



Replacing Belts

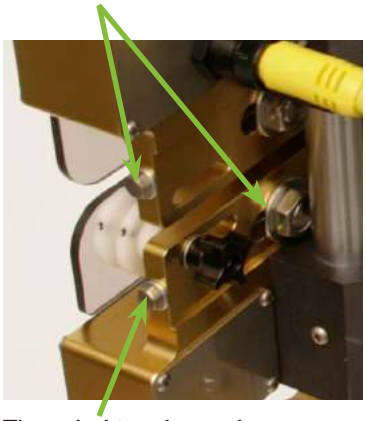
For Puller Model 1-12

To replace puller belts:

1. **Turn the rotary disconnect to the OFF position.**
2. **Remove the upper and lower polycarbonate belt guards:**
   - Remove the screws attaching guards to unit (five each: front).
   - Remove entrance guard.
   - Remove the stainless steel Belt Entry Guard. Remove the screws (4) attaching the guard to the unit (four each: top and bottom). Remove guard.

! **IMPORTANT:** The retaining nuts must be loosened before reloading belt tension rods.

Retaining nuts



Threaded tension rod

3. **Lower the retaining nut.**
4. **Release belt tension by loosening the threaded rods.** Keep tension on front and back edges as even as possible by turning each rod 5-10 revolutions, then switching to the other side. Continue until the belt is loose enough to slide off the puller
5. **Remove the belt from the puller.** Check the rollers and pulleys for buildup, especially inside grooves. Clean if necessary.

6. **Reverse the process to install the new belt.** Make sure ribs inside the belt fit properly into grooves, and keep tension on front and back sides as even as possible by alternating between the two threaded rods.
7. **Adjust belt tension and belt gap.** S*ee Maintenance Section entitled, Testing Belt Tension.*

Checking Torque

⚠ WARNING: No Lubricants

Do NOT use lubricants on the Trantorque coupling device.

⚠ DANGER: Sharp Blades

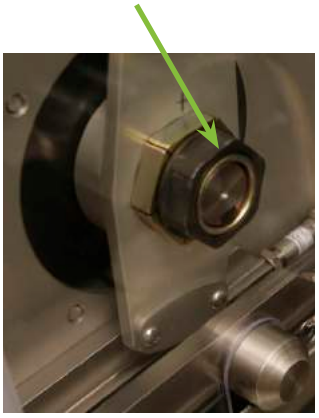
Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

The Trantorque coupling device connects the servo motor to the cutter head. It is important that it is tightened to the proper torque.

1. **Carefully remove the cutter blade.**
2. **Check to make sure both the shaft and component bore of the Trantorque coupling device are completely free of paint, grease, oil, and dirt.** If necessary, clean the surfaces with a non-petroleum based solvent, such as isopropyl alcohol.
3. **Use a torque wrench to make sure the nut is tightened to the proper installation torque** (2000 in-lb or 225 N-m). Do not overtighten; it can cause damage to the unit.

Transtorque bolt



SECTION
6

Troubleshooting

Before Beginning

You can avoid most problems by following the recommended installation, operation and maintenance procedures outlined in this User Guide. If you have a problem, this section will help you determine the cause and tell you how to fix it.

Before you begin troubleshooting:

- ❒ **Find any wiring, parts, and assembly diagrams that were shipped with your equipment.** These are the best reference for correcting a problem. The diagrams will note any custom features or options not covered in this User Guide.
- ❒ **Verify that you have all instructional materials related to the CPC** Additional details about troubleshooting and repairing specific components are found in these materials.
- ❒ **Check that you have manual for other equipment connected in the system.** Troubleshooting may require investigating other equipment attached to, or connected with the control.

A Few Words of Caution

⚠ WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.

This equipment should only be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation, and potential hazards of this type of machine.

All wiring, disconnects, and fuses should be installed and adjusted by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

⚠ WARNING: Electrical hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

A Few Words of Caution (continued)

⚠ DANGER: Sharp Blades

Most injuries caused by knife blades occur when the cutter has been turned off. Handle blades with care at all times.

- Always wear cut-resistant gloves when the cutting chamber is open and when handling blades.
- Always lock out power to the cutter before opening the cutting chamber.
- Always wait until the cutter head has completely stopped before opening the knife guard.

CSC cutters are equipped with several safety devices to ensure safe operation. Never remove or disable these devices to sustain production. Operating without these devices can cause severe injury.

- When the knife guard is opened, the knife guard switch stops the cutter.
- Two proximity-type safety switches prevent operation unless the cutter bushings are in place.
- The Cutter Stop button activates a circuit that stops the knife.

Identifying the Cause of a Problem

The Troubleshooting section covers problems directly related to the operation and maintenance of the Combination Puller / Cutter. This section does not provide solutions to problems that originate with other equipment. Additional troubleshooting help can be found in manuals supplied with the other equipment.

The main problems you will see with the Combination Puller / Cutters are:

- **Puller operation problems**, which focus on problems that are clearly related to the pullers mechanical components and electrical control system.
- **Cutter operation problems**, which focus on problems that are clearly related to the operation of the cutter's mechanical components and electrical control system.
- **Product quality concerns**. Extrudate quality problems may be related to Combination Puller / Cutter operation. Of course, other sections of the extrusion line also influence the quality of the extruded product. This section does not provide solutions to problems originating with other equipment on the extrusion line.

Additional troubleshooting help can be found in the documentation manuals included with this User Guide.

Puller Operation Problems

Symptom	Possible Cause	Solution
The puller 'creaks' while running.	The belt is too tight.	Check the belt tension; loosen if necessary. *See Maintenance section 5.*
	The bearings are failing.	Replace the bearings.
The puller does not start.	The Emergency Stop button is pushed in.	Pull out the Emergency Stop button. (Make sure it clicks into position.)

Cutter Operation Problems

Symptom	Possible Cause	Solution
Servo drive is without power	The Emergency Stop button is pushed in.	Pull out the Emergency Stop button.
	Master safety relay not energized	Check that the bushings are in place.
		Make sure that the blade guard is closed.
		Master Safety relay (ISC) has failed. Replace relay.
	A safety switch has failed.	Check connections and replace if needed.
Pressing Start Cutter has no effect. The light does not light.	There is a loose connection.	Check wiring between push button and the relay. (ICR)
	The relay is bad. (ICR)	Replace the relay.
	The safety circuit failed.	Check safety circuit, repair or replace components.

(Continued)

Cutter Operation Problems (continued)

Symptom	Possible Cause	Solution
Pressing the Manual cut button does not produce a cut when in an on-demand mode.	The servo amplifier motion program not running.	Stop then restart the cutter, if necessary, reboot main power.
	There is a loose connection.	Check wiring between the push button and input three on the servo drive and tighten connection.
After pressing Start Cutter, the cutter head rotates and stops in wrong position.	The Blade Home proximity switch failed or the connection to it is loose.	Check connections and replace switch if needed.
Master safety relay does not energize.	Guard circuit is open.	Check that the bushings are in place. Make sure that the blade guard is closed. Loose connection to guard circuit. Tighten connection. Guard switch is bad, replace switch. Bushing proximity is bad, replace switch.
	Emergency Stop button is pressed	Pull out Emergency Stop button.
Measurement display does not change value.	Input from encoder failed.	Check encoder cable for continuity. Connect any loose wires.
	Encoder failed.	Replace encoder.
In encoder or timer modes, the display shows the count which resets, but a cut does not occur at the point of reset.	There is a problem with the servo amplifier.	*See Checking the Servo Amplifier.*
	There is a loose connection.	Check wiring for loose connections.
Blade speed does not change when new speed is entered into the control.	There is a communication failure between the control and drive.	Check for wiring for loose connections and tighten.

(Continued)

Cutter Operation Problems (continued)

Symptom	Possible Cause	Solution
Cutter mode selection does not change cut mode.	There is a communication failure between the control and drive.	Check for wiring for loose connections and tighten.
The park (home) position is drifting, i.e. the blade parks further away from the original park site.	The coupling between the servo motor and the Micron reducer has slipped.	*See Checking the Motor/ reducer assembly, Section 6.*
	The Trantorque coupling has slipped.	*Refer to the Trantorque instructions, Section 5.*
Blade speed does not change when new speed is entered into the control. Cutter mode selection does not change cut mode.	There is a communication failure between the control and drive.	Check wiring for loose connections and tighten.
The park (home) position is drifting, i.e. the blade parks further away from the original park position.	The coupling between the servo motor and the Micron reducer has slipped.	See *Checking the Motor/ Reducer Assembly, Section 6.*
	The Trantorque coupling has slipped.	*Refer to the Trantorque instructions, Section 5.*

Product Quality Problems

Symptom	Possible Cause	Solution
Annular rings present on the extrudate.	The belt puller is too close to the cutter.	If the extrudate is interrupted (stopped during processing), annular rings can develop, especially on a thin-walled product. Slightly increase the distance between the puller and the cutter, and test the product until the distance is correct.
Burrs at cut site.	The bushings do not provide enough support during cutting.	Change bushing design to make more supportive.
	The bushing gap is too wide.	Check that bushing gap is 0.001-0.003 in. larger than blade. Adjust if necessary.
	The blade speed is too low.	Increase blade speed or decrease the cut path area.
	The blade is too thick.	Use a thinner blade or add heat to extrudate.

(Continued)

Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Hairs or strings.	Blade speed is too low.	Increase the blade speed or decrease the blade cut path area (blade width).
	The blade is too thick.	Excessive blade thickness can cause frictional heat. Use a thinner blade.
	The blade is wrong for the application.	Change angle of the blade attack or the blade style to decrease the cut path area.
	Material is building up on the blade and wiping off on the cut site.	Use blade lubrication (water, etc.) or change lubricants. *See Appendix D*. Consider a blade wiping system.
	There are imperfections on the blade.	The cutting edge should not have grind marks, burrs or other imperfections. Check the blade and replace if necessary.
	A hole or slot in the blade cut path is causing a 'cheese grater' effect.	Change to a different blade design. *See Appendix B.*
	The extrudate is too cold.	If the extrudate is too cold, it can fracture during cutting. Raise the extrudate's temperature.

(Continued)

Product Quality Problems (continued)

Symptom	Possible Cause	Solution
Cracks at cut site.	The extrudate is too cold.	If the extrudate is too cold, it can fracture or whiten during cutting. Raise the extrudate's temperature.
	The blade speed is too high.	High blade speeds can cause too much impact. Lower the blade speed.
	The bushings are not providing enough support during cutting.	Change the bushing design to make them more supportive.
	The cutting blade is too sharp	A blade that is too sharp can fracture some materials, especially rigid PVC and nylons. Slightly dull the blade.
	If using Nylon, it may be cooling too quickly.	If nylon is cooled too quickly, its molecular structure may become unstable, leading to poor physical properties. Try more gradual cooling.

(Continued)

Product Quality Problems (continued)

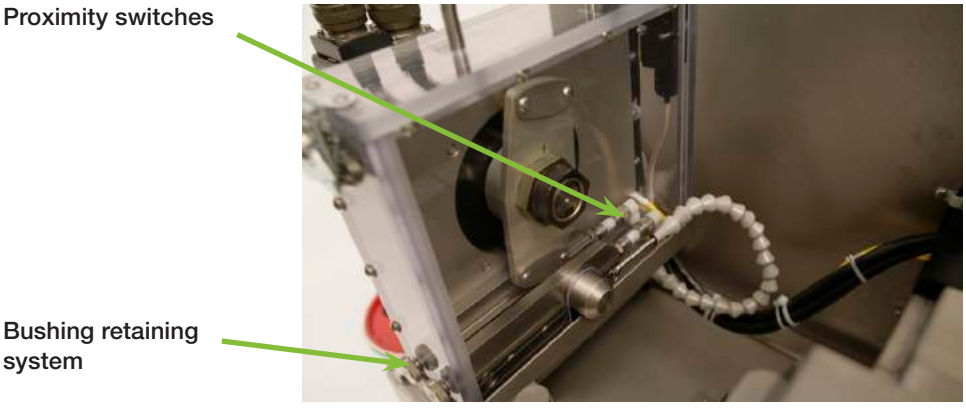
Symptom	Possible Cause	Solution
Cut is not square.	The extrudate is too cold.	Low blade speeds can cause excessive blade interruption. Increase blade speed or decrease the blade cut path area.
	The blade speed is too high.	Check that blade is 90 degrees relative to the bushing holder.
	The bushings are not providing enough support during cutting.	If the cutter bushings are not properly gapped, the blade may be free to move with the extrudate. Check and adjust if necessary. *See Section 3 and Appendix C.*
	The cutting blade is too sharp.	If the knife bevel is asymmetric, the blade will tend to move in the direction of the smaller bevel. Be sure that the bevel is symmetric. ✎ **NOTE:** You can use this to your advantage with some rigid products.
	If using Nylon, it may be cooling too quickly.	There must be enough space between the puller and cutter to allow for the extrudate to stop during cutting.
Length of cut is incorrect.	Repeatability is wrong.	Test for repeatability. *See Section 6.*
	Encoder, input device problem.	Check encoder, input device and clean. Run repeatability test, *see Section 6.*
	There is a problem with the puller.	Run repeatability test. *See Section 6.*

Replacing Safety and Proximity Switches

Three safety switches are included in CSC cutter sections: a keyed safety switch on the knife guard, and a proximity switch on each cutter bushing. A failure in any of these switches prevents the puller / cutter from running.

- Safety Switch
  If you suspect a problem with the keyed safety switch on the knife guard, check for loose or damaged wires. Replace the switch if wires appear to be undamaged.
- Proximity Switches
  The proximity switches on the cutter bushings have LEDs that light when the bushing is sensed. If an LED does not light when both the bushing are in place:

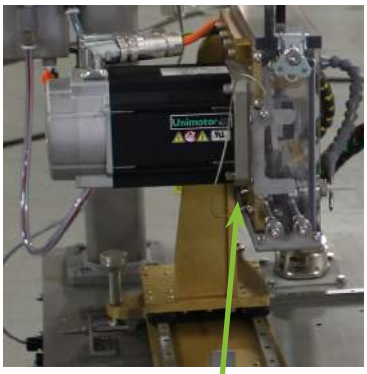
1. **Check for loose or damaged wires.**
2. **Remove the cutter bushing** and make sure the proximity switch is properly positioned, i.e. 0.010” from the bushing surface.
3. **Remove the proximity switch** by loosening the bushing retaining system. Test it by bringing an object close to the sensor when the power is turned on. If the LED does not light, replace the proximity switch.



Checking the Servo Amplifier

The servo amplifier is equipped with a digital readout that can be seen through the viewing window on the electrical enclosure. This display shows amplifier status and error messages. Refer to the supplier's documentation included with this User Guide.

✎ **NOTE:** Make sure you look for servo amplifier messages before you shut off the power, because fault message will be lost.



Remove bolts (4)

Checking the Motor Assembly

1. **Open the knife guard.**
2. **Remove the cutter head** by loosening the Trantorque assembly. Refer to the manufacturer's guide included with this User Guide for information about the Trantorque assembly.
3. **Locate the four (4) bolts** holding the motor assembly to the cutter. Remove them and carefully remove the assembly from the cutter.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee. Most manuals can be downloaded free of charge from the product section of the Conair website.
www.conairgroup.com

How to Contact Customer Service

To contact Customer Service personnel, call:

✎ **NOTE:** Normal operating hours are 8:00 am - 5:00 pm EST. After hours emergency service is available at the same phone number.

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, control type from the serial tag, and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.

Equipment Guarantee

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

Performance Warranty

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated, and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices, or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

Warranty Limitations

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

Cutter Blade Selection and Use

Cutter blade characteristics such as material, design, and thickness can have a large effect on cut quality.

Blade Materials

Blue tempered spring steel is most commonly used because of its cost and availability over a wide range of thicknesses (0.010-0.062 inch). It is a very tough material with an HRC value of approximately 48-51 and fair wear characteristics.

Razor blade stainless steel is becoming very popular due to its HRC value of 57-58, which leads to improved wear resistance. This material retains good toughness, but will chip or break. It is available in 0.010-0.062 inch thicknesses. Because it is non-corrosive, stainless steel is a good choice for medical cutting applications, and may even be coated with Teflon to enhance cut quality.

A-2 is a good grade of tool steel with an HRC of 60. Its minimum thickness (0.031 inch) forces the blade manufacturer to grind it down for thinner applications, which adds cost. A-2 is more wear resistant than stainless, but is also more brittle.

M-2 is an excellent grade of tool steel with an HRC of 63-66. It is one of the best materials for coating with titanium nitride for improved wear resistance. (However, coatings generally cause some slight loss of sharpness.) 0.025 inch material is available, which covers many applications without the need for secondary grinding operations.

D-2 is another excellent tool steel with an HRC range of 58-60. It is tougher than M-2 but has slightly less wear resistance. Its minimum thickness (0.035 inch) and the need for specialized grinding materials, make it a relatively expensive material. It is the material of choice for cutting Kevlar-reinforced hose.

CPM 10-V is a form of carbide developed especially for the high speed punch industry. With an HRC of 60-62 and a toughness that far exceeds D-2, it is by far the best cutting blade material. Because its minimum thickness is 0.035 inch, and it requires the use of diamond grinding wheels, CPM 10-V is the most expensive of the blade materials.

Blade Design

Straight-edge knives have a straight cutting surface. A chopping action (which has cutting forces parallel to the cut) is typically obtained with straight-edge blades.

Because the blade is mounted on a rotary arm, some slicing action (which has additional force vectors at various angles to the cutting edge) is obtained, but generally not through the entire cutting action. If a slicing action is required, the angle of attack can be modified by mounting the blade on a 30-45 degree angle as close to the cut site as possible. In many cases the bushings must be modified to allow the blade holder to have close proximity to the cut site. This offers the steepest angle of attack throughout the entire cutting process. Generally straight knives can be obtained in thicknesses from 0.004-0.060 inch depending on the application.

(Continued)

Cutter Blade Selection and Use (continued)

Curved-edge knives offer increased slicing throughout the entire cutting action. They are generally used for cutting rubber preforms, rubber hose, flexible foams, and other materials that require slicing. Blade lubrication is often used to enhance the cut and minimize blade and bushing buildup.

As a general rule, curved-edge knives offer improved cut quality on rigid materials if additional heat can be used. However if used on cold rigid materials, curved knives have a tendency to produce wavy or angled cuts.

A curved edge knife can sometimes cut larger cross section profiles and tubing with the same horsepower as a straight edge blade. However, the use of a curved blade increases product interruption. To overcome this effect, use a variable speed rotary knife cutter to vary the blade speed to obtain the desired cut quality.

Piercing blade (bat-wing, woodpecker) knives are specifically designed for cutting thin wall tubing. Their shape minimizes penetration marks caused by the flattening action of the blade prior to penetration of the extrudate. These are the most expensive type of blade, and the most susceptible to breakage. Because the point is exposed and not fully supported by the bushings, it may deflect into the bottom of the bushing bore and break off. For these reasons, piercing blade knives are usually used as a last resort.

Some rigid materials require warming when this type of blade is used because the impact of the point can cause cracking or whitening.

Blade Thickness

Because material is displaced rather than removed in rotary knife cutting, think of the blade as a wedge. The thicker the blade, the greater the displacement. This displacement can cause fracture in rigid profiles and tubing, which is often observed as a whitening on all or a portion of the cut. You can reduce this fracturing by reducing the thickness of the blade. (This effect can also be minimized by heating the profile or tube. However, if heat is used to enhance cut quality, the bushings must be supportive enough to minimize distortion.)

If the cutting blade is too thin, it may actually deflect within the bushing bore. This can lead to “S” shaped cuts or premature blade breakage.

Optimizing Blade Speed

Flexible extrudates generally require a very fast blade speed with a slicing action for best results. This is due to the fact that even minimal interruption can cause a blade jam on a product that has little or no internal strength.

On the other hand, rigid extrudates may require different blade speeds to obtain the desired cut quality. What’s needed for a particular application depends on blade style, internal heat, and blade thickness. Speeds as slow as 300 rpm may be required if a curved blade is used with little or no heat.

(Continued)

Cutter Blade Selection and Use (continued)

Improving Cut Quality by Adding Heat to Certain Materials

All rigid extrudates can have their cut quality improved by the addition of heat. A few of the most common materials and the respective temperatures are listed below:.

Rigid PVC	110°-125° F {43.33°-51.67° C}
Styrene ABS	120°-135° F {48.89°-57.22° C}
Polypropylene	160°-200° F {71.11°-93.33° C}

It is important to remember that as the temperature approaches the glassification zone, the degree of support offered by the bushing becomes more important.

Calculating Blade Interruption

Blade interruption is the length of time which the blade interrupts the extrudate during the cutting process. Knowing blade interruption allows you to optimize blade speed and design for specific applications.

You can calculate blade interruption for your application if you know:

- the cutting blade width
- blade speed (cutter rpm)
- extrudate cross section.

The rotary knife cut path circumference is fixed for each cutter model:

CSC Model	Bushing Diameter	Knife Cut Path Diameter	Knife Cut Path Circumference
1L	1.25”	10”	31.4”

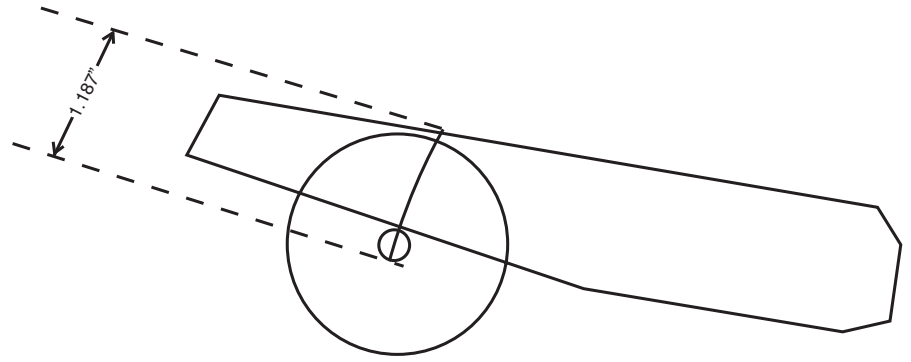
As an example, calculate the blade interruption (in milliseconds) for an CSC1 cutter running 1/4” (0.250”) OD tubing. The blade speed is 718 rpm and the cutting blade is 15/16” (0.937”) width at the point where it passes through the extrudate, and the cut path circumference is 31.4” for the CSC1.

Calculate the blade interruption time. The interruption time starts when the blade makes its first contact with the extrudate and ends when the blade is totally clear of the product (i.e. no longer interrupting it). Because we know the blade travel speed, we can calculate the interruption time if we know how far the blade travels during period of interruption. This distance is equal to the sum of the extrudate outer diameter and the blade width at the point of contact.

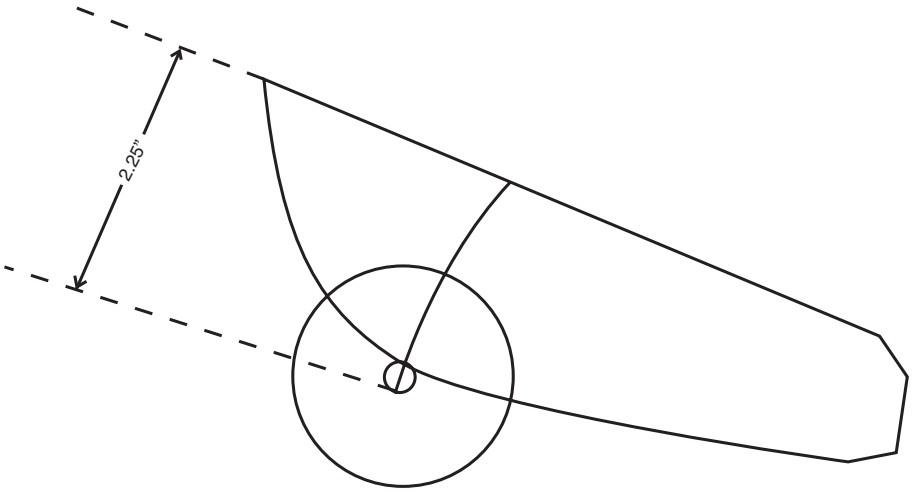
$$\text{Blade interruption time, msec} = \frac{\text{(Product OD + Blade width)}}{\text{Knife circumference}} \times \frac{6000}{\text{rpm}}$$

(Continued)

Calculating Blade Interruption (continued)



Straight blade



Curved blade

To calculate interruption time:

$$\frac{(0.937 \text{ in.} + 0.250 \text{ in.})}{31.4 \text{ in.}} \times \frac{60{,}000 \text{msec/rev}}{718 \text{ rpm}} = 3.2 \text{ msec}$$

Knowing the interruption time and the line speed, you can calculate the amount of production deflection that must be accommodated during cutting. To calculate the amount of extrudate deflection between the cutter and puller, multiply line speed by interruption time:

Blade Interruption time, msec	X Line speed, X fpm	12 / 60,000	Deflection, in.

3.2 msec X 60 fpm X 0.0002 = 0.038 in.

In this example the puller and cutter must be set up to allow for 0.038” of product deflection during cutting. Failure to do this can lead to puller stoppage (which can form annular rings on the product), and poor-quality cuts (hairs or fuzz and angular cuts).

Conair Cutter Blades

Use Commercial Razor Blades or contact Conair Parts for blade reccommendations.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

All About Cutter Bushings

Rotary knife cutter bushings are probably the most ignored aspect of cutting. Yet, they are probably the most important ingredient to obtaining clean, square, accurate cuts with minimal jamming and broken blades.

This appendix contains information about several aspects of cutter bushings:

- bore characteristics
- bushing length
- shear surface characteristics
- the bushing gap

Cutter Bushing Bore Size

The cutter bushing bore size affects both the cutting process and the overall extrusion process.

Bushings with relatively large bores are often used to facilitate start-up and minimize bushing inventory. While this practice is acceptable for start-up, it will lead to premature blade failure because the bushings do not properly support the blade. For optimum cut quality, make sure the bore adequately supports the tube or profile.

When the blade first makes contact with the tube or profile, it pushes the part until it assumes the size and/or shape of the bushing bore. In the case of tubes this causes two marks on the tube (penetration marks) that show where the tube flattened before the blade actually penetrated it. The tighter the bushing bore size to tube size, the closer the marks become, making them less obvious.

If the bushing bore is too tight, excessive extrudate interruption or even jamming may occur. In turn, this can cause internal air blockage in free extruded flexible materials and thus extrudate size fluctuations. In the case of rigid profiles or tubes, belt puller slippage may occur during the cutting if the bushings are improperly configured. This can cause annular rings around the extrudate and size fluctuations.

- For rigid profiles or tubes, allow 0.010-0.020 in. clearance over the OD tolerance. Anything tighter than 0.010 inch will be difficult to process. For easier startup, allow as much as 1/4 in. above a rigid profile because the blade will force the profile to the bottom of the cutting bushing where the shearing action occurs. However, if perfect squareness is required, the clearance above the profile should be minimized to prevent bowing. Supportive bushings become more important if heat is used to minimize whitening (fracturing).
- If you are cutting a square or rectangular profile, whether rigid or flexible, a round bushing bore will not offer proper support and will often lead to an “S” shaped cut. A flat bottomed bushing will offer excellent support and enhance the shearing action of the blade.
- In the case of flexible extrudates, allow 0.010-0.050 inch clearance depending on durometer and surface; the softer durometers and tacky surfaces require the most clearance. In the case of softer durometer materials, bushing lubrication may be required to minimize drag and material build-up between the cutter bushing faces.

(Continued)

All About Cutter Bushings (continued)

Cutter Bushing Bore Surface Quality

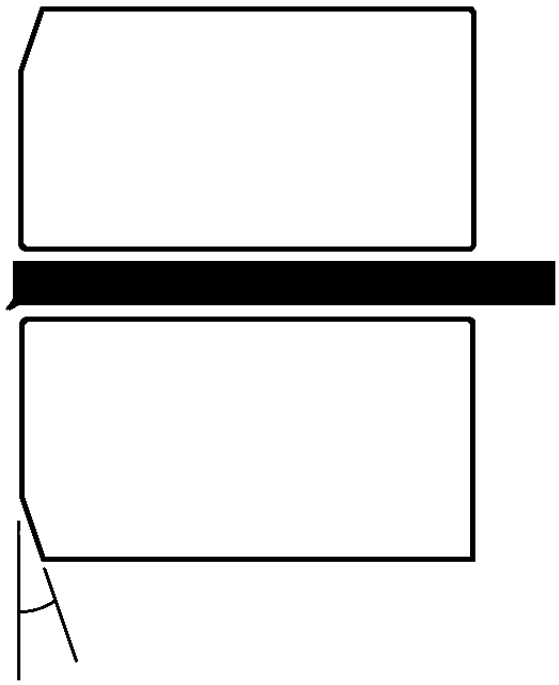
The internal surface of the cutter bushing must be smooth and glass-like when cutting flexible extrudates, otherwise excessive drag causes jamming and can lead to variations in cut-to-length accuracy.

- When cutting flexible materials, have the internal surface machined to resemble glass. In many cases, medical processors will actually have the ID of their bushings either honed or burnished for best results.
- When cutting clear extrudates, it is also very important to have a smooth internal surface to minimize scratches. In some cases it may be necessary to make a Teflon or Delrin insert to further minimize drag and/or scratching.
- Bushing lubrication can also help minimize bushing drag.
- Be sure to have a lead-in angle machined into the entrance of the upstream cutter bushing. The transition from the bore to the lead-in angle should not be abrupt as it to can cause variable drag.

Cutter Bushing Shear Surface Quality

Similar to a dull pair of scissors, if the cutter bushing shear surface is not sharp the tube or profile is not supported to the side of the blade and the cut will not be clean. In some cases, the entrance of the downstream cutter bushing is slightly radiused to minimize jamming. While this practice helps accommodate bushing bores that are not quite aligned, it has a negative effect on cut quality.

- The shear surface of both the upstream and downstream cutter bushings should be sharp and bored to the same size. NOTE: In high speed cutting applications, the downstream bushing is sometimes bored 0.005” larger than the upstream bushing to minimize jamming. Deburr the edge after the boring operation, but be careful to remove only the burr and not the edge.
- Leave a minimum land of 1/8 - 1/4 inches on the face of the cutter bushing beyond the bore. Angle the rest of the bushing face with a 10-15 degree lead-in.



(Continued)

All About Cutter Bushings (continued)

Cutter Bushing Length

⚠ WARNING: Blade hazard

In order to comply with OSHA regulations, the distance from the sidewall of the cutter to the blade (through the bushing) must be long enough to prevent fingers from reaching the blades.

On flexible extrudates, it is important to minimize the length of the cutter bushings. It is very difficult to push flexible extrudates through since it tends to compress as it is pushed, causing a marginal increase in the tube diameter. For this reason, bushing lubrication may be necessary to minimize drag as the length of the bushings increase. A discharge conveyor may also be helpful in removing longer cut parts. The exit bushing may be funneled to allow the cut part to drop out faster while still maintaining minimal bushing length for safety.

- For flexibles, the upstream cutter bushing should offer total support to the extrudate as close to the nip point of the puller as possible. In this way the part is not able to move from side to side or bow from the weight of the tube, which can, in turn, cause variable drag. You use the strength of the tube to push itself.
- The bore length of the exit bushing should not be shorter than 1 1\2 times the diameter of the tube with the remainder of the bushing length being tapered. On sticky flexible extrudates, the parts will actually stick back together if the new part has to push the cut part out very far.

For rigid extrudates, the length of the cutter bushings can result in a square cut or an angular cut. The cutter bushings support the extrudate keeping it from moving from side to side and bowing from the weight of the profile itself. Many processors make their bushings short to minimize cost of EDM which is determined by depth of cut.

- For rigid extrudates, a general rule is to make the length of the cutting bushings equal to two times the largest outside dimension. NOTE: In the case of full profile cutter bushings where maximum support is offered, the bushing length may be shortened depending on actual clearance.
- Be sure to have a lead-in angle machined into the entrance of the upstream cutter bushing. The transition from the bore to the lead-in angle should not be abrupt as it to can cause variable drag.

Adjusting the Cutter Bushing Gap

If the bushing gap is too big, material is dragged down between the bushings creating a burr, especially with flexibles. This may lead to jamming within the bushings where the upstream side of the cut extrudate actually hits against the downstream bushing surface. This is especially apparent with flexibles with non-concentric walls where a slight bow is present.

- Locate the downstream bushing such that it touches the blade without deflecting it. Lock it in place and rotate the blade to check proper gap.
- Locate the upstream cutter bushing with 0.001-0.002 inch of the blade and lock it in place. Rotate the blade through the set bushings to insure proper gap.
- If hairs are present on only the upstream cut end of a tube or profile, it may be necessary to allow a 0.002-0.005 inch gap on the downstream bushing to allow the blade to slightly move with the extrudate during the cutting cycle and not cause excessive frictional heat which actually melts the extrudate.

✎ **NOTE**: Because blades are rarely perfectly flat, it is possible that a swishing sound will be heard.

✎ **NOTE:** Blade/bushing lubrication can also help to solve this problem.

Blade and Bushing Lubrication

Blade and bushing lubrication can nearly always improve the quality of cutting.

Description of the Cutting Process

Unlike sawing, a rotary knife cutter displaces material rather than removing it. When the knife blade first contacts the extrudate, it pushes it against the opposite side of the cutter bushings. If there is too much clearance the extrudate may crack or distort before cutting even begins. Tubing may develop two distinctive marks related to the compression of the tube.

Once the blade penetrates the part, material is displaced to either side of the blade. This displacement will vary in degree and visibility depending on the type of material, temperature, blade thickness, blade style, and blade speed. As the material is displaced, heat is generated and passed to the blade surface.

Flexible materials (flexible PVC, urethanes, and even LDPE) will generally compress during cutting, leaving little or no sign of displacement. The cut will appear uniformly glossy and free of fracture. However, a closer look will show very fine lines on the cut face. With flexible materials, these lines will typically show an arc or "S" pattern which can be attributed to compression of the part as the blade passed through.

Rigid materials such as rigid PVC and styrene will tend to fracture during cutting. The cut surface changes from glossy to dull, and finally becomes whitened and rough. Whitening occurs when cutting changes to fracturing: the cut begins to extend in front of the cutting blade, which acts as a wedge. At this point, you can only hope the fracture is controlled, allowing for a square cut.

Friction and Heat during Cutting

Because most rotary knife cutters don't travel with the flow of the extrusion line, forward motion is interrupted as the blade passes through the plastic tube or profile. This interruption causes friction, which generates heat in the cutting blade. As the temperature of the blade increases, plastic is melted at the cut site. This melted plastic can adhere to and coat the cutting blade, especially on the upstream side, and be transferred to the next part in the form of hairs or tissue-like film. This will be especially noticeable on the top inside of the tube or profile.

If the blade has a rough surface where the extrudate rubs against it, material will accumulate on the blade in a cheese grater fashion. This scratched material will also be passed from the blade to the next cut and be seen as hairs or flakes.

Some of the more flexible materials, such as silicones, soft urethanes and flexible PVCs, also exhibit drag against the blade during the cutting cycle. The part will actually stick to the side of the blade and drag down between the bushings. Typically a small "C" shaped tail of the tube will accumulate in the bottom of the cutting chamber. This tail actually tore off the tube rather than cut due to the excessive drag against the blade.

The generation of heat during cutting can also lead to parts that stick to each other. They may appear to be welded together, and an extra operation may be required to separate them. This can be a real problem in materials such as latex, silicone, PP, and flexible PVC.

(Continued)

Blade and Bushing Lubrication (continued)

Benefits of Using Lubricants

The primary benefit of using a cutting lubricant is reducing friction. If the cutting blade is coated with a film of lubricant, the coefficient of friction between the blade and the plastic tube or profile is reduced, reducing the generation of frictional heat.

Lubricants also minimize the tendency for material to stick to the blade, thus minimizing the potential for material to be wiped on the next cut part. The co-efficient of friction is reduced with varying degrees, depending on the type of lubricant, which in turn limits the increase in blade temperature. Over time this can lead to an increase in blade life because the cutting edge will last longer at cooler operating temperatures.

While lubricants can also help minimize problems caused by rough or poorly ground blades and cutter bushings, it is generally better to solve the problem than mask it with lubricants.

Common Cutting Lubricants

Commonly used general purpose lubricants include:

- Tap water
- Dish washing liquid (Joy, etc)
- Glycol (anti-freeze, coolant)
- Water-soluble silicone cutting oils
- Diesel fuel
- Mold release
- Mineral oil

Medical grade lubricants:

- Distilled water
- Isopropanol (isopropyl alcohol)
- Mixtures of isopropanol and water

Lubrication systems

The most basic blade lubrication system for rotary knife cutters is using a stainless steel tray filled with the lubricant. Because the cutting blade passes through the tray during every cutting cycle, the blade is lubricated before each cut. This approach limits material buildup on blade and bushing surfaces for most applications. Care must be taken to maintain the lubricant level within the tray. Clean out accumulated cut residue on a regular basis.

Spray mist systems can be used to lubricate either the blade or the extrudate as it enters the cutter bushings. These systems allow the application of a minimum amount of lubricant with good consistency. If the mist is applied to the product as it enters the cutter bushings, the lubricant will minimize the drag between the bushing bore and the tube or profile, as well as wet the blade and bushing faces. With flexible and/or sticky materials this can improve both cut quality and cut-to-length accuracy.

(Continued)

Blade and Bushing Lubrication (continued)

The last method of blade lubrication (and the oldest) is the blade wipe system. Felt, sponge, or some other absorbent material is mounted so the rotary knife blade will pass through it, with interference, before making a cut. Typically a gravity drip or wick system is used to keep the absorbent material wet with lubricant. These systems not only lubricate the blade, but also wipe off residue before each cut. However, the operator must constantly observe the condition of the pads as they wear quickly and lose their function. Another concern (especially in medical applications) is what happens to wear particles from the pads. This material frequently ends up on the blade itself, and is then transferred to the very product it is meant to protect from contamination. Particles would be especially noticeable on the top inside of the tube or profile.

Choosing Belt Materials

When considering puller performance, an important concern is the type of puller belt. To select the proper belt material, you must consider the extrudate's tendency to deform under pressure. For example, thin wall profiles and tubing are prone to deformation, so you need lower pressures and longer traction lengths to deliver the required pulling force without deformation and slippage.

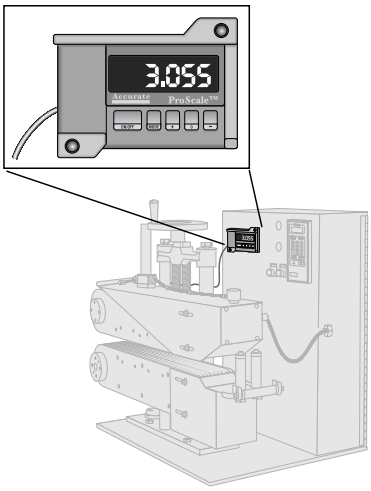
Various belt materials are available: natural rubber, neoprene, urethane, and dual material. Available belts are listed under Conair Belts in this Appendix.

Contact Conair Parts: (800) 458 1960
From outside of the United States, call: (814) 437 6861.

Conair Belts

Part No.	Material	Durometer	Covering Thickness	Color	Wear	Traction	FDA Approved
Model 1-12							
Belt type: Goodyear PD							
3511-30112	Natural rubber FDA	50-55	in. (2mm)	white	medium- excellent	excellent	Yes
173-047-02	Nitrile sponge FDA		in. (4mm)	white	medium-excellent	medium	Yes

Using the Digital Belt Gap Sensor



The digital belt gap sensor uses a linear scale attached to both belts to measure the relative distance between the belts. The relative distance is shown in thousandths of an inch (.001). The sensor has five buttons:

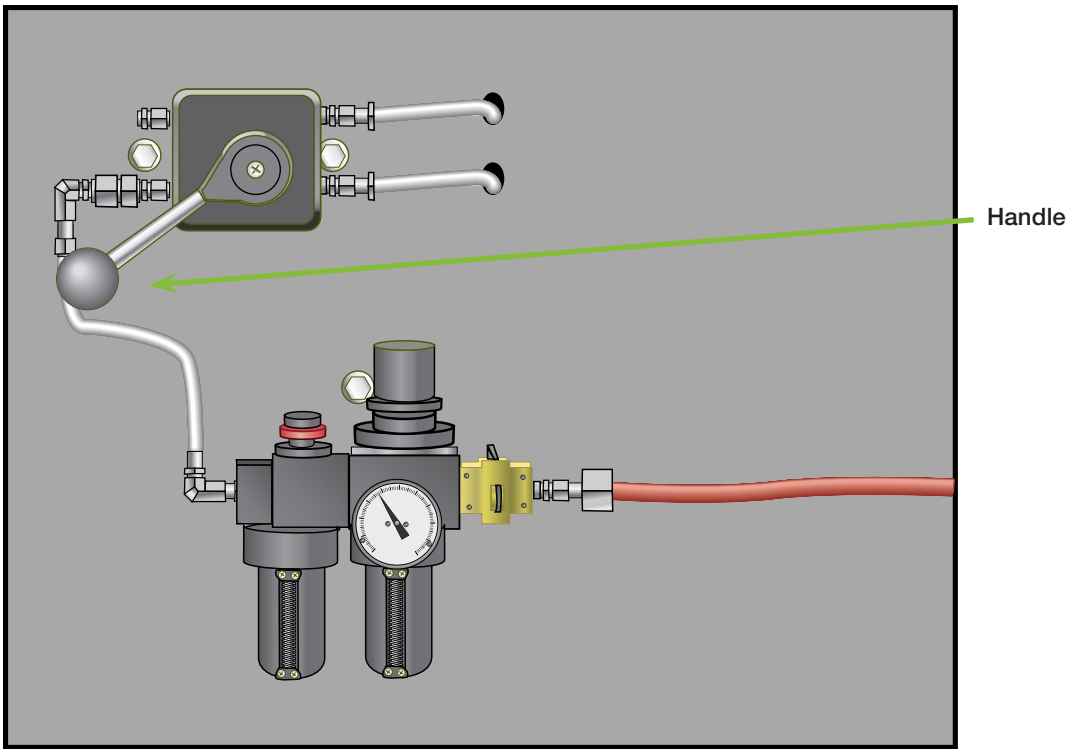
- (On/Off) - Turns the device on and off.
- (Mode) - Press to choose the readout in decimals, fractions, or millimeters.
- (+) - Press to move up one engineering unit.
- (0) - Press to zero the reading. Because all measurements are relative, the sensor can be set to zero at any time by pressing this button.
- (-) - Press to move down one engineering unit.

Readings displays are shown on the digital display.

For more information, refer to the belt gap sensor manual.

Adjusting the Pneumatic Upper Belt Actuator

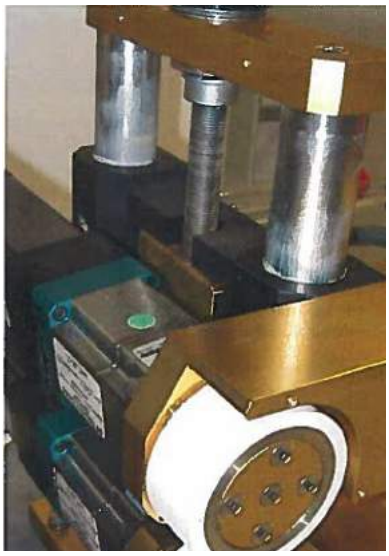
You can adjust the opening and closing speed of the air cylinder assembly that operates the upper belt boom assembly by adjusting (lifting and turning) the air regulator handle.



MedLine Pinch Rolls

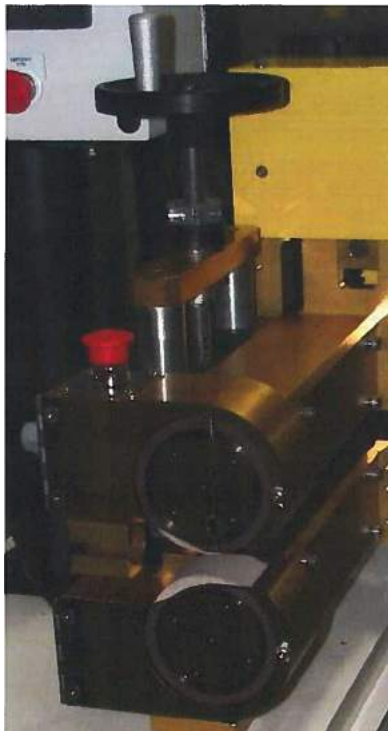
Dual Servo 3-inch Diameter by 1-inch Wide Pinch Rolls

Used for extremely small and precise medical and pharmaceutical applications.



Single Servo 4-inch Diameter by 2-inch Wide Pinch Rolls

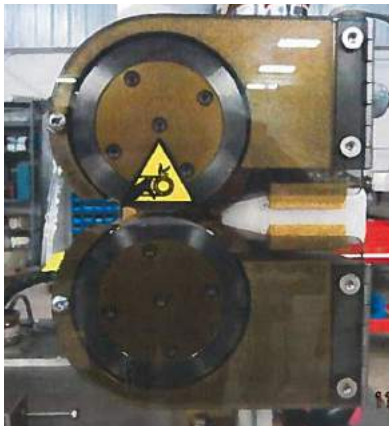
Used for off line applications, feeding from spools or reels with material which exhibits curvature/set, which makes it difficult to feed.



Custom (4) Roller Pinch Roll Unit

Designed to allow Harrell pinch roll users to have an updated unit, which will directly replace the original unit.

- Uses Harrell rollers
- Dual Servo
- Full enclosure guarding



Dual Servo 6-inch Diameter by 3-inch Wide Pinch Rolls

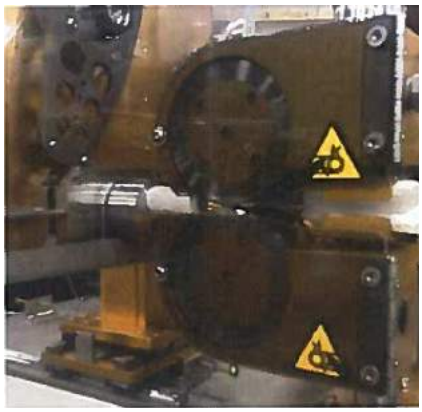
Used for high speed processing of FPVC (up to 1000 feet per minute).

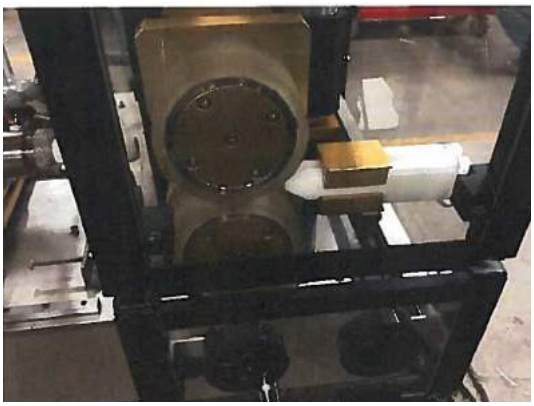
Available with both 70 Durometer Urethane and/or solid Stainless Steel Rollers

Pinch Roll Product Guides

Product guides serve to guide tube into rollers.

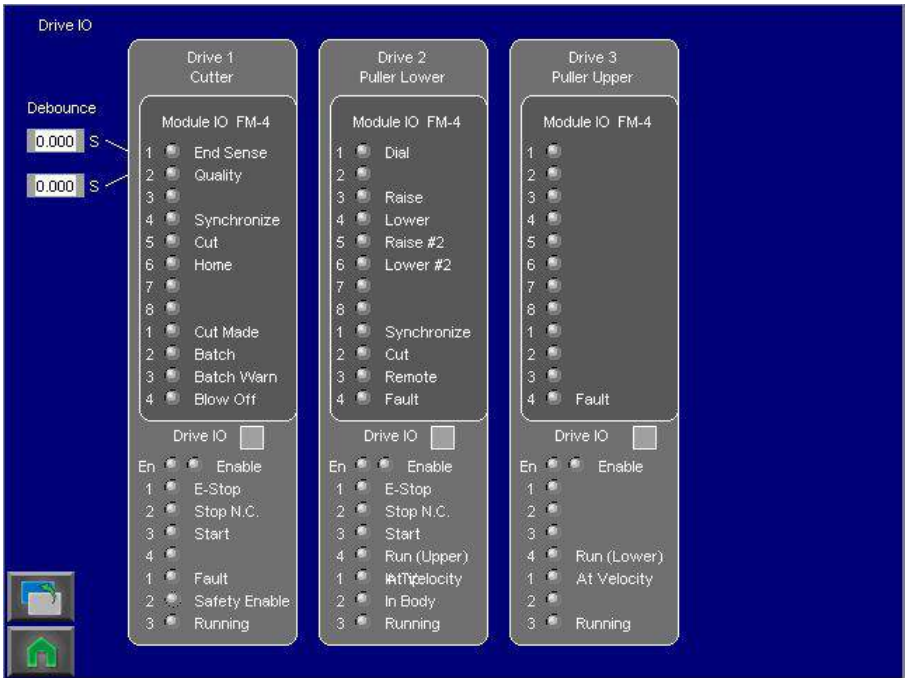
✎ **NOTE:** unit can be rotated with slot to enable string up (facing operator) or up for operation.





Quality Control Revision

Drive I/O Page



The original Quality system had one input using Cutter Module input #2, it now has three. These are wired at the Puller Module of the lower drive using inputs 2, 7 and 8, which are labeled Quality 1, 2 and 3. The original Input on the Cutter Is no longer used.

Quality Control Page

Offsets Section

The Quality Page now has three pairs of offsets, one pair for each input. Each input has a "Distance to Good" and a "Distance to Bad" preset. In addition, each input can be named. The name is saved on the Quality page but not at the 10 page, which keeps its name Quality 1, 2 and 3. For correct operation the Distance to Good offsets must always be larger than the Distance to Bad. A warning is given when this rule is broken.

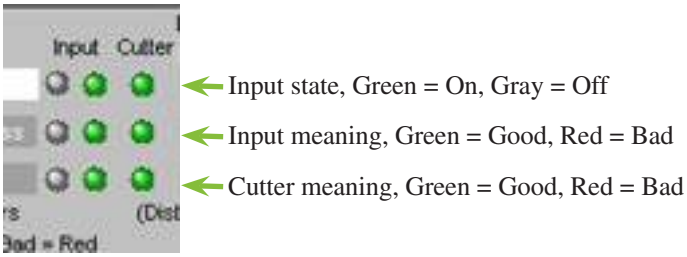
(Continued)

Quality Control Revision (continued)

In the example, Quality Input 1 has been named “OD” (Outside Diameter) and Input 2 has been named “Wall Thickness”. Any characters are allowed up to 16 characters.

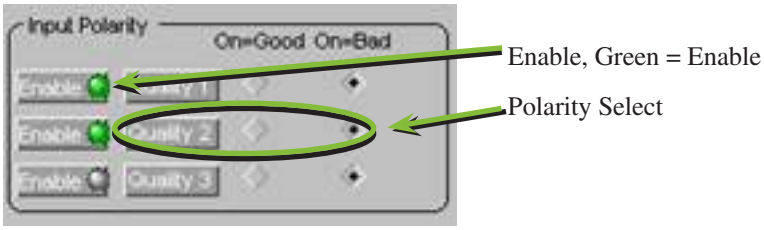
The first LED indicator to the right of the text field will be green when on (24VDC) and grey when off (OVDC). This is the state of the input and is the same for the Drive 10 page. Right of that is an LED indicator which is the meaning of the state of this input. Green indicates the state is good, red means he state is bad. During operation as the input changes state a log of the change is made to an offset queue. There are separate offset queues for each. The status at the Cutter changes after the offset distance completes. The LED indicators in the Cutter column have similar meaning to the corresponding input quality but after the distance offsets. The indicator will be green when good and red when bad. Any input that is bad will cause the message “Bad At Input” in red to show. likewise, if any Cutter status is red then “Bad at Cutter” will show in red. In the example, all inputs and status at Cutter are good so the messages are “Good At Input” and “Good At Cutter”-both in green.

Offsets Section



When the Quality system is enabled the Cutter will always start in the bad state (at the Cutter) and will remain in that state until all inputs are good and each Distance to Good has completed (will remain bad until the longest Distance to Bad completes).

Polarity Section



This section is used to individually enable the quality inputs. Use the Enable switches to enable the inputs that will be used. In the example, Quality inputs 1 & 2 are enabled and Quality 3 is disabled. Each Enable switch has a toggle action - press to enable, press again to disable. The meaning of each input can be defined as “On = Good” or “On = Bad”. Use the Quality buttons to select the meaning that is required.

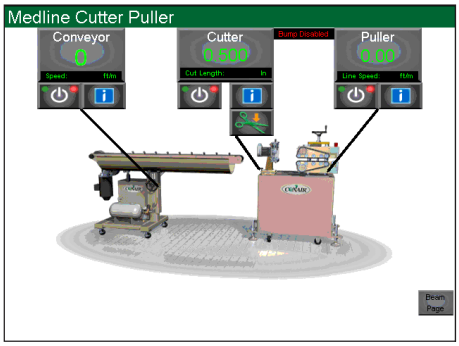
It is best to use “On = Good” logic when possible so that if operator forgets to plug the quality input into its place it is bad by default.

Warning Message
The Distance to Good MUST be greater than the Distance to Bad. A warning message will show if this rule is not correct.

Servo Beam

Beam

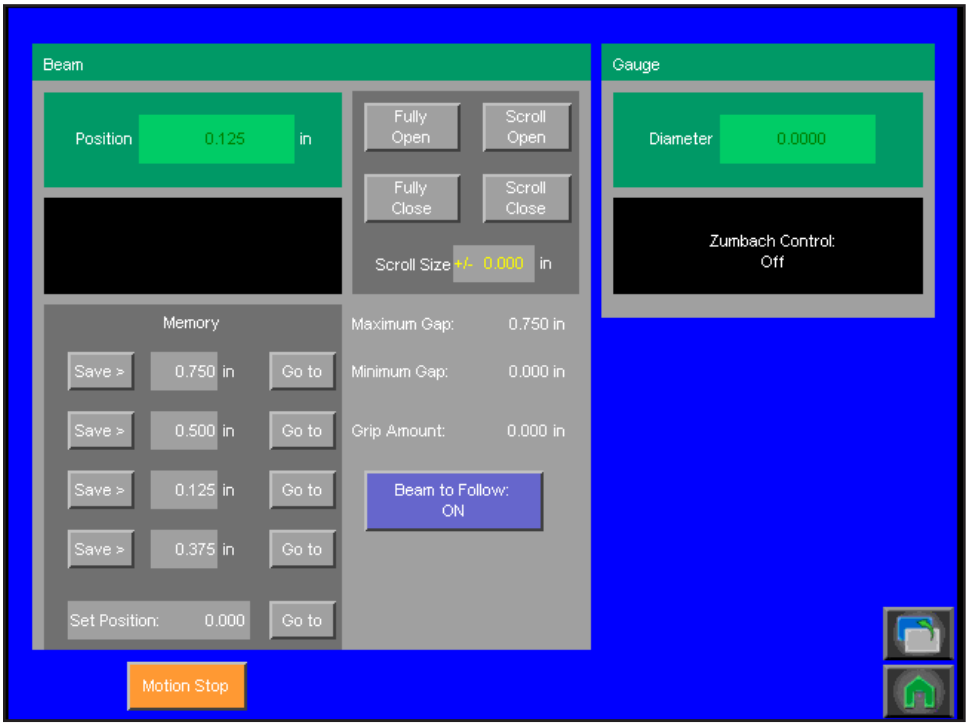
Home/Puller Main Screens



Go to Beam Position screen.

Beam Position Screen

Touch screens provide a user-friendly interface to set-up pre-defined beam positions.



Display current beam position.

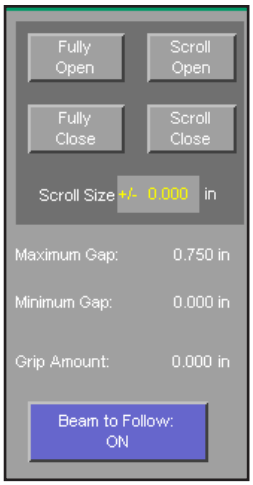
Save current beam position for pre-defined positions.

Display or set the pre-defined position.

Move beam to the pre-defined or set position.

Set a beam position to go to.

(Continued)



Servo Beam (continued)

Pushbuttons for Open/Close the beam fully or move per

the Scroll Size increment.

Settings for the Fully Open/Close beam positions.

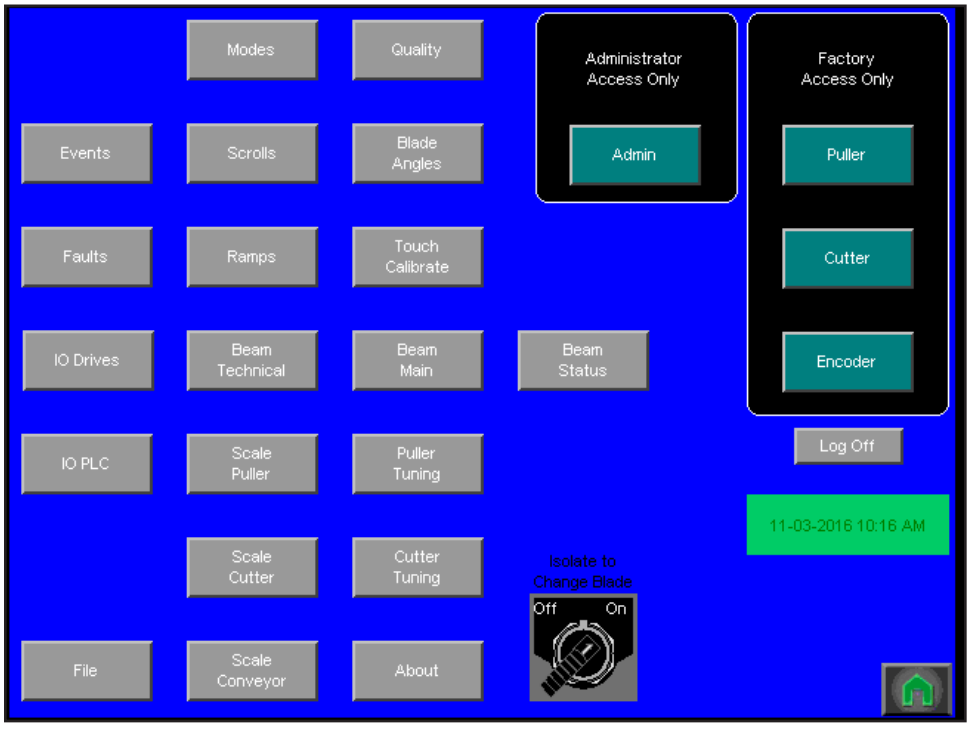
Setting for the distance necessary to close the beam to grip product.

Toggle to have beam follow a connected gage.

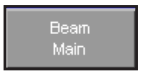
Stop beam motion.

Menu Screen

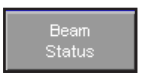
Touch screens provide a user-friendly interface to select functions.



Go to the Beam Technical screen.



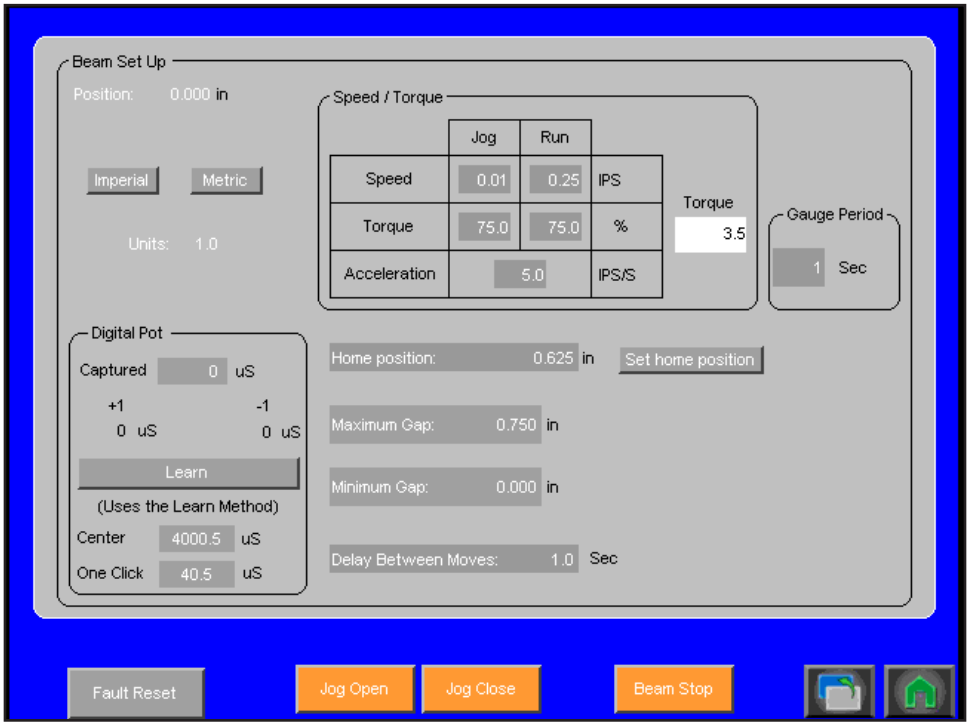
Go to the Beam Position screen.



Go to the Beam Status screen.

(Continued)

Servo Beam (continued)
Beam Technical Screen



Beam Set Up

- Set's Beam display units.
  - Imperial= inches
  - Metric= millimeters

Digital Pot

- Refer to manual for procedure.

Speed / Torque

- Set's the manual jog and running speeds, torque limits and accel (/decel) ramp rates.

✎ **NOTE:** Torque limits are SET AT FACTORY.

Home Position

- Set by closing beam on known thickness gage block and pushing "Set home position" button.

✎ **NOTE:** SET AT FACTORY.

Maximum/Minimum Gap

- Set's the maximum (open) and minimum (closed) beam positions.

Delay Between Moves

- Wait before moving beam in response to gauge change when the "Beam to Follow" mode is on.

(Continued)

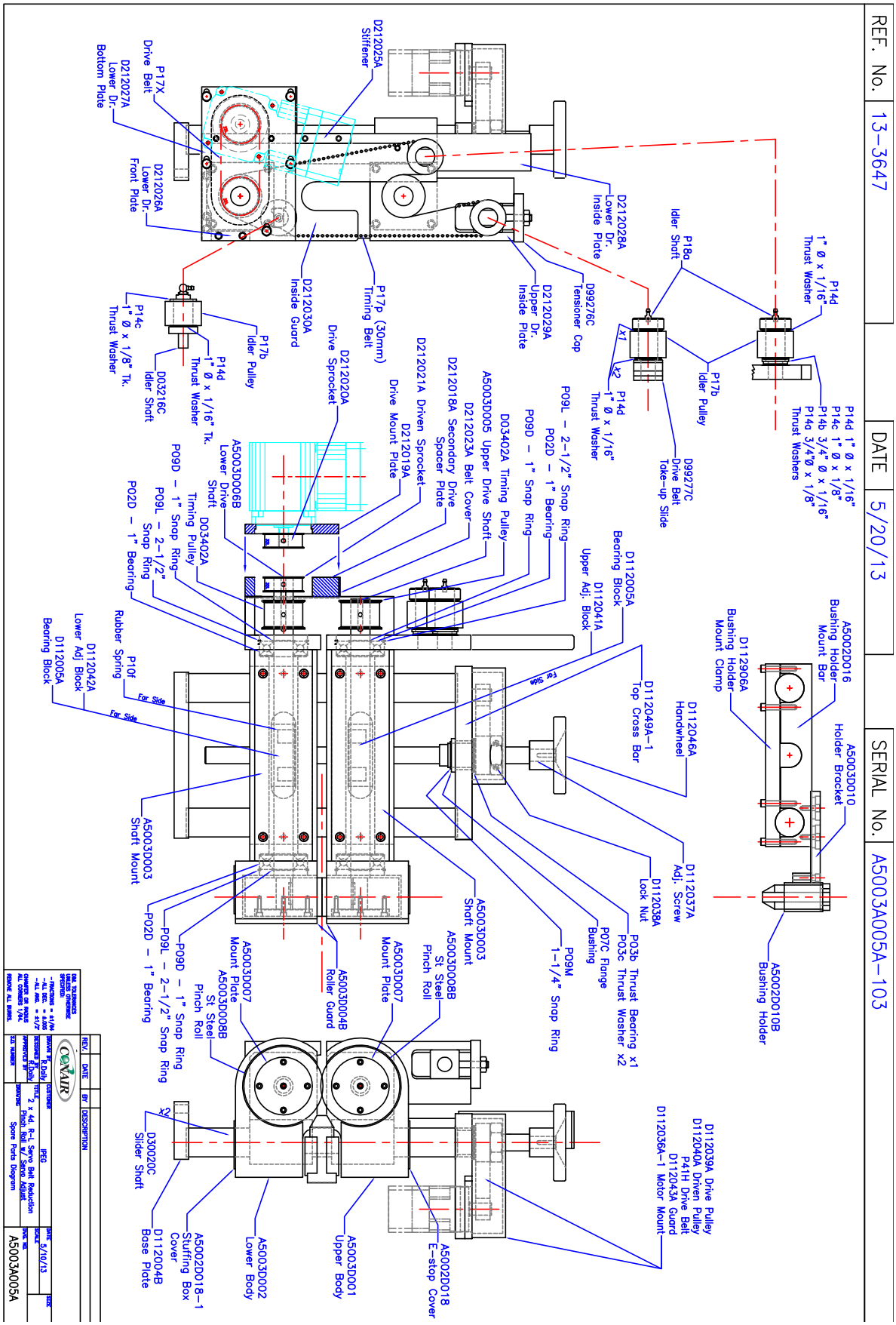
Servo Beam (continued)

Gauge Period

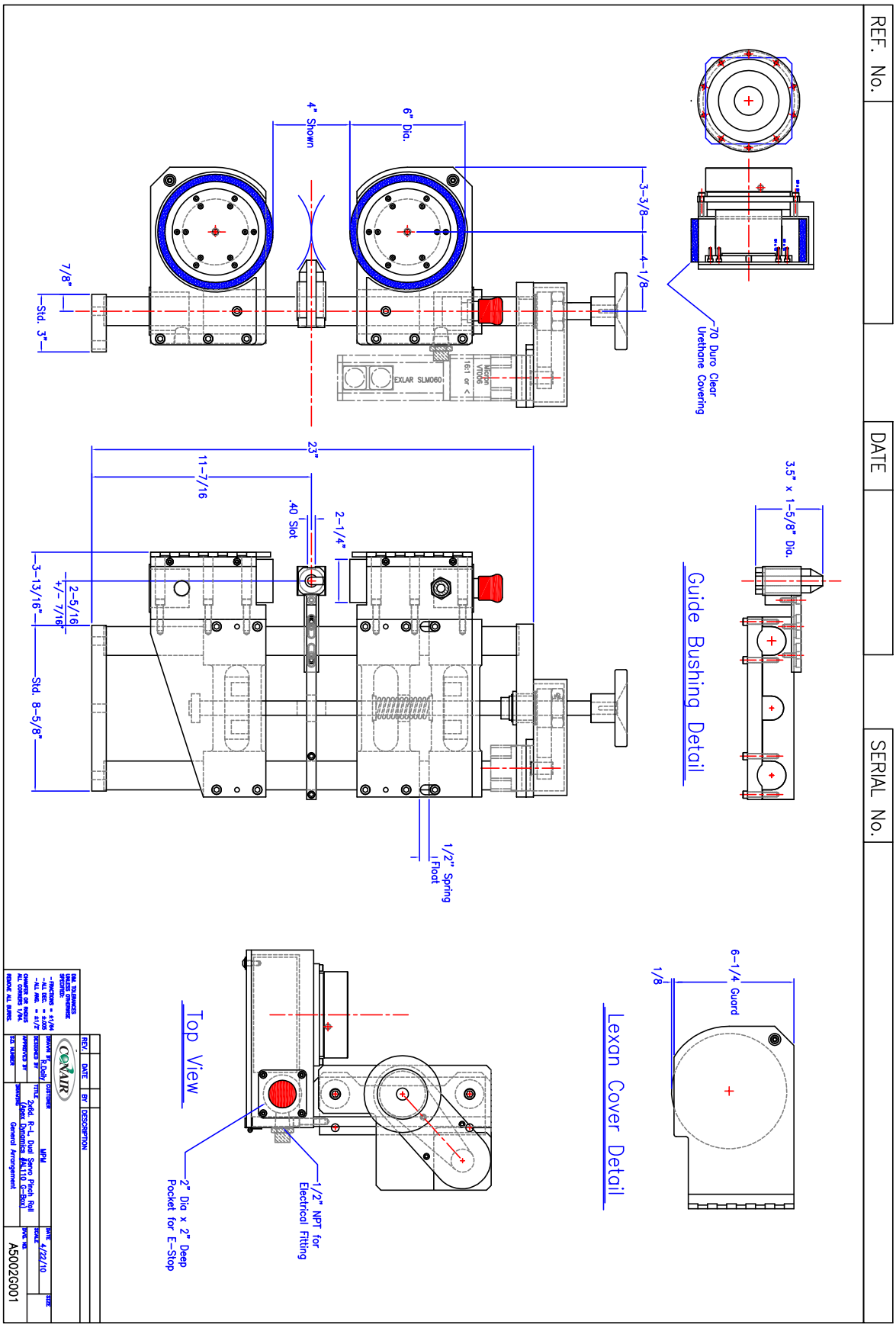
- Sample rate readings taken from gauge.

Beam Status Screen

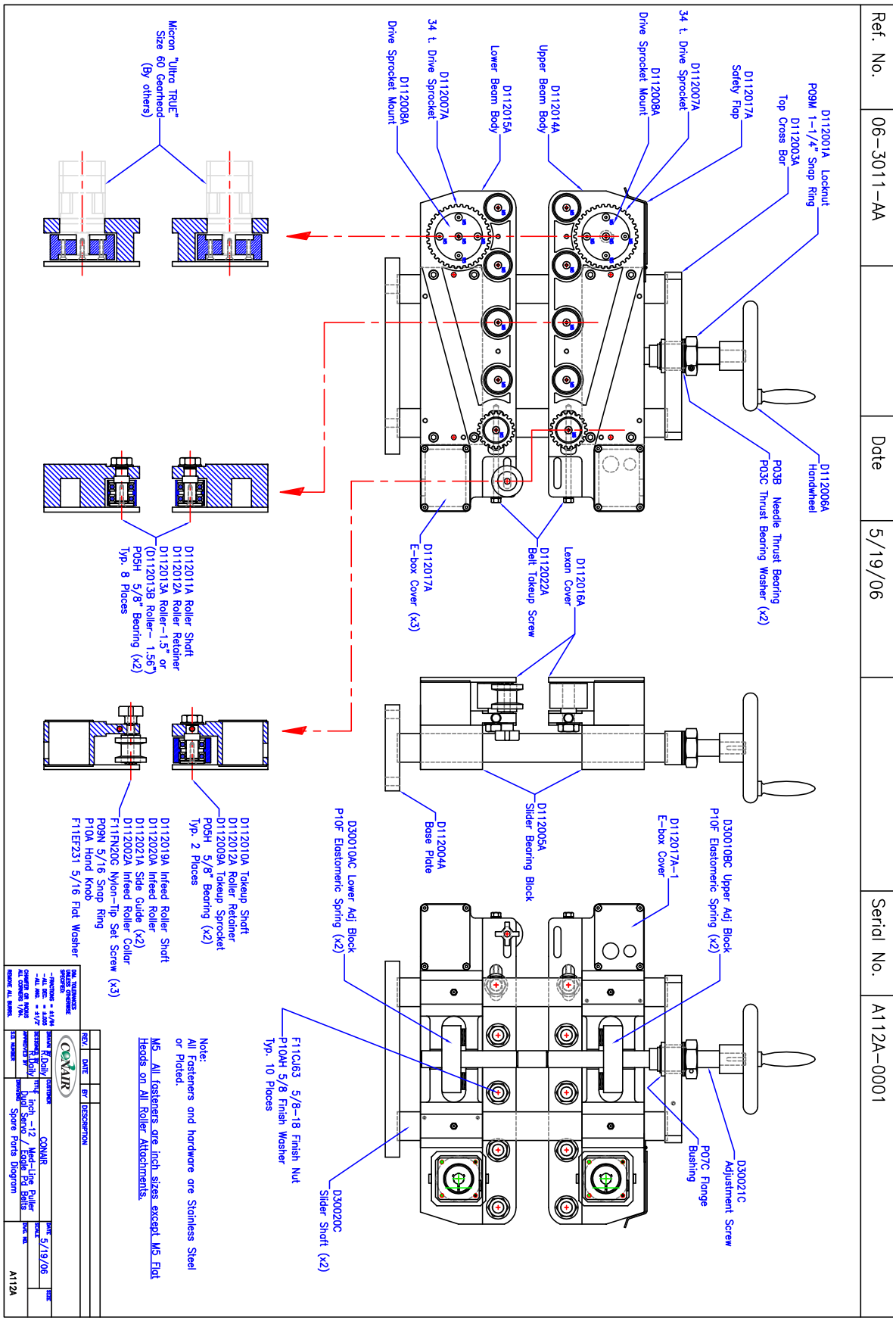
Technical Drawings



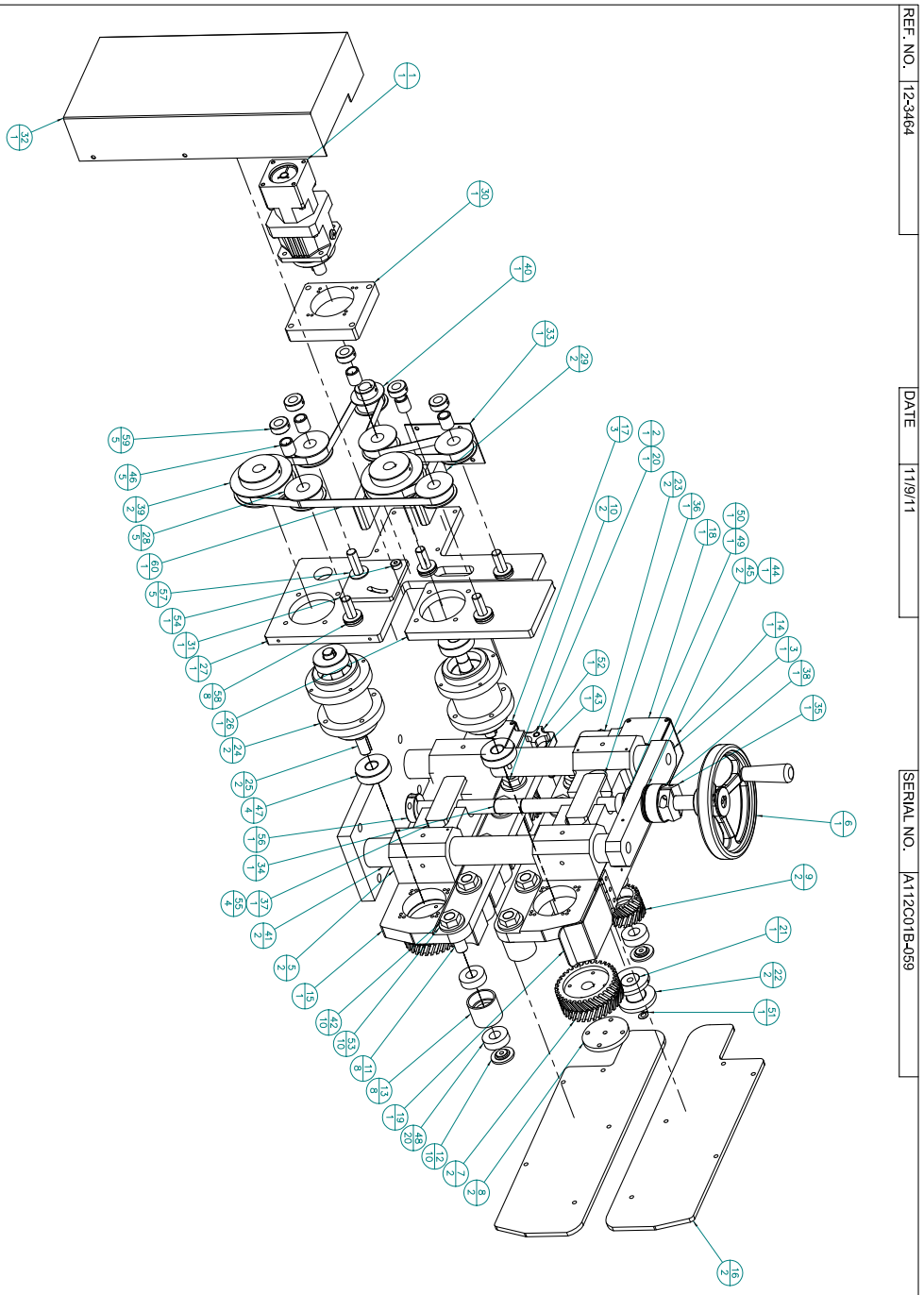
Technical Drawings



Technical Drawings



Technical Drawings



REF. NO.	12-3464	DATE	11/9/11	SERIAL NO.	A112C01B-059

Item Number	Document Number	Title	Quantity
1		GEARBOX (SUPPLIED BY CONAIR)	1
2*	D112002A	INFEED ROLLER COLLAR	1
3	D112003A	TOP CROSS BAR	1
4	D112004A	BASE PLATE	1
5	D112005A	SLIDER BEARING BLOCK	2
6	D112006A	HANDWHEEL	1
7	D112007A	DRIVE SPROCKET, EAGLE "HP" BELT	2
8	D112008A	DRIVE SPROCKET MOUNT PLATE	2
9	D112009A	TAKE-UP SPROCKET, EAGLE "HP" BELT	2
10	D112010A	BELT TAKE-UP SHAFT	2
11	D112011A	BELT SUPPORT ROLLER SHAFT	8
12	D112012A	IDLER ROLLER RETAINER	10
13	D112013B	BELT SUPPORT ROLLER	8
14	D112014B	UPPER PULLER BODY	1
15	D112015B	LOWER PULLER BODY	1
16	D112016A	LEXAN COVER	2
17	D112017A	E-BOX COVER	3
18	D112017A-1	E-BOX COVER	1
19	D112019A	UPPER BEAM SAFETY FLAP, R+L	1
20	D112019A	INFEED ROLLER SHAFT	1
21	D112020A	INFEED ROLLER	1
22	D112021B	INFEED ROLLER SIDE GUIDE	2
23	D112022A	BELT TAKE-UP SCREW	2
24	D112023A	BEARING MOUNT	2
25	D112025A	DRIVE SHAFT	2
26	D112026B	UPPER DRIVE MOUNT PLATE	1
27	D112027B	LOWER DRIVE MOUNT PLATE	1
28	D112028A	IDLER PULLEY	5
29	D112030A	DRIVE MOUNT SPACER	2
30	D112031A	DRIVE MOUNT PLATE	1
31	D112032A	IDLER MOUNT PLATE	1
32	D112033B	DRIVE PULLEY GUARD, R+L	1
33	D112034A	DRIVE PULLEY GUARD	1
34	D30021C	ADJUSTMENT SCREW	1
35	D112001A	LOCK NUT	1
36	D30010BC	UPPER ADJUSTMENT BLOCK	1
37	D30010AC	LOWER ADJUSTMENT BLOCK	1
38	D112044A	SPACER	2
39	D112047A	DRIVEN PULLEY	1
40	D112048A	DRIVE PULLEY	2
41	D30020C	SLIDER SHAFT	2
42	F11C-B3	1/4-8 S.S. HEX THIN JAM NUT	10
43	F11EF231	1/4-8 S.S. FLAT WASHER	1
44	P03B	THRUST BEARING	1
45	P03C	THRUST WASHER	2
46	P03G	NEEDLE BEARING	5
47	P04C	BALL BEARING	4
48	P05H	NICE BEARING	20
49	P07C	BRONZE FLANGE BEARING	1
50*	P09G	1.25 DIA. EXTERNAL SNAP RING	1
51	P09N	EXTERNAL SNAP RING, STAINLESS	1
52	P10A	HAND KNOB	1
53	P10AH	FLAT WASHER	1
54	P10AL	S.S. SHOULDER BOLT	10
55*	P10F	RED TOOL # BES-3503	1
56	P10Z	THREADED CLAMPING COLLAR	4
57	P14V	1/2 x 1/16 THRUST WASHER	1
58	P14W	1/2 x 1/8 THRUST WASHER	5
59	P41A	DOUBLE GEARBELT x 1/2" WIDE	8
60	P41B		5

REV.	DATE	BY	DESCRIPTION

CONAIR

DRAWN BY: LEM — DESCRIPTION: 1"-12 MED LINE PULLER — COMPANY: CONAIR — DATE: 10/16/08

CHECKED BY: LEM — MATL: 1" PULLER, R+L, "HP" BELT, MAN. PNE 4[illegible] — DWG. NO.: A112C01B.dft — REV.

SHEET 1 of 2