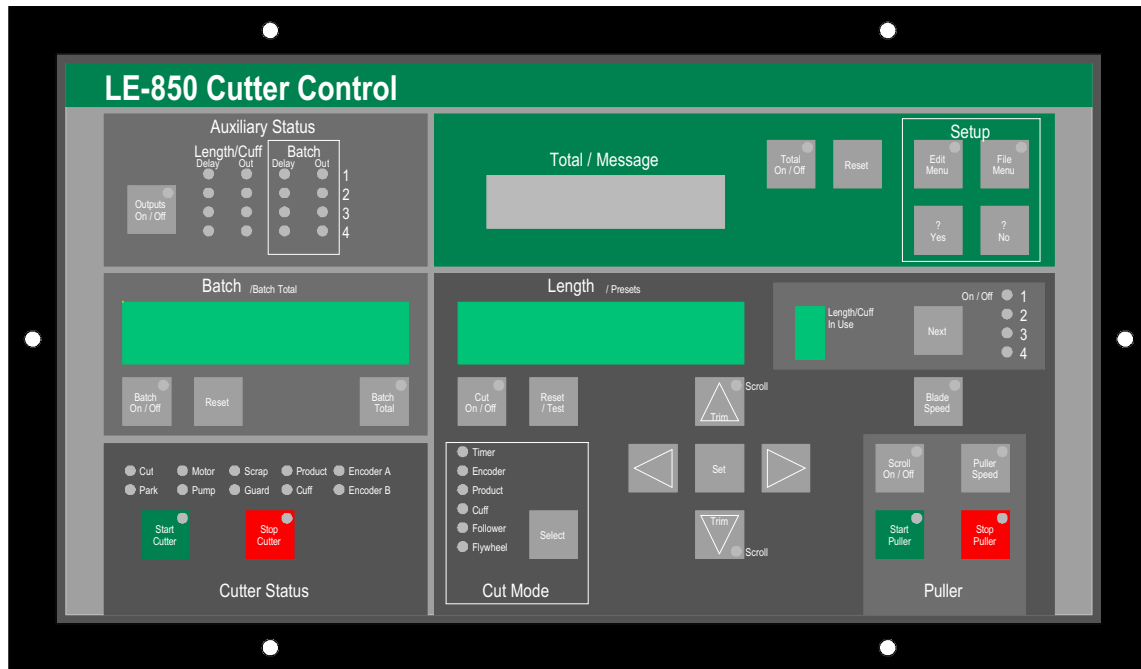


# LE-850 Instruction Manual

The LE-850 is a controller for use with servo rotary fly-knife cutters. It contains advanced features not found on typical rotary cutting systems.



## Features

The following features are available:

### Cut modes –

- ◆ **Timer** - quartz crystal derived - 1,000-cps
- ◆ **Encoder** - Quadrature or Uni-direction.
- ◆ **Product** edge via an optical sensor. Offset is available.
- ◆ **Cuff** for corrugated sections with flat portions.
- ◆ **Follower** - electronic gear lock to Puller.
- ◆ **Flywheel** - blade spins continuously - length control by rotation speed.

**Scale Factor** – for setting imperial or metric lengths via an encoder.

**Sequenced lengths** - 4 Lengths are available for On-demand modes. Any combination can be sequenced, i.e. length 1 followed by length 2 etc. Each length uses a separate Batch value. Lengths can be turned on or off individually.

**Auxiliary outputs** – each length or batch of lengths can be made to operate auxiliary outputs either immediately or after a time delay. Typically used for synchronising downstream sorting and packing machinery. Lengths have a separate menu for choice of which outputs to operate.

**Fast outputs** - two outputs are built in to the LE-850 control for quick response requirements. Dedicated for length use. Any length can operate these.

**Batch pre-warn** – to notify when a Batch is near completion. *A separate output and reset is available.* \*

**Batch Total** – a counter that counts batches. *A separate output and reset is available.* \*

*All outputs can be individually reset by hardware connections.* \*

**Puller control** – for combination servo cutter / puller machines. \*

**Automatic Shut Down** – to shut down the cutter and / or the puller on completion of Batch Total.

**Automatic Puller Correction** – “Scroll”, for automatic modification of servo puller speed to correct product diameter. *This requires an external scanner monitoring the product.* \*

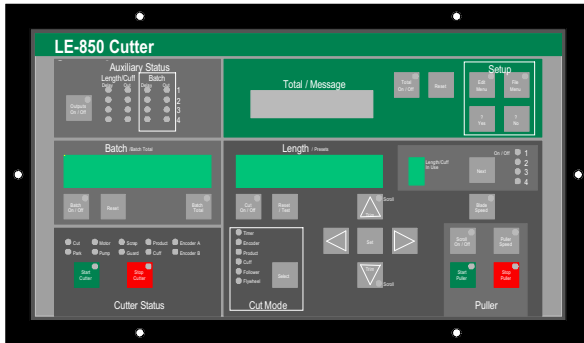
**Scrap Mode** – for separating out-of-tolerance product as detected by an external scanner. *This requires an external scanner monitoring the product.* The scrap product can be cut to a user-defined length to differentiate it from good. When scrap product is seen the auxiliary outputs are disabled. \*

**Recipes** – [option] similar to files where all parameters (ingredients) can be saved bundled in one place. Names of eight characters can be assigned to each of sixteen possible recipes.

**RS-485 communications** – [option] for virtual instrumentation all can be operated over the RS-485 communications on a host computer.

\* Most Auxiliary connections require an additional IO card.

**The Fascia**



The fascia is a flat membrane consisting of two six digit green LED displays, an In Use digit, a green backlit LCD message center, LED status indicators and operator tactile feel keypads.

Primarily the left-hand display is used to show the Batch Count, and the right-hand display is used to show the Length Count. These displays will show other values and parameters when making changes.

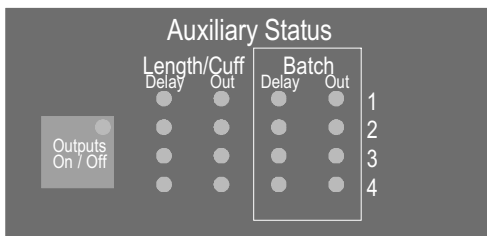
The message center defaults to an eight-decade counter for displaying total cuts. At other times it provides messages, i.e. information about which parameter is being displayed in the Length / Preset display.

There are many functions available in this control so special attention has been made to the layout. Associated functions have been blocked together and will now be discussed.

**Keys – in General**

Each press of a keypad will cause a momentary beep to be heard from the built in buzzer. There is also a tactile feel. Some keypads have no functions in certain modes, yet a beep will still indicate a response. Keys that are machine dependent may not have functions for your machine so will not beep. Some keys have a repeat function or access to a special function when the key is kept pressed.

**Auxiliary Status Section**



Each length or cuff and each batch can operate auxiliary outputs. Four length / cuff and four batch outputs are available. These outputs can be latched or timed, immediate or delayed. There is a separate reset available for each and a global reset that can disable all outputs simultaneously (requires IO card).

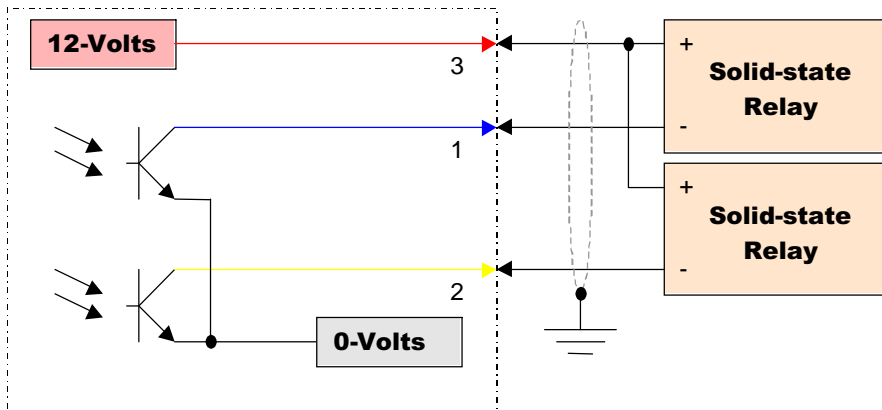
The timers can be set via the Edit menu - see Edit menu section. Delays range between zero and 20 seconds. Outputs range between zero and 5 seconds. *Zero is used to latch an output on.*

In this section there are sixteen colored indicators. All delays are yellow, outputs are green, and an output that is in a hardware reset state is red. The green and red lights are contained within the same indicator. *Very short durations below 10 milliseconds may not be seen due to the display refresh time.*

● Auxiliary outputs can be globally enabled or disabled using the Outputs On/Off key. Disabling the outputs will switch off all delays and outputs that are currently operating and prevent further operation. Individual disabling is possible by using hardware resets on a separate IO card. Enabling auxiliary outputs means that this section will function when the machine is running, i.e. available for program use.

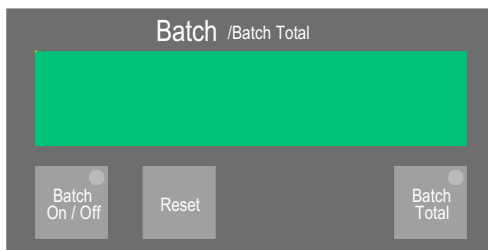
The state alters with each key press. To show when outputs are enabled the light in the key will light. They will then turn on as cuts and batches complete.

**LE-850 Fast Outputs**



Length Auxiliary outputs 1 and 2 are provided within the controller. They are available on a tiny 3-pin metal connector at the rear of the control. These outputs use opto-isolated components and have about 50mA of current capability. To operate larger currents or high voltage devices it is strongly recommended that they be operated via solid-state relays as in the example above.

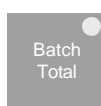
**Batch / Batch Total Section**



This section contains a six-digit display and three keys. The display defaults to showing the current batch count (amount of cuts made in the current batch).



This counter can be reset to zero by using the Reset key and it can be enabled or disabled by using the Batch On/Off key.



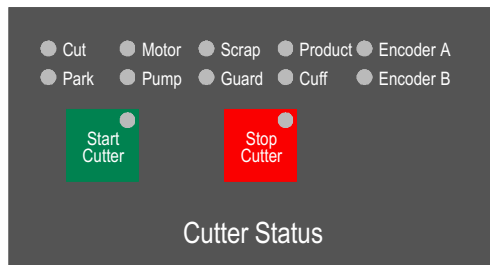
Each completion of a batch increases the Batch Total counter. To see the contents of the Batch Total press the Batch Total key. The value will show for 5 seconds. The Batch Total is a four-digit counter. To differentiate it from the six-digit Batch Counter it is preceded by P- (which is short for Packs). While the Batch Total value is being shown it may be reset to zero by the Reset key.

The Batch Total count is compared to the Batch Total preset. When this value is reached the Batch Total output will switch on and the indicator in the Batch Total key will light. The hardware reset on separate IO card will disable this output if activated. It can also be used to cancel the output after it has set. The Batch Total key resets this output. It does not reset to zero automatically so will continue beyond its preset.


**Batch Total - Auto Power down Feature**


The control can be set to shut down the cutter and / or the puller on completion of the Batch Total. This facility is available in the Options menu after setting the Batch Total preset and will be described later.

### Cutter Status Section



This section contains two keys and ten indicators for machine status.

 This key is used to start the cutter. The guard input must be closed before start can be accepted. Without it a “Guard Open” error will be displayed. The guard status light will be lit when the guard is safe. The light inside the Cutter Start key will show when the cutter is running. The motor light in the status indicator will also light.

 This key is used to stop the cutter. Certain faults will also stop the cutter accompanied by a fault message. The motor indicator will turn off a few seconds after Stop turns off.

A yellow light in this key will be lit if enabled from the Automatic Shutdown menu. When lit the cutter will power down on completion of the Batch Total. This feature will be described in more detail later.

### Cutter Status Indicators

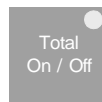
- Cut ----- lit when a cut has been triggered.
- Park----- lit when the park input is on.
- Motor----- lit when the motor enable output is on.
- Pump ----- lit when the drive enable output is on.
- Scrap ----- this has two colors. It is red when the input is on and it is green when the feature is switched on from the Options menu. Both lights on together appear yellow.
- Guard----- lit when the guard input is closed - safe to run.
- Product----- lit when the product input turns on
- Cuff----- for Cuff mode only, this lights briefly when a cuff is confirmed.
- Encoder A ----- lit when the encoder-A input is on.
- Encoder B----- lit when the encoder-B input is on.

At certain encoder frequencies Encoder A and B lights may pulse, stay on or flicker erratically. This is normal.

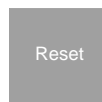
**Total / Message Section**

This section contains a Liquid Crystal Display (LCD) and six keys. The four set-up keys and messages will be described later. For now, the emphasis is on the use for showing the total cuts made. There are

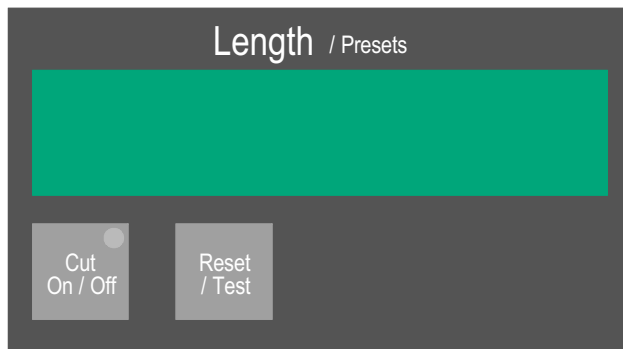
eight-decades available for this purpose. A comma separates each thousand, i.e. ten million, three hundred and sixteen thousand and eleven is shown as 10,316,011. This makes the display easier to read.



This key is used to enable or disable the total counter. The option changes with each key press. When enabled the light in the key will be on and the counter can count cuts.



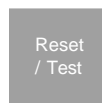
This key can be used to reset the count to zero.

**Length / Presets Section**

This section contains a six-digit display that defaults to show the current count but can also be used to display parameters and simple messages. Seven keypads are in this section; five of these keys are used for editing parameters and will be described later in the editing section. For now we will describe the two keys at the left-hand side of the display in association with the length counter.

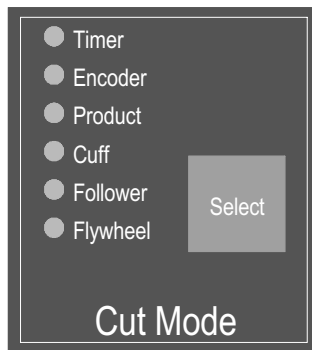


This key is used to enable or disable cuts. The option changes with each key press. When enabled the light in the key will be on. The Start indicator must also be on for cuts to occur - see Start Cutter key.




This key can be used to restart the count. If the motor is enabled and in an on-demand mode it will make a cut. A manual cut is considered a sample so will not be counted on either of the Batch or Total counters. Auxiliary outputs do not respond to manual samples. Counting continues at the next count edge following the reset so the next length will be correct. A test cut can be made irrespective of the Cut On/Off setting. This key is also used when editing presets.

### Cut Mode Section



This section contains one key and six mode indicators.

 Select is used to change the cut mode. There are six cut modes listed but some modes may not be available for your particular machine due to system availability. Each press of this key selects the next item available down the list. Modes that are not available will be skipped. Pressing this key while at the last available item in the list will return to the first available mode at the top of the list. Only one cut mode can be available at any given time.

During editing of parameters this key is disabled.

The new mode begins two seconds after it is selected.

### Cut Modes

#### TIMER

Counts milliseconds from internal quartz crystal source. When the count equals or exceeds the length preset the blade will be operated to provide a single cut (360°). The decimal point is shown to three decimal places for counter and presets - seconds.milliseconds.

Length sequencing is possible.

#### ENCODER

Counts signals from an Encoder connected to the Encoder A and B terminals. Typically, the Encoder is used to measure distance. When the count reaches zero a cut is made.

The phase relationship of the Encoder is used to determine direction when set to Quadrature mode. If only one channel is available the counter will use Uni-directional mode. The single channel should be connected to input A with B left open.

The controller automatically detects the encoder type by observing the activity on the two inputs. If it sees activity on the A input and none on the B the message window will briefly display "Uni-directional Encoder". A quadrature encoder will briefly issue a "Quadrature Encoder" message. In Quadrature mode a count is made at each signal edge of the A input which has the effect of providing two counts for each pulse. For example, an encoder with 600 pulses per revolution will give 1,200 counts. These inputs can handle frequencies up to 500KHz. Uni-direction mode uses only one edge of the A input so 600ppr will equal 600 counts.

The counter and presets are ten decades each, consisting of four integer digits and six decimal places (xxxx.xxxxxx). However, the display only shows the six most significant decades (xxxx.xx). The lower decades are still registered. The upper six decades of the encoder preset can be altered; the lower four decades are fixed at zero (xxxx.xx0000).

The scale factor is aligned to the lower six decimal places (0.xxxxxx). The scale decimal point cannot be seen.

Length sequencing is possible.

**PRODUCT** Provides a cut when the Product input is activated. Typically, an optical sensor is positioned to detect the product edge downstream of the cutter. Alternatively, this signal can be provided by another counting system or from a synchronising source.

A Hold-off timer is available to avoid double cutting caused by product bouncing in front of the sensor or contact chatter from relay contacts. The input initiates a cut and begins the Hold-Off timer. During the Hold-Off period the sensor is ignored. Hold-Off uses the internal quartz crystal timing source. The value entered is in milliseconds and must be set less than the time expected between cuts so that it is ready for the next edge, i.e. 70 to 80% of the length. The decimal point is shown to three decimal places for both count and preset - seconds.milliseconds.

An offset preset is also available which appears after entering Hold-Off. If an immediate cut is required simply set this to zero.

**CUFF** This is a special mode that uses the Encoder and Product inputs together. In this mode the product input has to change to a defined logic level and remain at that level for a distance longer than has been preset. Typically, this combination would occur from corrugated tubing that has flat sections, or material that includes a marker.

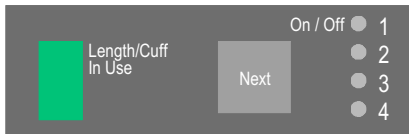
Once this criteria has been met the cuff will be confirmed to the operator by a short flash of the cuff indicator (machine status section). Between one and three cuts can be synchronised from this cuff. As with Product mode a Hold-off is available. Hold-off differs slightly from product mode as it uses distance rather than time. The search for the next cuff is disabled until the Hold-off distance completes.

Sequencing is available.

**FOLLOWER** Is available for FX style servo cutters that have a PCM-15 personality module fitted. In this mode the length entered is passed to the servo drive. The amount of blades that are fitted to the cut wheel can also be entered. The drive then uses this information along with information provided by the puller to lock the blade rpm to the puller speed. This is an electronic version of a gear lock. The length display will show the word "Slave" because the cutter is the slave part of a master/slave system. The puller is the master.

**FLYWHEEL** Typically, this mode is used for short lengths where the motor continuously rotates. The length is set by line and blade speed. The park sensor continues to be used to count cuts and a blade quantity preset is available for multiple blade applications. Length presets cannot be set in this mode so the display shows "FLY" meaning it is cutting using the Flywheel method.

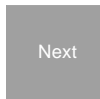
### Length / Cuff in Use Section



This section consists of a single digit, a key and four indicators.

The four indicators are used to show which lengths / cuffs are enabled. Enabling and disabling lengths is made through the edit menu.

The digit is used to display which length / cuff is currently in use. As there are four possible lengths / cuffs available this digit can only show numbers one through four. As a batch of lengths or a cuff is completed the next available length / cuff will be selected.



This key can be used to manually select the next length / cuff rather than having to wait for automatic switch over.

For Product, Follower and Flywheel modes length 1 only is available all other lengths are disabled.

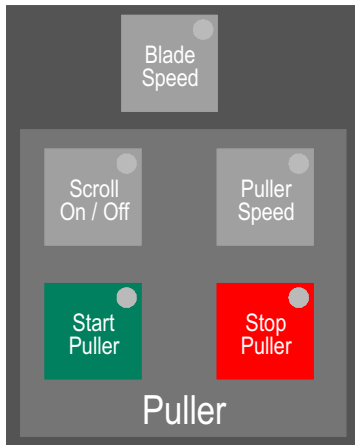
Timer and Encoder modes switch automatically to the next available length after the current batch of lengths is complete.

Cuff mode will switch to the next available cuff when the current cuff is complete.


If only one length / cuff is enabled the same length / cuff will repeat.


It is possible to switch off all lengths / cuffs through the edit screens. The length / cuff in use will then continue using the last preset that it had been processing.


### Puller and Blade Speed Section





These five keys are for Servo machines. The block of four keys are for combination cutter / pullers when they are enabled.

- 

This key is used to set the blade quantity in Follower and Flywheel modes and blade speed in every other mode. When this key is first pressed the light in the key turns on and the preset will appear in the Length / Presets display. The message window will show the name of this parameter. The value can then be altered as required using the edit keys. Entering a new value or pressing the Blade Speed key again will enter the value. The light in the key will turn off and shortly afterwards the displays will return to their default uses.
- 

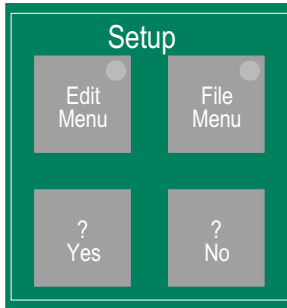
This key is used to set the puller speed. When this key is first pressed the light in the key will switch on and the preset will appear in the Length / Presets display. The message window will show the name of this parameter. The value can then be altered as required using the edit keys. Entering a new value or pressing the Puller Speed key again will enter the value. The light in the key will turn off and shortly afterwards the displays will return to their default uses.
- 

It is possible for the Puller speed to be modified externally using Scroll inputs. This key is used to enable or disable this function. The ability to scroll alters with each key press. When enabled the light in the key will be on. Typically, the scroll feature would be turned off while setting up the line and would be enabled once the product dimensions have stabilised.
- 

This key is used to start the puller. When enabled the light in the key will switch on.
- 

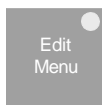
This key is used to stop the puller. The light in the Start Puller switch will turn off. A light in this key can be lit by enabling it from the Options - Automatic Shutdown menu. This feature will be described later.

### Setup Section

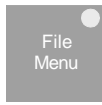


This section contains four keys. They are used with the LCD Message center, Preset display and edit keys (Set and arrow keys) to access menu items and parameters.

There are many parameters available. To assist in finding the right parameter each is named and grouped in easy to find sub menus.



This key is used to access the edit menu. The first time that it is pressed the light in the key will switch on. The first line of the Message center will change to read “Edit Presets”. The second line will read the first menu option available for the current cut mode. Pressing this key again at any time will cancel the edit menu without making changes and the light in the key will turn off.



This key is used to access the file menu. This is an optional feature. The first time that it is pressed the light in the key will switch on. The first line of the Message center will change to read “File Menu”, the second line will read “Load File?”. Two options are available in this menu, Load File or Save File. Pressing this key again at any time will cancel the file menu without making changes and the light in the key will turn off.



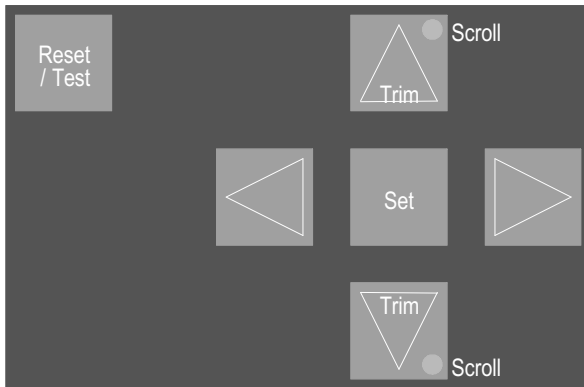
These keys are used while editing to accept or decline an option or preset. At all other times these keys have no functions. Most menu items will include a question mark at the end. For example “Load File?”. When this occurs, a yes or no response from the operator is expected. For example, you either want to load a file or you do not.

Yes, accepts the option shown. If this is a parameter it is placed in the edit window for editing. If there is a sub heading or further question then that will be shown.

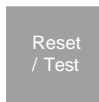
No, is used to reject the option shown. The next item or question down the list then appears. Mostly, this key has a very similar function to the down arrow key.

The functions repeat if kept pressed.

## Edit Keys

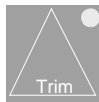


There are six keys in this section. These include the Reset / Test, Set, Up, Down, Left and Right.



When setting a file name the Message center is used to show the name as it can show text and numeric characters. The reset key is used to clear the name. Eight spaces (blanks) are shown after it is reset.

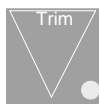
When a parameter is being shown in the Length / Presets display this key can be used to reset it to zero. A parameter appears with one of its digits flashing.



When choosing items from the Edit menu this key is used to move up the list of options. While the first item in the list is showing this key will choose the last item in the list.

When setting a file name this key scrolls the underlined character up through the available characters. Letters A to Z, numbers 0 to 9 and space (blank) characters are available.

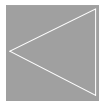
When a parameter is being shown in the Length / Presets display this key is used to increase the digit which is flashing. The number is increased from zero to nine and back to zero again.



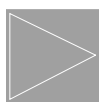
When choosing items from the Edit menu this key is used to move down the list of options. While the last item in the list is showing this key will choose the first item in the list.

When setting a file name this key scrolls the underlined character down through the available characters. Letters A to Z, numbers 0 to 9 and space (blank) character are available.

When a parameter is being shown in the Length / Presets display this key is used to decrease the digit which is flashing. The number is decreased from nine to zero and back to nine again.



When setting a file name or parameter this key selects the highlighted character to the left of the character that is presently highlighted. While the first character is highlighted pressing this key will select the last character. Characters are highlighted in a filename by an underline. Highlighted characters in a preset flash on and off.

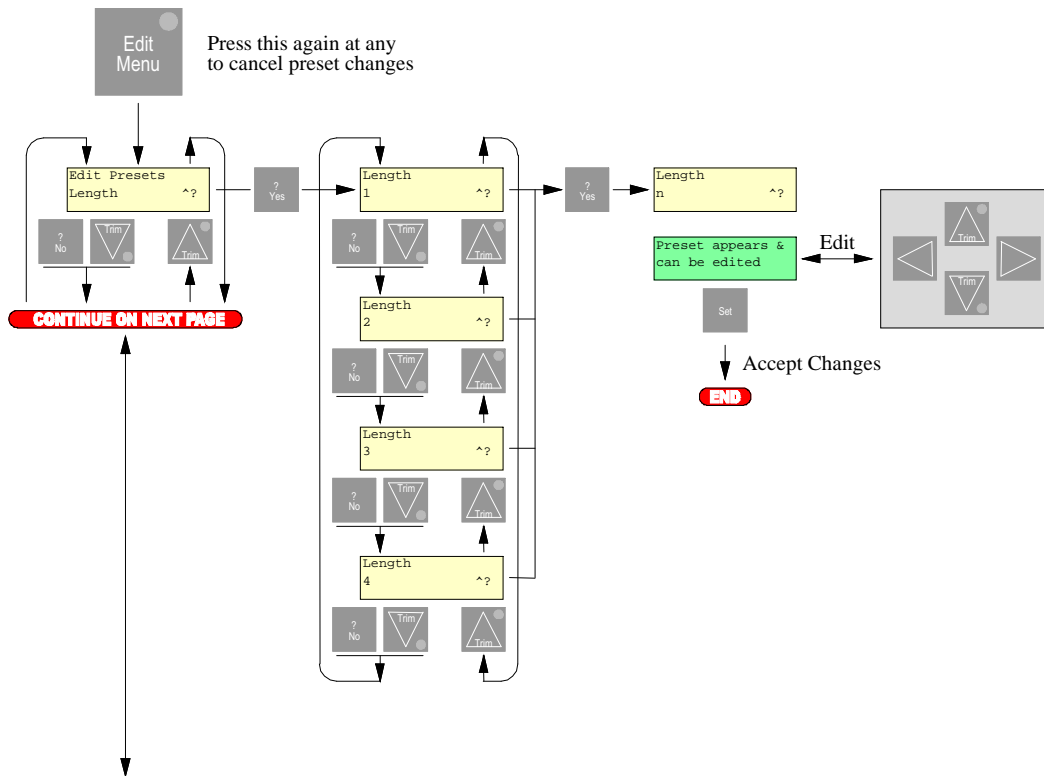


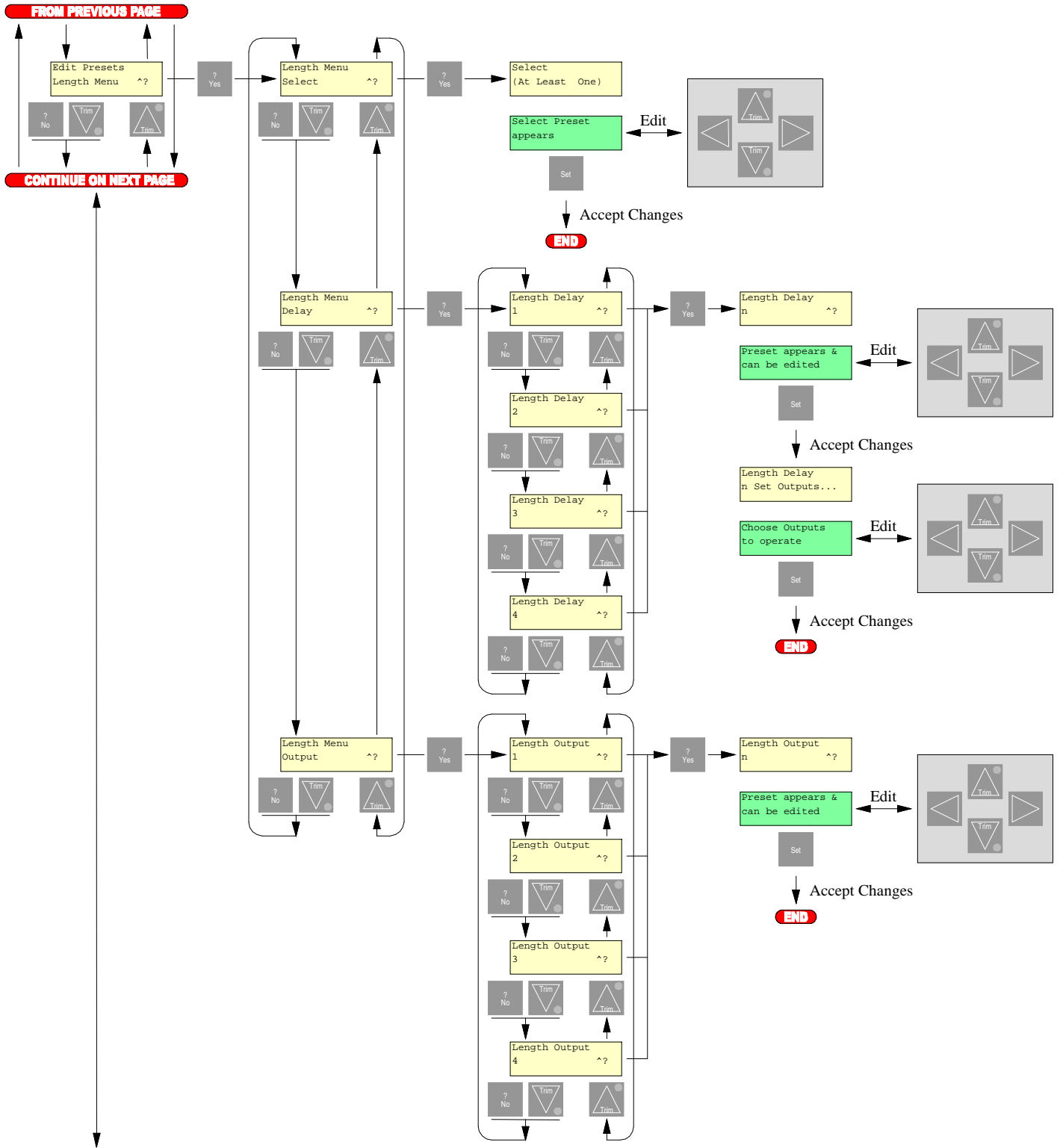
This is similar to the Left key but moves the highlight towards the right.

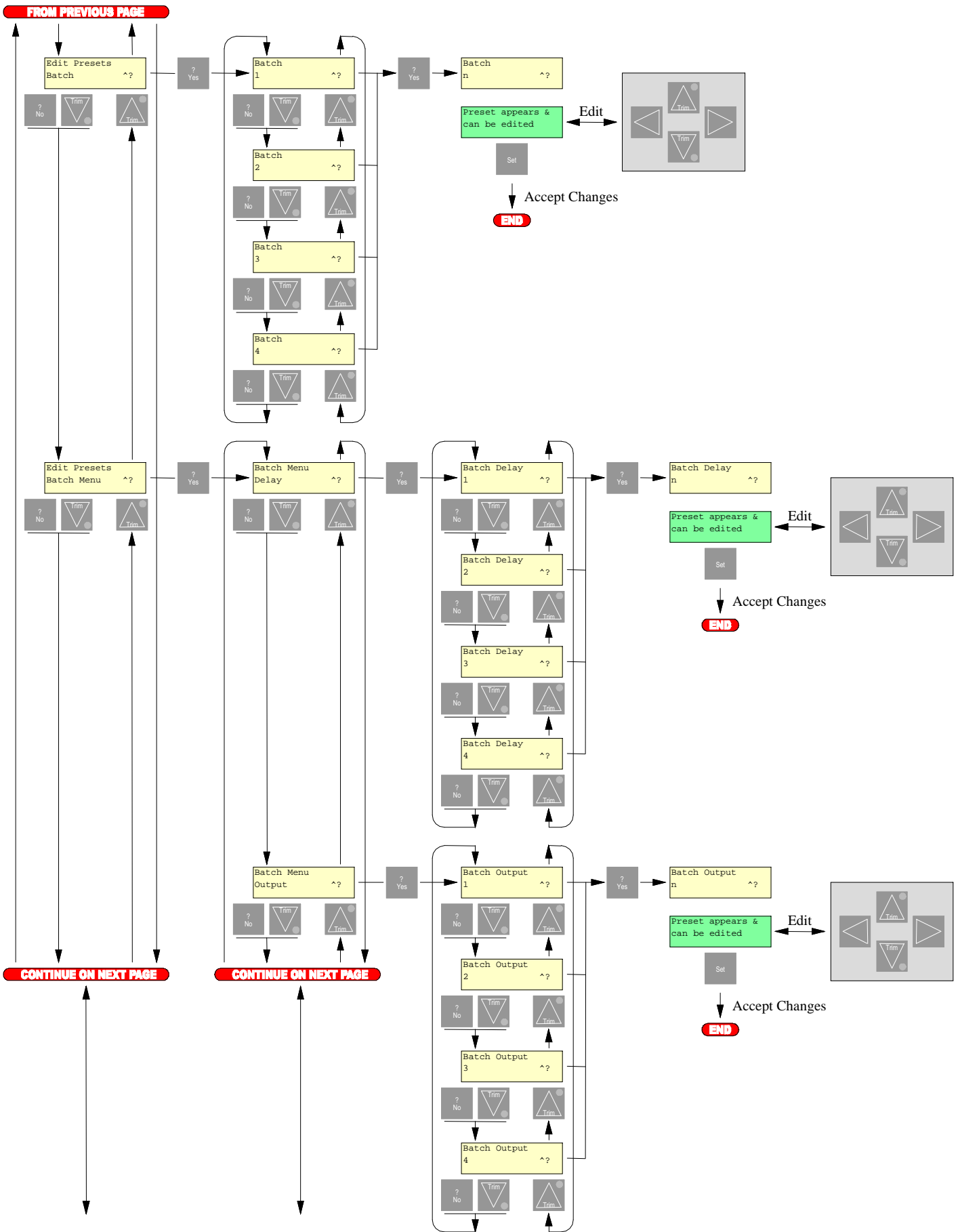
**Set** When a parameter has been modified there are two choices available; 1- Use the new value, or 2- keep the old value. Pressing this key accepts the new value. To cancel the changes any one of the edit keys can be pressed (Edit, File, Blade Speed or Puller Speed).

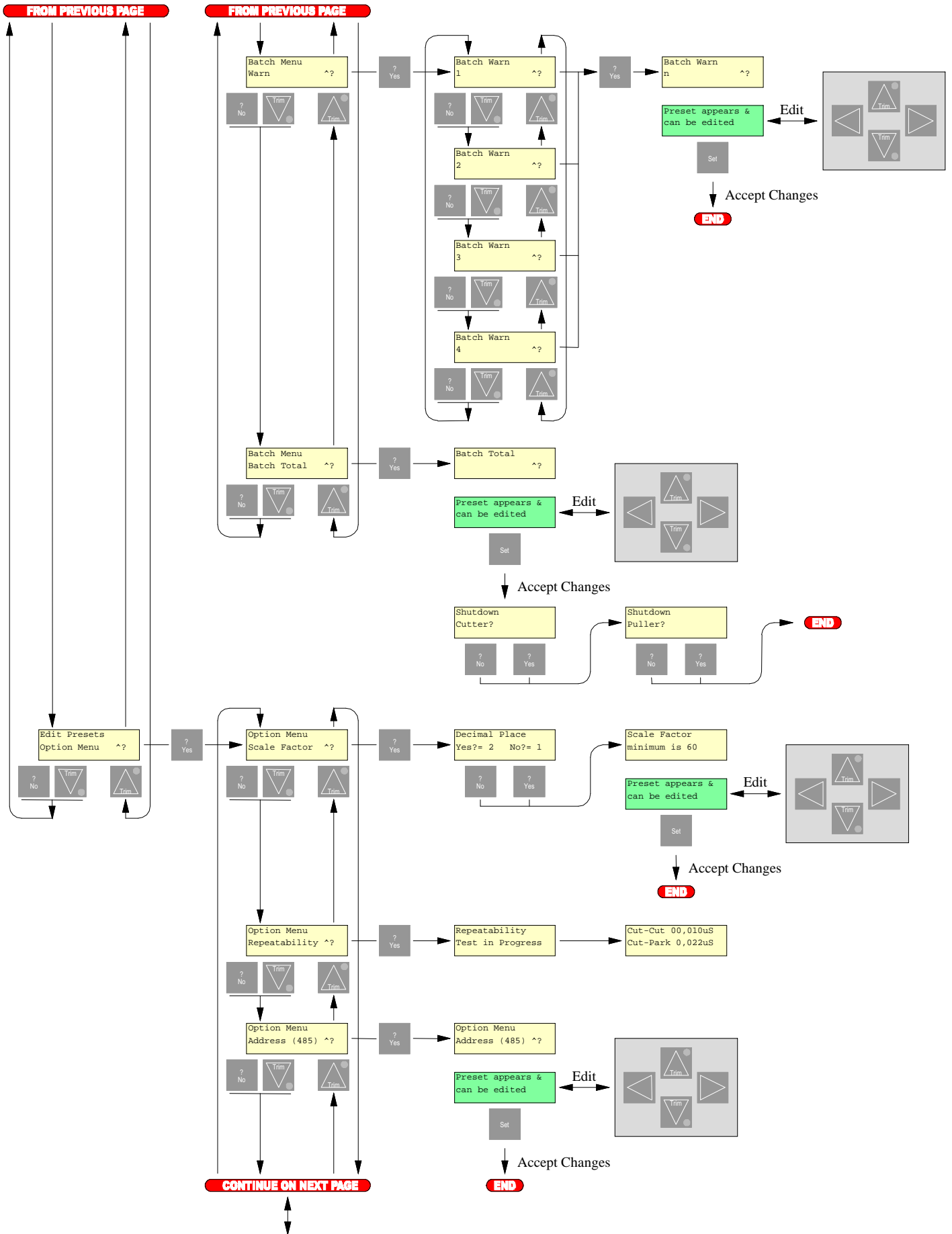
### Menu Structure

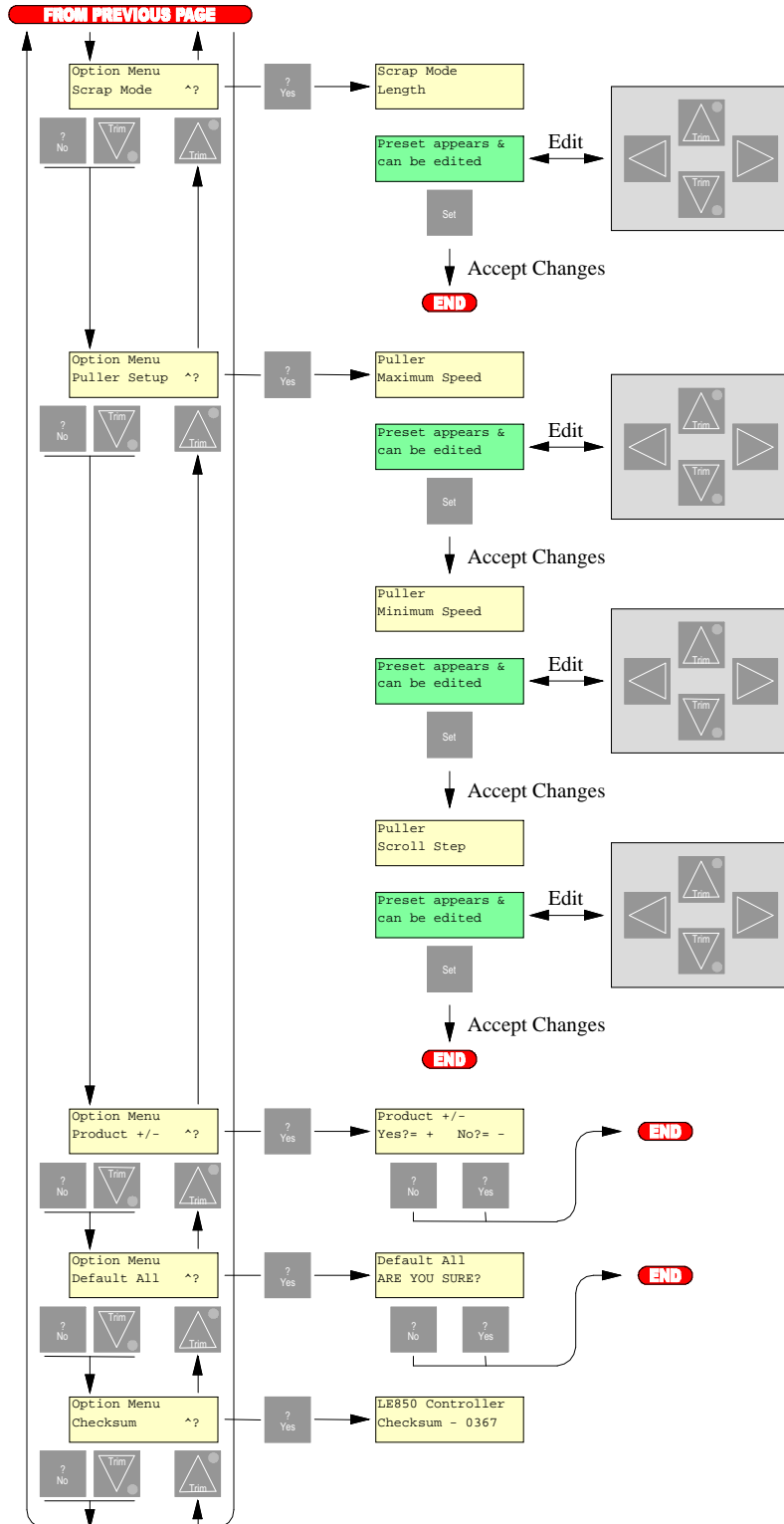
Most parameters are set using the Edit Menu. Parameters (presets) are logically grouped so that finding a parameter and changing it is only a matter of a few keystrokes. Edit Menu key is used to access the menu and may be used a second time to leave items unchanged. Set key is used to accept a change.







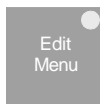




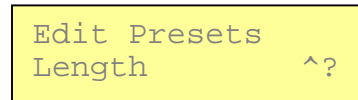
### Editing Presets and Menu Structure

This section shows examples of how to change a parameter.

**Example 1** (in Timer mode) Set length 1 for 2.5-second cut intervals. *There is no need to shutdown the motor prior to changing parameters.*



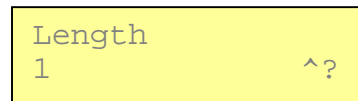
Press the Edit Menu key. The light in the key will illuminate. The message display shows:



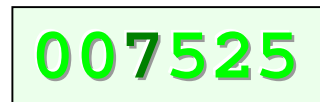
The symbols ^ and ? are used to point the operator to the expected responses. The ^ symbol means that the up and down keys may be used to move up and down through the menu list. The ? symbol means that Yes or No can be used. The first parameter option is Length and this is what we require.



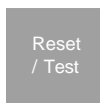
Press the Yes key. For this example length 1 preset is to be adjusted so answer yes. There are four lengths available in this mode so the message display will change to show:



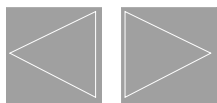
Press the Yes key again. Length 1 is the first choice and the preset that we wish to change. The Length/Presets display will now show the previous preset value with one of the digits flashing. The flashing digit can be increased or decreased by using the up and down arrow keys. The left and right arrow keys are used to select the digits either side of the flashing digit. They in turn will begin to flash.



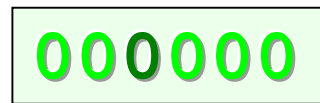
Try experimenting with the four arrow keys to become familiar with their uses. In addition, note how they wrap around, i.e. numbers will rollover from 0 to 9 and vice-versa when using the up and down arrow keys; edit digits will roll around from the left-most to the right-most digit and vice-versa when using the left and right arrow keys.

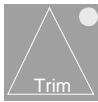


Press the Reset/Test key. The preset will change to show 000.000. Reset is useful when setting a new number as it wipes the slate clean. When making slight modifications to a previous number the reset may not be required.



Press the left and/or right arrow keys to select the seconds' digit (third from left).

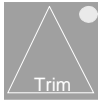




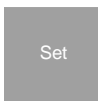
Press the up arrow key twice to change the value to 2 seconds.



Press the right arrow key. This selects the 1/10<sup>th</sup>-second digit.



Press the up arrow key five times to change this value to 5. The down arrow key would achieve the same due to the wrap around feature. The display now shows the required preset value - 002.500 (2.5-seconds).



Press the Set key. The light in the Edit Menu key will turn off and the display will continue to show the preset for a short while longer. Eventually, the displays will revert to their default uses, i.e. to show counts in progress. Editing of this preset has now been completed.

**Made a Mistake?**

If a mistake is made during editing the easiest way out is to press the Edit Menu key again to disable the function. A parameter is not changed until the Set key is pressed. Pressing the Edit Menu key or any other functioning edit keys (File Menu, Blade Speed or Puller Speed) while processing a preset will leave the preset as it was.

**Another Example (Example 2)**

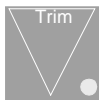
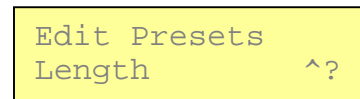
This time we will set Batch 1. Batch 1 is used to define how many pieces of Length 1 there are per bundle. The Batch counter for this application will not operate any auxiliary outputs. It is a fairly slow line speed operation and the operator can handle the cut pieces comfortably. The Batch counter will count up towards 50 but 50 will never be shown, as the 50<sup>th</sup> piece will reset the counter to zero, i.e. 48...49...0.

The operator has cartons to prepare while keeping a check of the product and must maintain hopper contents. This means that the operator will not always be ready as the 50<sup>th</sup> piece gets cut. This does not matter too much because the count restarts.

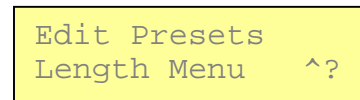
As the operator gets back to the machine a batch has obviously been completed and the count has just changed to 3. This simply is interpreted as one batch plus three pieces from the next batch. The bundle can be collected and the excess pieces put back.

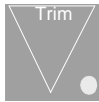


Press the Edit Menu key. The light in the key will illuminate. The message display shows:

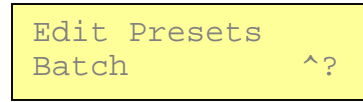


Press the No (or down) key.

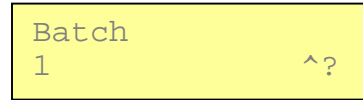




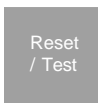
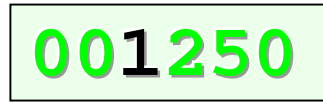
Press the No (or down) key



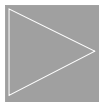
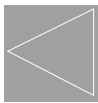
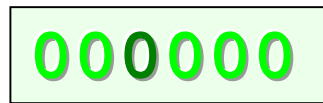
Press the Yes key



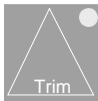
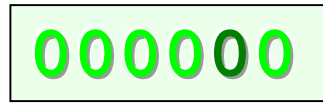
Press the Yes key



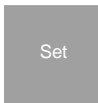
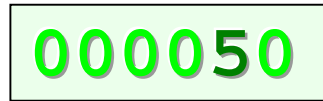
Press the Reset/Test key. This will zero Batch preset 1.



Press the left and/or right arrow keys to highlight the tens digit.



Press the up arrow key five times to change this value to 5.



Press the Set key. This preset has now been changed to 50.

**Menu List**

The previous examples show how to change two of the available presets. Most other parameters are modified in the same way. Use the Menu Structure list pages to help locate parameters until you become familiar with the layout.

**Menu List - Timer and Encoder modes**

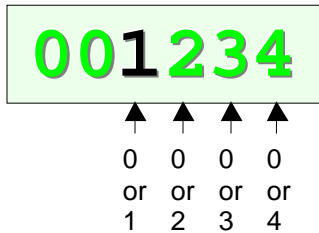
The following pages are used to explain parameters in more detail. Timer and Encoder modes have a similar menu structure while other modes will have a variation of the following.

**Length**

This sets the Length between cuts. In Timer mode the value is in seconds to three decimal places (milliseconds). In Encoder mode the value is distance. One or two decimal places may be set. This is chosen when setting the scale factor.

**Length Menu - Select**

This preset is used to choose which lengths to use. The preset uses the lower four digits of the six-digit preset display (the upper two digits are always 00). The edit keys can be used to choose a digit but each digit can only take on one of two values. For example, the third digit from the left can be a zero or a one. When one is showing it means that length 1 is enabled. The next digit to the right can be a zero or a two. The other digits can be 0/3 and 0/4. All four lengths or any combination can be enabled.



**Length Menu - Delay**

Each length has an associated auxiliary delay. The delays are used to operate auxiliary outputs after the cut, i.e. for length sorting. The value is in seconds to three decimal places. A range of zero to 20.000-seconds is available. Zero means that an output(s) will operate immediately.

Each delay can be used to turn on any combination of length outputs. After entering a delay a further question is asked...



The Set Outputs preset operates in the same way as Select shown above. Use it to choose which outputs will operate at the end of this delay. The first two outputs are available as Fast Outputs on the rear of the LE-850. All other outputs require an IO card. Timing of these other channels will be affected slightly by communications delays.

**Length Menu - Output**

When an auxiliary length output is used its duration 'On' time can be defined. The range is zero to 5.000-seconds. Zero has a unique use in that it latches an output on.

**Batch**

Use this to set the amount of pieces required per batch. If other lengths are enabled this value will also be used to switch to the next preset, i.e. if batch 1 is set to 50 on the 50<sup>th</sup> piece the control will switch over to the next available length.

**Batch Menu - Delay**

Similar to lengths an output can be operated upon each batch completion. Batch delays differ slightly to Length delays in that they are dedicated to one output, i.e. the same number value.

Example - Length 1 makes a cut and the Batch counter increases by one. When Batch 1 completes it resets (switches over to next length if another is enabled) and starts Batch Delay 1. Batch Delay 1 completing turns on Batch Output 1 and the output remains energised for the time set in Batch Output 1.

**Batch Menu - Output**

This sets the time that the auxiliary Batch Output remains on. Zero is used to latch an output on. An IO card is required for auxiliary batch outputs.

**Batch Menu - Warn**

This can be used to warn the operator that the batch is almost finished. All four warn presets operate the same output. Typically, this output would be used to operate an alarm. An IO card is required for batch warn output.

**Batch Menu - Total**

This sets the amount of batches that are required before the control should shut down. Automatic shutdowns are available from this preset for cutter and puller. They should be set as required after changing the preset. A separate batch total output is also available. An IO card is required for this. The Batch Total Output may be used without shutdown when setting both options to off (choose no).

Shutdown  
Cutter?

Shutdown  
Puller?

The LE-850 control expects Yes or No answers in response to the above two questions. When choosing Yes a yellow light in the associated Stop key illuminates. This indicates that it will shutdown (stop) on batch total completion. Batch total must be manually reset.

**Option Menu - Scale Factor**

This is used to calibrate the Encoder to the required scaling units. A simple Yes / No question is asked first in order to set the decimal place. Yes chooses two decimal places and no chooses one. This sets the decimal place for the Length counter and presets - *scale does not show any decimal places*.

After the decimal place option a value may be set that relates to the increment size given by the encoder. If the encoder is a quadrature style it will be necessary to set a scale factor half the size of the pulse width size. This is because the control uses the quadrature x 2 method (counts each edge on the A-channel).

Scale Factor is shown without any decimal places. It is less than one when two decimal places are chosen, i.e. 0.XXXXXX. For the one decimal place option the scale factor value is X.XXXXXX.

Example - A quadrature Encoder is being used that has a 12" circumference wheel and provides 6,000 pulses per revolution on each of the A and B channels. The LE-850 will count 12,000 times per revolution since it uses quadrature x 2 mode. Each count has a value of 0.001". Set the scale factor to 001000 when using the two decimal place option. Use 000100 for the one decimal place option. An invisible decimal place is after the first zero with this option (read this as 0.00100).

**Option Menu - Repeatability**

When the cutter is making cuts it is possible to check accuracy. This method makes use of a time stamp feature that is inherent in the microcontroller. In most cases two values are shown. These are known as Cut to Cut and Cut to Park. The values displayed are in microseconds. They show peak variance in cut to cut and cut to park times.

The first Cut to Cut and Cut to Park times are used to establish a reference. The display will initially show Repeatability - Test in Progress. Further Cut to Cut and Cut to Park times are then compared to the initial reference. The values shown are the difference between the highest and lowest times. As new worse case values arrive this number will grow.

Use this to determine problems with the cutter or the line. In time mode the Cut to Cut value should be fairly tight as the cut trigger is generated from the same clock. However, in Encoder mode this value will be larger and shows how much the line is varying.

Flywheel mode shows a Park to Park variance value. Repeatability is not available while the control is stopped.

**Option Menu - RS-485 Address**

If RS-485 communications is installed this menu item will appear so that a unique address may be assigned to the LE-850 control. Any address between 00 and 99 may be used although 00 should be avoided as many protocols use this address for broadcast messages. The default address is 85.

Terminal A is the non inverting input / output, and terminal B is the inverting input / output.

The LE-850 Controller uses the following technique for serial communications :-

**RS485 Multi Drop Ansi-X3.28-2.5-A4**

Baud Rate	-	9600
Format	-	1 start, 7 data, 1 even parity, 1 stop
Address	-	00 to 99 (default is 85) (00 is normally reserved so should be avoided). (See section on Address Changing).

Officially, the standard allows for 32 drivers and 32 receivers using a maximum cable length of 4,000feet (1,200 meters). Ideally, a shorter cable length will be used because of the typical noisy environment. The communications device uses a reduced slew rate driver to minimize EMI (required for CE), and reduce reflections caused by improperly terminated cables. This does not affect our data transmission rates as it is good for data rates up to 250kbps, as opposed to the possible 2.5Mbps of the standard RS485. The driver is short circuit protected.

To minimize reflections, the line should be terminated at both ends in its characteristic impedance, and stub lengths should be kept as short as possible. The total expected load for RS485 is 60R, usually made up of a 120R resistor at each end of the line. A 120R resistor is already fitted to the LE-850 controller with one end connected to the B terminal, with the other end of the resistor brought out to the A Load terminal. This may be linked to the A terminal if the termination load is required.

**Option Menu - Scrap mode**

This option allows a different length to be cut when the product is out of tolerance. This ensures that bad product does not get mixed in with good. A laser scanner and IO card are required for this feature. While the product is out of tolerance auxiliary outputs do not operate.

**Option Menu - Puller Setup**

This option appears on the LE-850 when puller control is available. A maximum and minimum speed may be defined. Puller Speed will then be limited by these two values. Ensure that maximum is always greater than minimum.

A scroll step may also be set. This may be used with a laser scanner and IO card to step the puller preset speed up or down within the limits.

**Option Menu - Product +/-**

This option allows the product edge to be set for Product and Cuff modes. A simple yes/no question is asked to set the logic. Example - an eye sensor is used that turns on an output when the product breaks the light beam. The output pulls to zero volts when the beam is broken. For this sensor set negative edge. Another sensor is then used but it turns off when the beam is broken. For this sensor set the positive edge option.

**Option Menu - Default All**

This option may be used to return all parameters back to their factory default states. An "ARE YOU SURE?" warning appears. Choose Yes if you want to go ahead or use No or Edit Menu again to quit.

**Option Menu - Checksum**

Checksum is shown automatically at power up. It can be viewed again through this option. Checksum is unique to the program contents of the EPROM. The value is a four digit hexadecimal sum of the entire EPROM.

**Menu List - Product Mode**

In product mode a cut is usually made by an eye sensor mounted downstream of the cutter that is connected to the product input. The source can alternatively be from another control system. In this mode the length is fixed by this input so multiple lengths are not available.

A Hold-off value can be set. This is used to disable the sensor once the product has been detected and cut initiated. This value protects against double triggering caused by the product that can bounce in front of the sensor after it has been cut. It will also protect against double cutting from contact closure sources, i.e. relay contacts. When the Hold-off time finishes the sensor becomes active again.

Hold-off time should be set to 75 to 80% of the expected time between cuts so that it is ready for the next cut.

After setting Hold-off time a further preset may be set called offset. When set to zero a cut occurs immediately. However, if a value is set here the cut can be time delayed.

Start and Cut On/Off provide an automatic cut at start up.

**Menu List - Cuff Mode**

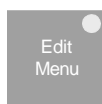
This special mode uses a different kind of menu structure. If this mode is not available for your control Select key will simply skip to the next available mode.

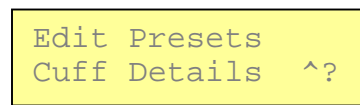
Cuff mode is available for corrugated sections that have flattened sections (cuffs), but can also be used to synchronise to products that are ink marked or punched upstream of the cutter. An optical sensor and an encoder are used together to provide a product signature recognition system like the image that would be seen on an oscilloscope. There are six values associated with each cuff and four cuffs that can be set.

1. First Cut (offset)
2. Second Cut *optional - set to zero to turn off*
3. Third Cut *optional - set to zero to turn off*
- 4 and 5. Cuff shape (sensor logic level plus length)
6. Hold-off


**Setting a Cuff**

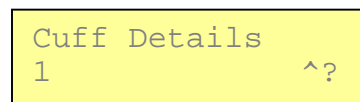
In this example a high cuff of 2.2-inches long needs to be cut in the center. Just one cut is required. This sequence repeats every 20-inches.


 Press the Edit Menu key. The light in the key will illuminate. The message display shows:

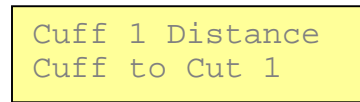


The symbols ^ and ? are used to point the operator to the expected responses. The ^ symbol means that the up and down keys may be used to move up and down through the menu list. The ? symbol means that Yes or No can be used. The first parameter option is Cuff Details and this is what we require.

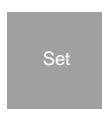
 Press the Yes key. For this example Cuff 1 is to be set so answer yes. There are four cuffs available so the message display will change to show: Up and down keys may be used to select one of the other cuffs.

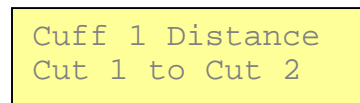


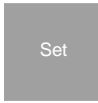
 Press the Yes key. This preset is also known as Offset. It appears at the top of the list because it is used regularly when positioning the first cut. The previous cut 1 (offset) value will appear in the preset display for editing.



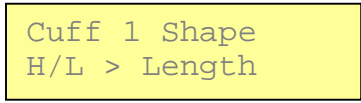
The value is affected by line speed, blade park position and position of the photo eye in respect to the cutter. Initially, start with a small value and then increase later to get the cut in the correct position. For now use the edit keys to set this to 0.2". This preset will be readjusted last.

 Press the Set key when done. A second cut may occur after the first cut if it is required. Cut 2 is referenced to the first cut. If not required simply enter zero for this preset. In this example we do not want a second cut so enter zero.

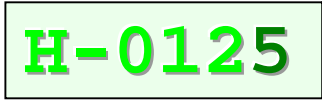




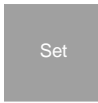
Press the Set key. If a value had been entered for cut 2 then an option will be given to set a third cut.



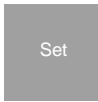
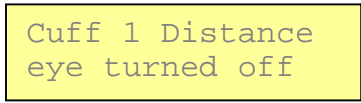
The preset that now shows is in fact two presets in one. The first character is used to set the logic level of the cuff (high or low). Use Option Menu - Product to set this so that high means a wide cuff (beam broken) and low means a small cuff (beam open).



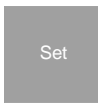
The last four digits are used to define the cuff confirmation length. A cuff is confirmed when the logic level is maintained for longer than the length set. This allows smaller corrugations to be ignored. Example - the corrugations are 1/4" apart but the cuff is 2.2" wide. We need to set a value that is in between these two so that the two distances can be differentiated. A value of 1/2" to 2" should suffice. In the example above we have set 1-1/4". Cuts are synchronised from the initial (high) edge and not the confirmation distance so any reasonable distance will do. Set a value that is long enough to avoid false triggering. If possible, set at least twice the corrugation spacing.



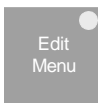
Press the Set key. Once a cuff has been detected there is no need to be looking for the next cuff as it is twenty inches away. The sensor can therefore be switched off to prevent false triggering. This preset is very similar to the Hold-off used in product mode except that distance is used rather than time. The Hold-off should be set slightly lower than the cuff spacing so that the sensor can wake up in time for the next cuff. For this example it will be set to eighteen inches.



Press the Set key. This cuff has now been set and Edit Presets turns off. However, the cut will still need adjusting. Go back to the Cut 1 length to adjust the cut position as required. Before doing this it is recommended that the error is first measured. For example, we originally set 0.2" but it is cutting 2.55" too soon. Change the Cut 1 value to 2.75" (2.55" + 0.2").



Press the Set key. The second cut distance preset appears again. Since Cut 1 was the only preset that was being changed it is now safe to quit from Edit Presets mode.



Press the Edit Menu key. The light in the key will turn off and this mode ends.

Batch and total count the first and third cuts in three cut applications. The second cut is usually used for a scrap length so it is ignored.

**Cuff Menu - Select**

Cuffs can be turned on or off using the Cuff Menu - Select option. This works in the same manner as the select feature for Timer and Encoder modes.

**Cuff Mode Auxiliary Outputs**

In this mode Cuff is used to activate the auxiliary delays that turn on the auxiliary outputs.

**Menu List - Follower Mode**

This mode is available for Servo Machines that have Follower ability. One length and blade quantity can be set. The values are transferred to the drive and the drive then performs a gear lock function. Auxiliary outputs are not available. Blade Quantity is set using the Blade Speed key.

**Menu List - Flywheel Mode**

In this mode the blade runs continuously. Auxiliary outputs are not available. Blade Speed is used to set Blade Speed and Blade Quantity. The Blade Quantity option is only available while the control is stopped.

**File Menu (recipes)**

Recipe is an optional installation. When not available pressing the key will display a Function not available message.

Load File or Save File are the two possibilities. Use with caution as they move data and overwrite existing data in much the same way as files in a personal computer.

Sixteen locations are available which can hold all user variables. The current operator settings, known as the work-page can be saved to any of the sixteen locations. These locations are fixed in size and numbered. To assist the operator these files can be saved with meaningful names of up to eight alphanumeric characters.

When saving be aware of the possibility of overwriting an existing used location. This is where the alphanumeric names are useful.

When loading a file to the work-page do so with caution. If the current work-page has not yet been saved do so before loading another file.

During the loading process the LE-850 will ask "ARE YOU SURE?" before overwriting the current work-page. Yes will overwrite; no will cancel.

During saving the LE-850 will ask "FILENAME OK?" before saving. Yes will save the file with the displayed name to the location specified; no will offer the option to change the name. It is recommended that filenames be used although this is not necessary as the locations are numbered.

**Auxiliary Outputs Example - Product Sorting**

Auxiliary outputs allow cut pieces to be sorted. Length/Cuff and Batch can be used to operate outputs. Most applications use one length.

For example, an order for one million 6-inch pieces of product XYZ has been received. These pieces are to be boxed 500 per carton. The pieces may free-fall into the box and will be assisted by a puff of air on a take-off conveyor table so that the pieces drop in the right place. Two positions (zones) are going to be used so that one carton can be sealed while the other is being filled.

For this application two presets and two auxiliary outputs are going to be used. Auxiliary outputs are being used to operate pneumatic valves. An Encoder is available so Encoder mode is selected.

Lengths 1 and 2 are set to 6-inches and turned on from the Length Menu - Select

Batches 1 and 2 are set to 500 pieces.

Outputs 1 and 2 are set to 50-milliseconds. This is long enough to blow the product into the box.

Delay 1 is set to 2-seconds so that the pieces just clear the outgoing bush before being blown into the box.

It is set to operate output 1.

Delay 2 is set to 5-seconds so that the pieces can fall into the second box. It is set to operate output 2.

Batch Total is set to 2,000 with its output connected to an alarm to indicate when the 2,000 boxes of 500 (1-million) are complete. The power down feature is not selected.

**Quality Checking**

From the previous example it can be seen that the system could easily be modified to provide samples for quality checking. For example, the system could be made to cut 100 pieces, which drop in zone 1, then make one sample piece (of any size) and send this to zone 2. In the example above where we are using two drop zones, a third preset could be used for the sample with no eject so that it travels to the end of the take-off.