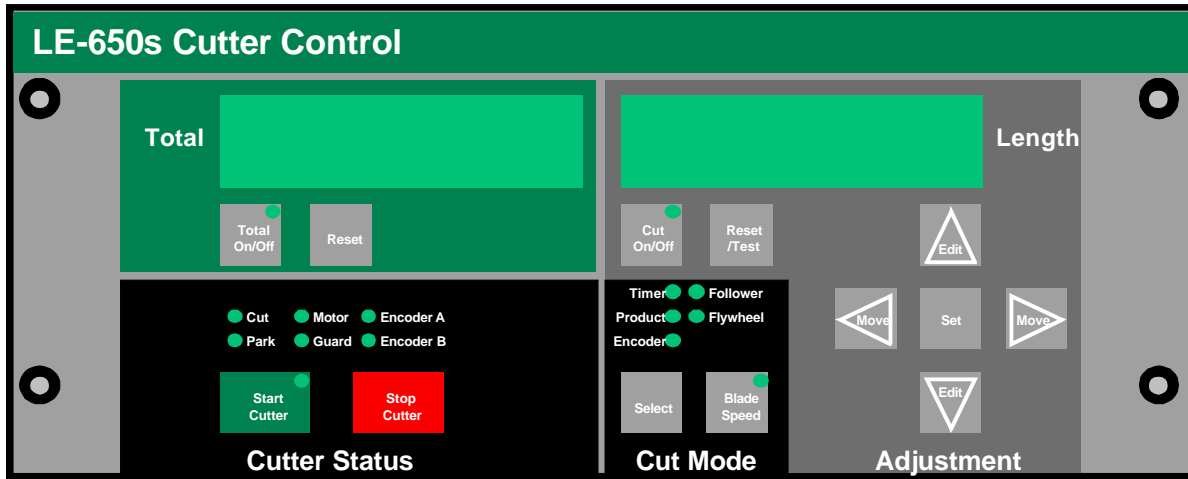


LE-650s
Instruction
Manual

LE-650s Controller

The LE-650s Controller is a user-friendly panel mounted operator interface for Servo Motor Rotary Cutting machines. Everything required to provide correct system operation and ease of product length setting is contained within. Various cutting methods (modes) are available. A piece counter and length counter are normally displayed, although the display also serves to assist the operator when setting presets or explaining any fault condition.



A six-digit presetable Length Counter provides the "cut to length signal". The operator may set a scale factor to calibrate the length when using an Encoder to provide for metric / imperial conversion, or shrinkage compensation.

An RS-485 communications port allows control and monitoring of variables by a master computer. An RS-423 communications port is also available but is dedicated to communicating with the Servo drive.

Fascia Panel

The fascia is a flat membrane type consisting of two six-digit counters, LED indicators and operator tactile feel keypads. Primarily the left-hand display is used to show the Total (Cut Pieces) Count, and the right hand display is used to show the Length Count. These displays will show legends and presets during programming, or error messages if any fault condition is detected. Displays are large, 0.56" high, Green Light Emitting Diodes (LED's) for clear and distant visibility.

Some keypads, like the displays, take on different roles when setting presets.

Key Pads

Each press of a keypad will cause a momentary beep to be heard from the built in buzzer. Some keypads have no functions in certain modes, yet a beep will still indicate a response.

Constant Functions

Seven of the keypads have fixed functions that do not alter between normal running and programming. These keypad functions are as follows: -



has an alternating action i.e. each press will select the opposite state, off to on, or on to off. The Total Counter will be active when set to on, as shown by an indicator (LED) inside the switch. This function may be set to off when producing samples.



clears the Total Counter to zero.



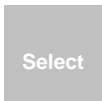
will place the Servo Motor Control into a ready state and then begin the selected Cut Mode after a two-second delay providing the CUT ON/OFF is on. The indicator in the switch will light to show that START has been accepted. If the guard is open then the START function will be refused and "Guard Error" will be displayed (See "Guard" section).



will force the Servo Motor into a brake condition and stop the selected Cut Mode. The indicator in the START switch will go out to show that STOP has been accepted. STOP is selected automatically after power up or when a guard is opened (See "Power up" and "Guard" sections).



behaves in a similar way to the TOTAL ON/OFF switch but affects the Cut output. The Servo is placed in a suspended state when off.



selects the cut source. Each press of the key is used to select the next Cut Mode. The selection process is TIMER - PRODUCT - ENCODER - FOLLOWER - FLYWHEEL - TIMER. Timer, product and encoder are known as "on-demand modes" where count completion or edge of product detection provides the cut signal. While in an on-demand mode the Cut Length display will normally be showing a count in progress from one of the various sources (See "Cut Modes" section). An indicator above the switch shows which source the controller is using. Only one light out of the five choices will be illuminated. When changing between modes the new mode does not become active until two seconds have elapsed and no cuts will be performed during that time.

Some cut modes are unavailable due to machine type or application restrictions.



is used with the edit keys to change the Blade Speed RPM or Blade Quantity. This function is described in the programming section.

Dual Functions - Edit Keys

Normal Running



provides a sample cut while the motor is enabled. The cut piece is not counted on the Total Counter. The Length Counter will reset, but counting will continue on the next count pulse. The following length will therefore be correct (equal to the programmed Length Preset). Test cuts can be made with the CUT ON/OFF in either state while the motor is enabled.

For some machine types or application restrictions this key will not initiate a cut.



The Length Preset will appear in the Length Display window with the word "Preset" (PrESEt) shown in the Total Display window. (Seven segment displays cannot faithfully produce all letters of the alphabet, some characters can only be shown in upper case, others in lower case). The whole display will count up 1 for each press (in the least significant digit position). Holding the keypad down will also provide the same function. After two seconds the preset will change more rapidly. The value in the Length window is instantly used as the new Length Preset. When the key is released the displays will continue to hold the preset for five more seconds before returning to display the count in progress. The preset can be trimmed up to 999999. The edit keys are not accepted in Flywheel mode.



This key complements the Edit up key providing a count down of the preset. The preset can be trimmed down to 000000.



no function during normal running.



no function during normal running.



will switch from normal running to preset programming. The key does not obtain a preset in Flywheel mode.

Programming

Length Preset

The Length Display will show the previous Length Preset with one of the digits flashing. This display is ready for editing on a digit by digit basis. The range is from zero to 999,999 (zero acts like a preset of 1). The Total Display will show the word "Preset" (PrESEt). Decimal points are fixed for the type of preset (See Cut Modes, Scale and Blade Speed).



sets the Length preset to zero (000000).



increases the value of the flashing digit by 1. Numbers step from 0 through to 9 and then back to 0 with each key press.



decreases the value of the flashing digit by 1. Numbers step from 9 through to 0 and then back to 9 with each key press.



selects the digit to the left of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the left-most digit was editable then the right-most digit will become the next editable digit after a "<" key press.



selects the digit to the right of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the right-most digit was editable then the left-most digit will become the next editable digit after a ">" key press.



will accept the Length Preset as displayed. After five seconds the display will revert to showing actual count or "Slave" if in Follower Mode. When in the Encoder mode a second rapid press of Set will gain access to the Pre-scaler preset (this facility is locked out if the Start indicator is on).

Pre-scaler (Calibration Factor, Scale Factor, Multiplier) (Encoder Mode only)

The Length Display will show the previous Pre-scale value with one of the digits flashing. This display is ready for editing on a digit by digit basis. The range is 0 to .999999, the decimal point is not shown as the preset represents six decimal places. The Total Display will show the word "Scale" (SCALE).

In Quadrature Encoder mode (encoders with A and B channels connected) the pre-scale is the unit of measure that equates to the distance between two signal edges on the Encoder A channel (consecutive off to on and on to off edges). This value is expected to be very small i.e. lower than 1 so six decimal places are provided for scale. The encoder counter is increased (or decreased) by the value of the pre-scale at each edge detection of the Encoder A input. To find the Scale Factor it is required to know how many Encoder A edges occur in a particular distance. The formula for scale factor is :-

$$\text{Scale Factor} = \frac{\text{Any Distance}}{\text{Counts (Signal Edges) per Distance}}$$

For example - an encoder with a 12” circumference wheel provides 600 pulses per revolution. 600 pulses equate to 1,200 signal edges.

$$\text{Scale Factor} = \frac{12}{1,200} = .01 \quad (\text{Set Scale to } 010000).$$

Using the same encoder for metric (centimeters) multiply by 2.54.

$$\text{Scale Factor} = \frac{12 \times 2.54}{1,200} = .0254 \quad (\text{Set Scale to } 025400).$$

If the Encoder is a uni-directional type only the rising edges are counted. In this case a 600-pulse encoder will provide 600 counts.

Encoder parameters

The Encoder counter consists of 10 decades fixed to 6 decimal places (xxxx.xxxxxx). The scale factor is 6 decades (all decades are after the decimal point - 0.xxxxxx). The Encoder preset is 10 decades, Only the upper 6 decades may be set and seen - the lower four decades are permanently zero (xxxx.xx0000).

Example: Scale is 0.005000 (5 thou.) and Length Preset is 0012.00 (12-inches)

Scale.....0000.005000

Count.....0009.750000 (current count example at 9.75")

Preset.....0012.000000



clears the Pre-scale preset to zero (.000000).



increases the value of the flashing digit by 1. Numbers step from 0 through to 9 and then back to 0 with each key press.



decreases the value of the flashing digit by 1. Numbers step from 9 through to 0 and then back to 9 with each key press.



selects the digit to the left of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the left-most digit was editable then the right-most digit will become the next editable digit after a "<" key press.

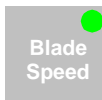


selects the digit to the right of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the right-most digit was editable then the left-most digit will become the next editable digit after a ">" key press.



will accept the Pre-scaler as displayed and end the programming facility. Normal running will be resumed. The display will return to showing the actual count after five seconds.

Blade Speed - Servo Machines with Variable Blade Speed only



accesses the Blade Speed RPM or Blade Quantity presets. During on-demand modes only the Blade Speed can be adjusted. In Follower mode only the Blade Quantity can be set. The Flywheel mode can access both presets. The displayed preset can be adjusted using the edit keys. The Length Display will show the previous value with one of the digits flashing. This display is ready for editing on a digit by digit basis. The adjustable range is 0 to 9999.99 with the decimal point fixed to two decimal places. Each servo type has a minimum and maximum speed. A value outside the allowable range will be modified to minimum or maximum. Also when setting the amount of blades only certain numbers are accepted. The Total Display will show the word "Blade" (bLAdE).

It is only possible to set a Blade Quantity when in Follower mode. 1, 2, 3, 4, 6, 8 or 12 blades are accepted. The display shows these as 0.01, 0.02 etc. Any other value will default to a Blade Quantity of 1 (0.01).

During Flywheel mode it is possible to set the Blade Speed or Blade Quantity. If the entered value is greater than 1.00 it will be considered to be Blade Speed and will be range checked accordingly. If the value is below 1.00 it will be checked against the list of acceptable blade quantities. Any other value will default to a Blade Quantity of 1 (0.01).

It is possible to set the Blade Speed and Blade Quantity with the motor running or not. However, if the motor light is on pressing Blade Speed will access the Blade Speed. With the motor light off Blade Quantity will be shown.



clears the Blade Speed preset to zero (0000.00).



increases the value of the flashing digit by 1. Numbers step from 0 through to 9 and then back to 0 with each key press.



decreases the value of the flashing digit by 1. Numbers step from 9 through to 0 and then back to 9 with each key press.



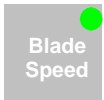
selects the digit to the left of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the left-most digit was editable then the right-most digit will become the next editable digit after a "<" key press.



selects the digit to the right of the flashing digit. This becomes the next editable digit and the previous digit stops flashing. Wrap around is used so that if the right-most digit was editable then the left-most digit will become the next editable digit after a ">" key press.



will accept the Blade Speed preset as displayed and end the programming facility. If the value is greater than the maximum speed allowed the preset will be replaced by the maximum. The same applies to setting a value less than minimum in which case the minimum value will be used. Normal running will be resumed. The display will return to showing the actual count after five seconds.



will function exactly the same as the SET key.

Cut Modes

TIMER

counts milliseconds from a built in quartz crystal source. When the count equals or exceeds the Length Preset the blade will be operated to provide a single cut. The decimal point is shown to three decimal places for count and preset (seconds.milliseconds).

PRODUCT

provides a single cut in response to activation of the Product +/- terminals. The sensor providing the signal can use the LE-650s 12-volt power supply. Usually the sensor is positioned to detect the product edge although the signal can also be provided by an external counting system or synchronising source. These types of signal are prone to double triggering caused by the product jumping or relay contact bounce. The effect can be overcome using the built in Hold-Off timer. The signal initiates the cut and begins the Hold-Off timing. During the Hold-Off time the sensor activity is ignored. The Length display counts during the Hold-Off period using the quartz crystal timing source. The value entered is in milliseconds and must be set to less than the time expected between cuts so that it is ready for the next edge (i.e. 70 to 80%). The decimal point is shown to three decimal places for count and preset (seconds.milliseconds).

ENCODER

counts signals appearing on the Encoder A and B terminals as supplied by an Encoder. The Encoder is usually collecting distance information from the product being extruded and can cause the count to be up or down depending on the phase relationship of the Encoder signals. When the count equals or exceeds the Length Preset the blade will be operated to provide a cut. The Encoder can be a uni-direction or bi-direction (quadrature) type. When using uni-direction encoders only the A terminals are connected. Encoder B connections should be left open, shorted together or linked to 0v.

The controller automatically detects the encoder type by observing the activity on the two channels. If it only sees activity on the A input the left display will briefly issue an "EnC-A" message. A quadrature encoder will briefly issue an "EnC-Ab" message. A count is made at each signal edge on A which has the effect of providing two counts for each pulse. For example: an encoder with 600 ppr will cause 1,200 counts for one revolution. 250,000 counts per second can be achieved - this is equivalent to a frequency of 125 kHz.

The counter and preset are ten decades consisting of four integer digits and six decimal places (xxxx.xxxxxx). Only the six most significant decades are shown (xxxx.xx), although the lower decades are still registered. The upper six decades of the encoder preset can be altered, the lower four decades are set internally to zero (xxxx.xx0000). The scale factor uses six decimal places (0.xxxxxx).

A quadrature encoder is a more accurate source than a uni-directional encoder as any reverse movement or shock tends to be cancelled by the ability to count in both directions.

FOLLOWER the cut to length control is passed to the Servo drive. In this mode the Servo drive will synchronise the blade arm to the Encoder using an electronic gear lock method known as Master/Slave or Master/Follower. This mode provides automatic compensation of line speed variations. The LE-650s is used to set the length and amount of blades. The servo drive uses these values to calculate a ratio. During this mode the LE-650s does not control the Length so the display will show "SLAVE".

FLYWHEEL is expected to be used for very short lengths. The motor will rotate at the pre-defined Blade Speed and may have up to 12-blades. The Length preset has no function in this mode so the display shows "FLYCut" meaning it is cutting using the Flywheel mode.

Power Up Reset

When power is first applied to the LE-650s Controller all outputs are switched off. An initial test is made to ensure that all presets and counters have not been corrupted. This test is made using a check-sum (sum of all presets added together). Copies of presets are retained so that the system can discover and correct any error using one of the good back-ups. The display will show a sign-on message for two seconds, "Good dAy" followed by "SErVo" and EPROM version number. If an error was encountered it will be mentioned i.e. "Point Error" otherwise the display will show "tESt Good". In the case of an error the operator can check to see if it was fixed correctly before continuing. A final message "SEt to VEr....." will show the servo version. The fascia will eventually display the Length and Total Counters with the previous count showing (unless an error had previously been discovered).

Messages

The displays will normally be displaying actual count. When powering up, programming or during error conditions the displays will show legends for operator assistance. For power up legends see the section on Power Up Reset. For programming legends see Programming. Errors such as a guard opening will be latched into the display until the operator presses a key.

External Connections

Power (Mains Supply)

120 volts A.C. supply. Two terminals are provided labelled "Live" and "Neutral". A fuse is provided @ 250 milli-amps connected between the transformer and the Live terminal.

Ground

Two terminals marked "Ground" are connected internally to the metal case and should be taken to the machine frame ground. Regulations suggest that it is not suitable to rely on the fixings alone to provide the suitable grounding so it is recommended to also ground the LE-650s enclosure via its ground post.

Sensor Inputs

Sensor inputs have similar characteristics. All inputs, except Encoder, are connected to the control's 12-volt DC supply via an internal pull-up load. The external circuit needs to sink about 10 milli-amps to register an active state. All sensors should use the Controller 12-volt power supply. The Encoder connections are isolated so can use the controller supply or an isolated / non-isolated source ranging between 5 and 24-volts.

Machine Select - 8 Pin Connector

LE-650s									
Machine Select Links				Sign-on	RPM		On-demand		
4	3	2	1	Message	Max	Min	CPM	Cut Pulse	
				Plug Out	n/a				
			✓	Ver-1	1,000	200	350	50	milliseconds
		✓		Ver-2	750	200	250	50	
		✓	✓	Ver-3	750	200	350	50	
	✓			Ver-4	187.5	100	60	500	
	✓		✓	Ver-5	300	100	150	50	
	✓	✓		Ver-6	365	100	60	500	
	✓	✓	✓	Bad Code	n/a				
✓					n/a				
✓			✓	Ver-1	1,000	100	n/a		
✓		✓		Ver-2	750	100			
✓		✓	✓	Ver-3	750	100			
✓	✓			Ver-4	187.5	100			
✓	✓		✓	Ver-5	300	100			
✓	✓	✓		Ver-6	365	100			
✓	✓	✓	✓	Bad Code	n/a				

These inputs - Select 1 to Select 4 - are used to set the LE-650s to work correctly with the

selected servo / machine. Each servo type has a unique code and is set during machine manufacture. The coding links are threaded into the wiring harness so that if controls are swapped between machines the wrong machine selection cannot be made. The table shows the servo types that are currently available.

Encoder A and B (Product)- 4 pin Connector

Phase difference count inputs are possible. A quadrature encoder can supply a suitable count. Each input is monitored for a change of state, causing a count in the relative direction. LED's marked "Encoder A" and "Encoder B" display active inputs. These light when the respective input pair turns the channel on. The light will stay on for 1/20th second after the channel turns off.

A uni-direction counter should have its signal connected to the Encoder A channel. The controller will automatically switch between uni-direction and bi-direction by detecting the ratio of signals occurring on the two channels. Each signal edge, high or low, will create one count therefore doubling the encoder resolution.

The Encoder B channel is also available for detection of the product edge via a suitable sensor. Turning the channel from off to on is used to initiate a trigger.

Guard - 3 pin Connector

An external circuit is available for guards. A safe condition is met by the Guard terminal being connected (via the guard circuit) to a 0-volt terminal. An open collector N.P.N. sensor or switch may provide this signal. A safe guard will light the "Guard" LED on the fascia panel. If a guard opens while the machine is running the Motor output will disable, placing the Motor in a forced stop condition. The display will read "GuArd oPEn". The cause of stoppage will remain displayed until a key is pressed.

Cut Sense - 6 pin Connector (shared with Park)

This input is used when assigning Cut Modes. Do not change any connections made at this point.

Park (Brake) - 6 pin Connector (shared with Cut)

The park sensor is used to count rotations of the blade arm. The Total Counter will increase by one when the Park position is sensed in on-demand modes. For Follower and Flywheel modes the Total Counter will increase by the amount set by the Blade Quantity preset.

When the park sensor input is at 0 volts and for 1/20th of a second after the terminal returns to 12 volts the Status LED on the fascia marked "Park" will light.

Outputs - 5 pin Connector

The outputs are NPN open collector sharing a common 0-volt reference. The Cut and Brake / Program outputs can switch up to 50 milli-amps @ 30 volts D.C. maximum. The Motor and Pump / Jog outputs can switch up to 500 milli-amps @ 30 volts D.C. maximum. An on state is active low.

Brake / Program (Program Initiate)

This output is connected to the Servo Controller to initiate the program. It remains active for 50 milliseconds after a valid start.

Cut

This output is connected to the Servo Controller to trigger an on-demand cut. It remains active for 50 milliseconds after a trigger. Each servo type limits the cuts per minute in on-demand modes depending on the machine setting (See Servo settings).

Motor

This output is connected to the Servo Controller to stop the motor when the output switches off. While active the motor may run.

Pump / Jog

This output is used by Flywheel mode when there is no Follower (personality module) control in the system.

Communications - 7 pin Connector

RS-423 - This is dedicated for communications to the Servo drive.

RS-485

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

The LE-650s 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 50) (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 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-650s controller with one end connected to the B terminal, with the other end of the resistor brought out to the A Load terminal. A Load may be linked to the A terminal if the termination load is required.

Address - setting

The default address is 50, but can be any value from 00 to 99. To change the address to a different value requires a special key sequence. While the LE-650s is not in an edit mode (no digits are flashing) and the Start LED is off, press the right shift button and keep it pressed. After five seconds the display will change to show Addr. 0000## (where ## equals the current address). Using the edit keys it is possible to change the two-digit address to a new value. Pressing the Set key will accept the new address. Address 00 is normally reserved so should be avoided.

Parameters

A parameter is made up of two characters (mnemonics), followed by a data stream. Each parameter will fall in to a particular category such as Read Only (RO), Write Only (WO), Read and Write (RW), and a variant on Read Only known as Read Clear (RC). Read Clear is only associated with the Status Word which contains data bits (0 = off, 1 = on); the action of the read automatically clears a set bit when it is an RC type. Some of the parameters use a hexadecimal format (H) where 0 to 9, and A to F can be communicated. Hexadecimal parameters include an ">" character between the mnemonic and the data.

II Instrument Identifier RO H (returns 650F)

The first three characters "650" are the controller identifier, the last character 'F' defines the machine type as a Servo.

KY Key Code WO H

It is possible to operate four of the LE-650s keys through the communications. The edit and On / Off keys are not available for external use. The possible keys and their codes are :-

0 = Stop

1 = Start

2 = Reset (Total Count)

3 = Reset / Test (Length Count)

Any other codes will select Stop.

The first data character after the '>' character must be received and must be one of the values in the table above. The key buffer can contain four characters in total but data D2 to D4 are optional. If inserted the key routines will be operated one at a time until all key operations have been completed. The keyboard buffer can only accept new data when the buffer is empty. A flag in the Status Word register determines if the buffer is available (see SW codes). If key codes are transmitted while the buffer is in use a NAK will be returned.

SW Status Word

RW *see individual bits

H

Bit	Name	Digit		0		1		Type		
		Bit	Bit			RW	RO	RC		
15	<i>not used</i>	1	3	Off	On			RO		
14	Motor	1	2	Off	On			RO		
13	Total Enable	1	1	Off	On	RW				
12	Cut Enable	1	0	Off	On	RW				
<i>The above bits are copies of LED's which have the same name.</i>										
11	Encoder A	2	3	Off	On			RO		
10	Encoder B	2	2	Off	On			RO		
9	Park	2	1	Off	On			RO		
8	Guard	2	0	Open	Safe			RO		
7	Quadrature	3	3	Uni-	Quad-			RO		
6	Cut occurred	3	2	No	Yes					RC
5	Set-point modified locally	3	1	No	Yes					RC
4	Mode changed locally	3	0	No	Yes					RC
3	Checksum	4	3	OK	Error			RO		
2	Keys - Stop key will still function	4	2	enabled	disabled	RW				
1	Key Buffer	4	1	empty	active			RO		
0	Error occurred	4	0	No	Yes					RC

CM Cut Mode

RW

- 0 Timer
- 1 Product
- 2 Encoder
- 3 Follower
- 4 Flywheel

This parameter consists of a single value 0 to 4. Some modes are not available depending on machine type. Selecting a mode that is not available will cause the next available mode in the list that is possible.

ER Error Codes RO H

Returns the last four error codes, with the most recent error shown first.

- 0 No Error.
- 1 Guard - was open when trying to start or was opened while running.
- 2 Not used.
- 3 Machine Select plug out - need to know machine type.
- 4 Machine Select set to an unrecognised machine type.
- 5 Encoder too fast - may need to divide the encoder signals.
- 6/7 Not used
- 8 Repeatability Error (test must be in progress)
- 9 Data - data stored in RAM may have been corrupted (possibly due to static)

Counters and Presets

These parameters are each 6 decades wide. Decimal points are for display purposes only (relevant to the mode), they are not expected or transmitted in any data streams. The format is thus xxxxxx.

LC Length Count RO

TC Total Count RO

SL Set-point Local RW

Read or Write value is directed from or to the parameter currently selected by the Cut Mode.

SF Scale Factor RW

BS Blade Speed RW

BF Blade Follower RW

This parameter is available for setting Blade Quantity for Follower and Flywheel modes.

BH Blade Speed High (Maximum) RO

BL Blade Speed Low (Minimum) RO

Inquiries

1. The host computer initiates all inquiries with :-
EOT, GID, GID, UID, UID, P1, P2, ENQ.

EOT = ASCII - Hex 04, used to clear the line. All devices on the RS485 look at the next four characters to see if they are being addressed.

GID = Group Identifier (First part of Address - expects 0 to 9, ASCII - Hex 30 to 39). This is sent twice.

UID = Unit Identifier (Second part of Address). Also sent twice.

P1 = First character of parameter required.

P2 = Second character of parameter required.

ENQ = ASCII - Hex 05.

After a communications link has been established (as notified by a valid response to the previous communication) it is possible to use a shorted inquiry using ACK and NAK (see later). The following is also valid :-

P1, P2, ENQ

2. If the address and parameter are recognized the LE-650s will respond with :-

STX, P1, P2, D1, D2, D3, D4, D5, D6, ETX, BCC

Shorter parameters send less data.

STX = ASCII - Hex 02

P1 and P2 = Parameter mnemonic

D1 to D6 = Data (Parameter Value) - in ASCII Form

ETX = ASCII - Hex 03

BCC = Checksum of characters P1 to ETX inclusive. This is found by using the Exclusive Or (xor) logic function :-

$BCC = P1 \text{ (xor) } P2 \text{ (xor) } D1 \text{ (xor) } D2 \text{ (xor) } D3 \text{ (xor) } D4 \text{ (xor) } D5 \text{ (xor) } D6 \text{ (xor) } ETX.$

The host computer will check the BCC with the BCC that it internally calculates before accepting the data.

If the Address was recognized but the parameter was not the LE-650s will respond with :-

STX, P1, P2, EOT

3. If the LE-650s responded using the first method the host can now use the following simpler inquiries:-

NAK = ASCII - Hex 15. This requests that the same parameter be repeated. This may be required because the value was not understood or can provide a simple means to repeatedly monitor a value.

ACK = ASCII - Hex 06. This requests that the next parameter be returned. Only TC, LC, SL and SW parameters are cycled.

Sending Data from the Host Computer to the LE-650s

1. The host computer makes all parameter updates using :-
EOT, GID, UID, STX, P1, P2, D1, D2, D3, D4, D5, D6, ETX, BCC.

After a communications link has been established (as notified by a valid response to the previous communication) it is possible to use the shorted update :-

STX, P1, P2, D1, D2, D3, D4, D5, D6, ETX, BCC.

2. If the message was understood and parameter within range the LE-650s will respond with ACK. If the parameter is out of range the response will be NAK.

No reply will be given if the address is not recognized or if a parity, framing or overrun error occurs.

3. The host computer may now use an ACK or NAK inquiry. Using NAK will return the last parameter changed if it is a RW type.