

# **Lift Shaft Absolute Encoder**

**ACE Lifts Ltd**

**Units 4 & 5**

**St Ives Way**

**Sandycroft**

**Flintshire. CH5 2QS**

**Tel 01244 525999**

**Fax 01244 520707**

**WE RESERVE THE RIGHT TO ALTER, WITHOUT GIVING PRIOR  
NOTICE, TECHNICAL DATA DESCRIBED IN THIS MANUAL**

# Table of Contents

- 1 Installation
  - 1.1 Equipment
    - 1.1.1 Description
    - 1.1.2 Location
    - 1.1.3 Connections/ Wiring
- 2 Configuration
  - 2.1 How to use the Menu System
  - 2.2 Expected Commissioning Sequence
    - 2.2.1 Scanning Floors
    - 2.2.2 Trial Run
    - 2.2.3 Saving Configuration
- 3 Operation
  - 3.1 Output Relay Description
    - 3.1.1 **SU & SD** - Stepping
    - 3.1.2 **LU & LD** - Levelling
    - 3.1.3 **UL & DL** - Terminal Floor Limits
    - 3.1.4 **TFR & BFR** - Terminal Floor Resets
    - 3.1.5 **OK** - Safety Relay
    - 3.1.6 **TUL** - Test Up Limit
    - 3.1.7 **AZ & ACI** - Anti-Creep
    - 3.1.8 **H/W** - Handwinding
    - 3.1.9 **SLU & SLD** - Terminal Slowing Limits
  - 3.2 Safeguards
    - 3.2.1 Running inputs
    - 3.2.2 Magnet positions
- 4 Adjustments
  - 4.1 Slowing Distance
  - 4.2 Magnet Length
  - 4.3 Hysteresis
  - 4.4 Overspeed limits
  - 4.5 Terminal Limits
  - 4.6 Test Limit
  - 4.7 Movement Timeout
  - 4.8 Single Speed Configuration
  - 4.9 Floor Levels
  - 4.10 Hydraulic Option
  - 4.11 Diagnostics
- 5 Maintenance
  - 5.1 Faults
  - 5.2
- 6 Encoder Floor Level Adjustments

# 1 Installation

## 1.1 Equipment

### 1.1.1 Description

The encoder system is made up of the following components:-

- a) Absolute encoder interface unit (Main board + programmer)
- b) Absolute encoder loom
- c) Absolute encoder
- d) Mechanical fixing kit
- e) Toothed belt

### 1.1.2 Location

The absolute encoder is generally fitted at the top of the shaft, with the wheel in the pit

The belt connects the encoder/wheel and car fixing kit together

The absolute encoder interface is located close to or inside the control panel

### 1.1.3 Connections/ Wiring

Please see attached drawings and pictures at the front of this manual.

The minimum recommended wire size for all interconnections is 0.75mm<sup>2</sup>.

**Please note all setup functions must be  
with the lift “on test”.**

# Configuration

## 1.2 How to use the Menu System

The Configuration panel for the encoder consists of a single LCD display with four buttons positioned underneath it. The LCD usually shows two lines of information: the top line provides information, or requests configuration details, while the second line usually shows the button options available to the engineer.

In order to select an option shown on the second line the engineer simply presses the button closest to the corresponding option on the display.

The following second lines are typically used by the system...

**Down Up Quit OK**

In this case the left most button (Down) will cause the information field line to scroll down a line, or in some cases causes the numeric value presented on the first line to be decreased. The next button (Up), will scroll the first line option up one line, or increase the numeric value displayed on the first line. The far right hand button (OK) will be used to indicate that the engineer wishes to select the first line selection, or is happy to accept the numeric value displayed on that line. Finally, the next button in from the right (Quit) allows the engineer to abort any action they are currently involved in, and return to the previous menu option.

It is worth noting that there are a few occasions when only an OK button is presented to the engineer. In these cases the first and second lines describe an action that the engineer should take before proceeding. The OK button should only be pressed once the indicated action has been completed.

**100s 10s 1s OK**

This second line is used to enter some of the larger configuration values. Pressing the '100s' button will increment the value displayed on the first line by 100. Note that the entry will wrap around, so if the key is pressed when 900 is on display, this will revert back to 000 on the display. The '10s' and '1s' buttons work in exactly the same way, but operate on the 10s and units columns of the first line display. Finally the 'OK' button indicates that the first line value is acceptable.

**Please wait  
Storing**

This is occasionally displayed when the encoder stores its configuration. Once the configuration is saved then a new menu option will be presented to the engineer.

**Please wait.  
Calculating..**

As for the configuration saving display, this is displayed whenever the encoder becomes tied up with computation of floor positions. This will only happen at the commissioning stage. All the operational computations do not take long enough for this display to be necessary.

## 1.3 Expected Commissioning Sequence

### 1.3.1 Scanning Floors (lift must be on "test" control)

**ACE Lifts Ltd  
Encoder Ver:1.xx**

This display will be shown when the encoder is first powered up, and has no detected faults. Note that if a fault is shown on the display, please refer to the faults section to find out how to clear the fault condition. Simply pressing any button on the keypad will move into the configuration screens of the system.

Pressing any key will display the password prompt screen

**Password?  
0 1 2 3**

Please enter the password **2012** to continue to the main menu

The password system is designed to protect against accidental overriding of the saved configuration

There are a number of configuration options available to the engineer. Each is presented in turn on the first line of the display. The second line displays standard 'Down', 'Up'... etc options.

To initially set up the system the engineer should first select:

**Start floor scan**

**Down Up Quit OK**

The floor locations can be determined either with the use of a push button, or by using reed proximity switches and magnets. If magnets are used the system assumes that they will be left in the shaft and uses their positions as an additional check to ensure that the encoder belt is not slipping.

Once the engineer selects the floor scan option they need to indicate the type of floor indicator that will be used. The following display is presented, to which the engineer should press the nearest button to either 'Button' or 'Magnet'.

**Floor Locator is**

**Button / Magnet?**

If magnets are to be used it is essential that they are positioned in the shaft at this point. The encoder board will request the engineer to confirm that they are appropriately positioned before proceeding by presenting the following display.

**Floor magnets in**

**Position? No Yes**

It is essential that the floor magnets are roughly positioned before entering 'Yes', since any movement in the magnet positions after this point will cause the encoder's safety checks to be triggered, and it will refuse to allow the lift controller to go 'fully operational'.

If magnets are not used then the display will move directly to the following caption, which will also be displayed once the magnets are positioned.

**Move car through**

**Entire shaft. OK**

At this point the engineer should move the lift car (under test) throughout the length of the shaft before pressing the OK button. **Note that the encoder board cannot determine all of the shaft limits at this time, so the engineer needs to be careful not to overrun the endpoints of the shaft.** It is also worth noting that the floor positioning does not need to be particularly accurate at this stage. If the push button option is being used then the engineer should stop close to each floor and press the button once for more than a second before moving on to the next floor.

Only once the lift car has moved through the entire range of the shaft should the engineer press the 'OK' button to indicate the shaft has been fully traversed. The encoder then checks how many floors it believes have been indicated in the shaft and presents this to the engineer

**05 floors found**

**Correct? No Yes**

If No is selected then the engineer will need to restart the scan process from the beginning. If Yes is selected then the encoder needs to determine which way the toothed belt has been installed around the encoder. It does this by requesting the engineer to provide the current location of the lift...

**Car is nearest**

**Top Bottom**

The engineer should select either 'Top, or 'Bottom'. Once this selection has been made then the encoder will output the expected signals to the lift control panel. The only problem may be that the actual floor positions may be incorrect. The engineer will be instructed to proceed to the trial run stage of the commissioning.

### 1.3.2 Trial Run

#### Do trial run for Adjustments. OK

This display indicates that the engineer should place a call to every floor on the way up the shaft and every floor on the way down the shaft. At this stage the lift should be taken out of test mode and placed into normal operation. This means that the terminal floors need only be visited once, but the intermediate floors will be visited twice each. It is essential that the floor is visited by going up to that floor and coming down to that floor. At each floor the engineer should record whether or not the lift car is too high, or too low. In addition to this, the engineer should record the number of millimetres of adjustment that is required. [Please see pages at the end of this manual.](#) **Once all these measurements have been made then the engineer should hit 'OK' and move on to the next display.**

**If trial runs are not made before pressing OK then an OVERSPEED FAULT will result**

On completing the trial run it is necessary to enter any adjustments into the encoder. For each floor the encoder will prompt..

Flr:01, down car  
level? Bad OK

The floor number is indicated after the 'Flr', while the direction of movement to get to that floor is also indicated. So in the above example, the encoder is asking if the lift car is correctly positioned after moving down to the first floor.

The following display, on the other hand, asks the same question but for the car level after having moved up to the second floor.

Flr:02, up car  
level? Bad OK

The engineer should press the relevant button for 'Bad' floor level, or 'OK'. If the engineer selects 'OK' the system will simply query the next floor configuration. Pressing 'Bad' will result in the following display.

Flr:01, up-car  
was... Low High

The engineer should make the relevant selection indicating if the car was higher than the desired floor level, or lower. Having made the selection then the engineer enters the required adjustment using the following screen.

Move 02 by 017mm  
100s 10s 1s OK

### 1.3.3 Saving Configuration

Eventually the engineer will have completed entering all of the adjustments determined during the trial run. The unit will then ask the engineer if the configuration is to be saved, or whether a new trial run is necessary. We would recommend that the engineer continues to carry out trial runs until such time as they are happy that all floor levels are correct. Selecting 'Redo' will simply return the engineer to the trial run display, and enable further tests to be carried out.

Redo level test/  
save? Redo Save

When the engineer is happy with all the floor levels, then they should select the 'Save' option to save all of the configured floor information. Until this time none of the data is stored so it is essential that the 'Save' option is selected prior to removing power from the unit.

## 2 Operation

### 2.1 Output Relay Description

#### 2.1.1 Stepping (SU & SD)

Lift control panels use the Step Up (SU) and Step Down (SD) signals as an indication that the lift car is approaching any given floor. When approaching a target floor, upon detecting the step signal, the controller will slow the lift to allow for the floor level to be accurately detected.

The SU signal is generated below floor level, at the start of the slowdown distance.

The SD signal is generated above floor level, at the start of the slowdown distance.

#### 2.1.2 Levelling (LU & LD)

Levelling into floor is done by means of two signals – Level Up (LU) & Level Down (LD) both energised at floor level.

The LU signal extends below floor level while the LD signal extends above floor level. The lift will be travelling on slow speed by the time the levelling signals are detected.

#### 2.1.3 Terminal Floor Limits (UL & DL)

The Up Terminal Limit (UL) and Down Terminal Limit (DL) are failsafe signals operated at the top and bottom of the shaft respectively

#### 2.1.4 Terminal Floor Resets (TFR & BFR)

The Top Floor Reset (TFR) and Bottom Floor Reset (BFR) are operated at the start of the terminal slowing positions at the top and bottom of the shaft respectively

#### 2.1.5 Safety Relay (OK)

The optional Safety Relay (OK) is output when the encoder system is operating correctly and should be inserted in the main safety circuit. Please be advised that unless the system is set up 100%, occasional nuisance tripping will be experienced due to the enhanced monitoring software.

When a fault is detected, the relay is de-energised and fault information displayed on the LCD

#### 2.1.6 Test Up Limit (TUL)

The Test Up Limit (TUL) is a failsafe relay output that de-energises approx 1.8M from the top of the shaft (or as specified by the commissioning engineer) to protect the lift engineer from injury by collision with obstruction near the top of the shaft.

#### 2.1.7 Anti-Creep (AZ & ACI) LIFT MUST BE SET TO HYDRAULIC MODE

The Anti-Creep Zone Relay (AZ) extends to cover the full floor zone occupied by LU+LD signals

The Anti-Creep Initiate Relay (ACI) operates below LD as specified in the hydraulic option.

Once energised, the relay will only release when lift has returned to floor level (relevelled)

#### 2.1.8 Hand winding (H/W)

The unit operates in hand wind mode when the hand wind input (TB1-5) is applied.

The Hand Wind (H/W) relay is energised when the lift is at floor level; the actual distance from floor level is displayed on the LCD.

### **2.1.9 Terminal Slowing Limits (SLU & SLD)**

The Up Slowing Limit (**SLU**) and Down Slowing Limit (**SLD**) are failsafe signals operated at the start of the terminal slowing positions at the top and bottom of the shaft respectively

## **2.2 Safeguards**

### **2.2.1 Running inputs**

TB1-1 (**FL**) is the external floor button when setting up encoder (in parallel with onboard button)

TB1-2 (**STR**) where used, will assist in stall detection

TB1-3 (**UP**) where used, will assist in stall detection

TB1-4 (**DN**) where used, will assist in stall detection

TB1-5 (**HWD**) places the unit into hand wind mode

### **2.2.2 Magnet positions**



### 3 Adjustments

#### 3.1 *Slowing Distance*

Change Slow down  
Down Up Quit OK (Press OK to adjust)

Slow down: 080cm  
100s 10s 1s OK (Adjustments in cm)

#### 3.2 *Magnet Length*

Change MagLength  
Down Up Quit OK (Press OK to adjust)

MagLength: 015cm  
100s 10s 1s OK (Adjustments in cm)

#### 3.3 *Hysteresis*

Change Hysteresis  
Down Up Quit OK (Press OK to adjust)

Hysteresis 002mm  
100s 10s 1s OK (Adjustments in mm)

#### 3.4 *Over speed limits*

Change Overspeed  
Down Up Quit OK (Press OK to adjust)

Overspeed: 10%  
Down Up Quit OK (Adjustments in %)

#### 3.5 *Terminal Limits*

Edit Term. Limit  
Down Up Quit OK (Press OK to adjust)

Term Limit:010mm  
100s 10s 1s OK (Adjustments in mm)

### 3.6 Test Limit

Edit Test Limit  
Down Up Quit OK (Press OK to adjust)

Test Limit:180cm  
100s 10s 1s OK (Adjustments in cm)

### 3.7 Movement timeout

Movement timeout  
Down Up Quit OK (Press OK to adjust)

Movement Time 24  
Down Up Quit OK (Adjustments in secs)

### 3.8 Single Speed Configuration

Single Speed Cfg  
Down Up Quit OK (Press OK to adjust)

Single Speed-Off  
Change Leave (Applies to strain gauge system)

### 3.9 Floor Adjustments

Adjust Floors  
Down Up Quit OK (Press OK to adjust)

### 3.10 Hydraulic Option

Hydraulic Option  
Down Up Quit OK (Press OK to adjust)

Lift:Hydraulic  
Change Leave Option to change ACI point

### 3.11 Diagnostics

Diagnostics View (Press OK for Diagnostics)  
Down Up Quit OK (Up/Dn=navigate)

0012.967m SU SD Position and Step Status  
E+F1 LU LD AZ AI Floor, Level and A/Creep Status

Encoder: 024682C Modified Encoder Raw Count  
Spd: 0.000m/s Current Lift Speed

Up Adj: 0000000 Single Speed Option  
Dn Adj: 0000000 Using Strain Gauge System

Strain:0000 G:-- Single Speed Option  
A:--- R :--- SpdA Using Strain Gauge System

## Maintenance

### 3.12 Faults

The system can detect a number of faults during normal operation:

- A stall condition, where the run inputs are detected, but no encoder movement is detected.
- An overspeed condition where the lift car moves considerably faster than the speed at which the lift was commissioned.
- Magnet movement, when magnets have been used to set the floor levels the system will keep track of their positions and ensure that they don't move. This becomes simply an additional security check on the encoder integrity.

Any of these faults will cause the encoder unit to break the lift safety circuit. Pressing the 'OK' button will clear the circuit and the indication until such time as another fault occurs.

The following displays are used to indicate faults.

**Stl,Ovr & Magnet**  
Clear Fault? OK

**Stall, Overspeed**  
Clear Fault? OK

**Ovr & MagnetMove**  
Clear Fault? OK

**Overspeed Fault**  
Clear Fault? OK

**Stall & Magnet**  
Clear Fault? OK

**Stalled/Encoder**  
Clear Fault? OK

**Magnet Moved Flt**  
Clear Fault? OK

**Unknown Fault**  
Clear Fault? OK

# Encoder Floor Level Adjustments

## UP TRAVEL

FLOOR

## DN TRAVEL

READINGS in mm  
3 << 2 << 1

ENCODER  
BUILDING

READINGS in mm  
1 >> 2 >> 3

HI OK LO	HI OK LO	HI OK LO	<b>10</b> _____			
HI OK LO	HI OK LO	HI OK LO	<b>9</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>8</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>7</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>6</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>5</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>4</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>3</b> _____	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	<b>2</b> _____	HI OK LO	HI OK LO	HI OK LO
			<b>1</b> _____	HI OK LO	HI OK LO	HI OK LO

# Encoder Floor Level Adjustments

## UP TRAVEL

FLOOR

## DN TRAVEL

READINGS in mm  
3 << 2 << 1

ENCODER  
BUILDING

READINGS in mm  
1 >> 2 >> 3

HI OK LO	HI OK LO	HI OK LO	10			
HI OK LO	HI OK LO	HI OK LO	9	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	8	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	7	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	6	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	5	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	4	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	3	HI OK LO	HI OK LO	HI OK LO
HI OK LO	HI OK LO	HI OK LO	2	HI OK LO	HI OK LO	HI OK LO
			1	HI OK LO	HI OK LO	HI OK LO