Quick-start guide
This guide is intended to be a supplement to the full KEB elevator manual. Read KEB document#: 00F5LUBK321 thoroughly before powering up the drive.

Programming the drive from default
The drive is programmed via the programming menu (Home > Prog). A user should begin at the top of the programming menu and work their way downwards, filling in the required information.

Start-up Process

Check Drive Connections
- Power (inc. resistor/regen)
- Control
- Encoder
- Communication

Configure Inputs/Outputs
- PNP/NPN
- Define Inputs
- Define Outputs

Basic Set-Up
- Units
- Motor/Control Type
- Load Configuration
- Contract Speed

Configure Inputs/Outputs
- System Units (Imperial/Metric)
- Motor Type (i.e. Induction geared or PM synch gearless)
- Control Type (i.e. Binary, Serial, Analog)

Configure Inputs/Outputs
- Encoder Pulse Number (ppr)
- Encoder Multiplier (EnDat = 8; TTL = 2)
- Type of Input (PNP or NPN logic)

Encoder Learn
- SPI (stationary)
- Pole Learn (requires movement)
- Encoder Synchronization

Run the Motor
- Speed Profile
- Inertia Learn (optional)
- Gains
- Pre-torque (optional)

Special Functions
- Test Function
- Overspeed Test
- Safety Release

Motor Data
- System Units (Imperial/Metric)
- Motor Type (i.e. Induction geared or PM synch gearless)
- Control Type (i.e. Binary, Serial, Analog)

Encoder Data
- Encoder Pulse Number (ppr)
- Encoder Multiplier (EnDat = 8; TTL = 2)
- Type of Input (PNP or NPN logic)

Speed Profile
- Motor Speed (RPM)
- Inertia Learn (optional)
- Gains
- Pre-torque (optional)

Motor Learn (Stationary)
- SPI (stationary)
- Pole Learn (requires movement)
- Encoder Synchronization

Advanced Adjustments
- Speed Profile
- Inertia Learn (optional)
- Gains
- Pre-torque (optional)

K Special Functions
- Test Function
- Overspeed Test
- Safety Release

B2 - Confirm the correct drive outputs are assigned according to the controller drawing.

The output menu is found at the bottom of the programming screen.

Output
Note: The basic setup might already have been done by the controller mfg.
C1 - For induction motors, enter the following parameters from the motor nameplate:
- LM01 - Motor Power (note units)
- LM02 - Motor Speed (RPM) - Verify it is rated “slip speed”
- LM03 - Motor Current
- LM04 - Motor Frequency
- LM05 - Motor Voltage
- LM06 - Motor Power Factor

For synchronous motors it is important that the relationship between the motor speed and rated frequency correlate to the number of poles!

D1 - Enter the basic encoder parameters:
- LE02 - Encoder Pulse Number (ppr)
- LE05 - Encoder Multiplier (EnDat = 8; TTL = 2)
(E) **Machine Data**

- **E1** – Enter the machine data:
  - LS01 - Sheave Diameter (use inches for English units; mm. for metric units)
  - LS02 - Gear Ratio (x:1); gearless applications → x=1
  - LS03 - Roping Ratio (x:1)

Incorrect setting of the machine data parameters may cause the elevator to run too fast or too slow or may incorrectly calculate the overspeed limit.

(F) **Speed Profile**

**F1** – Enter the speed control parameters (digital, binary, and positioning control only).

The speed commands in Analog and Serial speed control are dictated by the controller so these speed parameters will have no effect. However, in Analog speed control, the user must enter a High Speed setting which corresponds high speed to +10V.

Enter the following speed settings if applicable:
- LS01 Leveling Speed
- LS02 High Speed
- LS03 Inspection Speed
- LS04 Correction Speed
- LS05 Intermediate Speed 1
- LS06 Intermediate Speed 2
- LS07 Intermediate Speed 3

Note: The nomenclature of the speeds above are defined (as default) by KEB. However, the controller manufacturer may assign speeds differently (e.g. the controller manufacturer may use Intermediate Speed 1 for High Speed). If the elevator does not move at the correct speed, verify which speed is selected and its corresponding setting (Diag. screen #10). Also, verify whether the command speed and encoder speed match.

**F2** – To begin with, use the KEB defaults for the profile adjustments.

The KEB LCD operator can approximate all relevant profile parameters depending on the desired aggressiveness of the application (i.e. soft, medium, or hard profile). The adjustments can be made with:
- LS15 High Speed Profile
- LS16 One Floor Profile (Intermediate Speeds 1, 2)
- LS17 Emergency Profile (Intermediate Speed 3)

**F3** – Alternatively, if a user wants to customize the profile, they can adjust the different speed profiles based on the selected speed:

- Acceleration
- Start Jerk
- Accel Jerk
- Deceleration
- Decel Jerk
- Stop Jerk
- Final Stop

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<td>LS43-45</td>
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(G) **Motor Learn**

**G1** – Motor Learn

The Motor Learn function can be found under the Tune Parameters group from the Programming menu (Home > Prog > Tune Parameters > LL01).

Begin the procedure by setting:
- LL01 Motor Tuning = Start

Follow the instructions on the LCD screen. The user is instructed to:
1. Disable the brake
2. If the speed is generated by the controller (Analog or Serial), then set external speed command to zero
3. Press and hold inspection (speed + enable inputs) until completed

The process should take 2-5 minutes and will emit a high pitched noise while the drive measures various motor parameters.

The drive will confirm a successful motor learn, and LED 1 and 2 will flash if needed, reconnect the brake wire and return the controller command speed.

**G2** – Encoder Learn, Induction Motors

In applications with Induction Motors, the Encoder Synchronization function can be used to determine the correct A/B phasing of the encoder channels and whether the direction needs to be inverted for the correct direction of travel. For induction motors, the Encoder Synchronization can be adjusted at parameter LL07; Proceed to section H3 (IM only)

**G3** – Encoder Learn, PM motors

When using PM motors, the encoder position/pole must be learned.

If at any time the physical relation between the motor shaft and encoder changes (i.e. encoder replaced, encoder slippage, etc.) the encoder position must be relearned.

There are 2 functions available to determine the encoder pole position with PM machines:

1. SPI (Stationary Pole Identification) – This process is preferred and can learn the encoder position without movement (i.e. with ropes + brake set). OR
2. Encoder Pole Learn – Process requires sheave movement with little friction (i.e. unroped or balanced car) but can accurately determine encoder phasing.

(H) **Encoder Learn**

**H1** – Encoder Learn, Induction Motors

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For Induction motors, the Encoder Synchronization can be adjusted at parameter LL07; Proceed to section H3 (IM only)

**H2** – Encoder Learn, PM motors

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(I) **Run The Motor**

At this point, the drive should be set up far enough to run reasonably well on inspection speed. The user should run the elevator in both the up/down directions and monitor the current in the home/diagnostic screen.

- For a balanced car, the current should be reasonably low.
- For an empty car, the running current should be less than motor rated current in both directions.

If operation on inspection speed shows no issues, the next step is to run the elevator up to high speed.

Before this is done, there may be a few parameters which need adjustment:
- LC30 - Maximum Torque (Default is 150%; Typical values are 200-250%)

Any time the motor data parameters are adjusted, the LC30 Maximum Torque will automatically re-calculate to 150%.

**Run The Motor (at High Speed)**

Now, the elevator should be able to run at high speed with no major issues. At this point, if the user is satisfied then no further adjustments may be needed to increase ride quality.

If further adjustments are needed, see (J) Advanced Adjustments.
Advanced Adjustments (Password limited)

**J1 - Adjusting Accel/Decel rates**
See section F2 for more information.
In general, higher values result in a hard/fast profile, while lower values give softer, slower transitions.

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**J2 - Inertia Learn (FFTC)**
Feed Forward Torque Control (FFTC) reduces the dependence on speed feedback from the motor by predicting what the elevator system will do and providing the required torque. It is recommended for optimal control of dynamic applications.

**Process**
1. Get the car running at contract speed over multiple floors
2. Balance the car and run on inspection to the middle of the hoistway.
3. Run the car at high speed. For buildings with 12 floors or less, run the car from top to bottom. For taller buildings, run between at least 10 floors from the middle of the hoistway (5 above, 5 below). Make sure this measurement is done from the middle of the hoistway to account for rope compensation. Make sure the car reaches high speed! If not, lower the speed such that the car reaches a stable speed for 2 seconds.
4. Begin the process by setting:
   - LL10 - Inertia Learn (“START”)
5. Follow the directions on the keypad. After four runs, the drive will automatically calculate the inertia based on the averages.

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**J3 - Gain Adjustment (in lieu of Inertia Learn)**

**Proportional Gain**
The proportional gain maintains general control and stability over the entire speed range. In general, it provides the magnitude of response. The proportional gains are split up into the 3 values:
- LC03 - Acceleration and constant speed
- LC04 - Deceleration
- LC05 - Pretorque

Lower values (1000) may result in loose control and overshoot of the command speed as high speed is reached.

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**Integral Gain**
The integral gain is responsible for correcting long-term average error in speed as well as providing increased control and rigidity at lower speeds for starting and stopping. The integral gains are split into 3 values:
- LC08 - Acceleration and constant speed
- LC09 - Deceleration
- LC10 - Pretorque

If the gains are too low, the actual speed will have difficulty tracking the command speed. The drive will not catch the load quickly or will have difficulty overcoming starting friction during takeoff.

If the gains are too high there could be torque pulsations during accel, constant speed, or decel.

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**Integral Gain Offset**
The integral offset gain values are effective only at low speeds. Values which are too low will cause the actual speed to lag the command speed. Values too high will cause vibration or steps at the final approach.
- LC11 - KI Offset Acceleration
- LC12 - KI Offset Deceleration

**J4 - Pretorque Adjustment**
The drive’s internal pretorque is a feature which can be used to minimize the rollback which may occur at brake pick without the need for an external load weighing device. (Pretorque is available when LC01 = Closed Loop FOC or Closed Loop Synthetic Pretorque)

**Adjustments**
- LT02 (Control Hold Off timer) - Should be set such that it expires briefly before the brake is picked.
- LT03 (Speed Start Delay) - Relates to the pretorque holding period before takeoff.
- LC05 (KP Speed Pretorque) - Gains active during LT03 pretorque period.
- LC10 (KI Speed Pretorque) - See LC05. Adjust higher for tighter control.

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**Special Functions**
- **LL15 - Overspeed Test**
  Allows the drive to run at a higher speed than the programmed contract speed for a single run in order to perform overspeed or governor tests. The speed at which the overspeed test will perform is set in LL16.
- **LL17 - Safety Release**
The safety release function turns off the acceleration jerk rates and raises the maximum torque limit for one run in order to drive an elevator car off the safeties.
Troubleshooting & Errors - See section 7.0 of drive manual for complete listing

### Error Over Voltage
- Trip Voltage (460V drive) = 840VDC
- Trip Voltage (230V drive) = 400VDC
- Braking resistor should shunt at: 760VDC (460V drives) 380VDC (230V drives)

**Check:**
- Brake resistor connection
- Disconnect resistor - measure resistance
- Measure DC bus terminals (= 1.41x VAC)
- Proper mains grounding
- Is the Brake transistor functioning?

### Error Under Voltage
- Trip Voltage (460V drive) = 240VDC
- Trip Voltage (230V drive) = 216VDC

**Check:**
- Input voltage and wiring
- Missing input phase
- Imbalanced input phases (not to exceed 2%)
- Proper mains grounding

### Error Motor Protection
- Excessive RMS motor current - according to LM08 (IM) and LM11 (PM motor)

**Causes:**
- Excessive Current
- Incorrect motor data
- Incorrect encoder data
- High mechanical load/issuses (friction)

### Error Over Current
- Can be monitored on Diag, screen #1 or DG06 or DG31
- If error occurs **instantly** at the start of each run, the issue may be:
  - Ground fault on motor leads
  - Damaged or slow closing motor contactor
  - Motor Failure
  - Motor current sensor shorts

**Check:**
- Brake resistor connection
- Disconnect resistor - measure resistance
- Measure DC bus terminals (= 1.41x VAC)
- Proper mains grounding
- Is the Brake transistor functioning?

### Error Overload
- Time dependent overload - excessive current

**Check:**
- Error occurs **intermittent** the issue may be:
  - Damaged or slow to close motor contactor
  - Loose motor connections
  - Electrical noise, faulty grounding
  - Faulty cabling

### Error Overspeed
- The internal overspeed limit is exceeded

**Causes:**
- Incorrect machine data settings (LN01-03)
- Lack of motor control
- Modulation grade is reached

### Error Over Speed
- Internal overspeed limit is 110% of contract speed (US06)

**Causes:**
- Incorrect machine data settings (LN01-03)
- Lack of motor control
- Peak current reached (Dia, screen #1)
- Incorrect encoder data (i.e. LM02 & LM04)

### Error Low Speed Overload
- Excessive current at low speed (< 3Hz)

**Causes:**
- Excessive Current
- High duty at low speeds
- Incorrect encoder data
- High mechanical load/issuses (friction)

### Error Low Motor Current
- Low current during initial current check

**Causes:**
- One or more motor leads not connected
- Motor contactor not closing (or in time)
- Motor contactor contacts are damaged
- Motor windings are damaged

### Error Motor Noise
- Vibration
  - Increase sample rate of encoder (LE04)
- Reduced speed control gains
  - Check if modulation grade is reached

- **Squealing/Grinding**
  - Check sample rate of encoder; 4-8ms typ.
  - Check encoder multiplier (LE05)
  - Verify motor data

- **“Clunk” at the end of the run**
  - Verify the drive enable is not being dropped prematurely while drive is still outputting torque to the motor (i.e. enable is dropped before the speed and direction are dropped)
  - Check fault log - Is “Drive Enable Dropped” error present?

### Selected Parameters - See section 8.1 of drive manual for complete listing

**The ability to view/write parameters is dictated by the user access level (Home > Prog > Pass (F2)) - Contact the controller OEM for more information**

#### LE - Encoder Parameters

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<td>LE02 Encoder 1 Pulse Number</td>
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<tr>
<td>LE03 Swap Encoder 1 Channels</td>
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<tr>
<td>LE04 Encoder 1 Sample Rate</td>
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<tr>
<td>LE06 Encoder 1 Pole Position</td>
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#### LM - Motor Parameters

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<td>LM03 Motor Current</td>
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