

# e-Agitator User Manual v1.02



**Kahu EV LP**  
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## Contact

In the event that a fault arises that Kahu has not identified then the operator shall immediately notify Kahu via the following actions:

- a. Phone call to 04 974 5792 (note: this number diverts to a nominated Kahu staff cellphone)
- b. Email with details and photographs if required to [support@kahuev.com](mailto:support@kahuev.com)

## Change Control

This manual has been developed by Kahu EV LP and is maintained under change control. Any requests for change should go to:

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## Copyright

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This manual is the property of Kahu EV LP.

# 1 About This Manual

This manual describes the functions and usage of the Kahu EV electric e-Agitator drive.

All specifications provided in this manual are current at the time of printing. However, because the design is subject to continual product improvement, Kahu EV reserves the right to make changes at any time without notice.

Depending on specifications, the vehicles or equipment shown in the illustrations herein may differ from your vehicle in terms of colour and equipment.

**PLEASE NOTE:** Throughout this manual the term “high voltage” is used to describe main battery power. This is no higher than 750V DC and may be considered “low voltage” on some industrial sites. Despite being classed as low voltage in some situations a battery electric vehicle shares no common components with industrial style electric components or systems. Under no circumstances should battery box or power distribution covers be removed unless the technician has been approved to do so by Kahu EV.

## Manual Conventions

This manual has several key conventions to be aware of.



### **WARNING**

Explains something that, if not obeyed, could cause death or serious injury to people.



### **NOTICE**

Explains something that, if not obeyed, could cause damage to or a malfunction in the vehicle or its equipment.



### **ATTENTION**

A special feature or aspect of the vehicle that requires specific attention due to its difference from legacy diesel vehicles.

## 2 Introduction

The e-Agitator is a fully electric agitator drive and control solution designed for commercial use on concrete mixing trucks. It has electric drive with a battery pack behind the cabin. All high voltage components are contained in bolted metal cases, easily identifiable by being coloured bright orange.

Maintenance on components contained within such orange housings must only be carried out by trained and certified personnel taking all necessary safety precautions. This includes all orange cabling exiting the battery pack, which itself is also housed in bright orange tubing.

## 3 Safe Operation

The e-Agitator is subject to standard procedures for the safe operation of any motor vehicle.

This section is intended to detail the differences and considerations that are required for the safe operation of a heavy battery electric vehicle as opposed to a traditional internal combustion engine powered vehicle.

### System Safety Features

The e-Agitator includes the following safety features

- Emergency Stop Button
- Battery Isolation Switch
- Road speed integrated work light and water pump shutoff (10kmh)
- Vehicle chassis ground isolation monitoring
- Multiple Safety Fuses
- Thermal Monitoring
- Comprehensive logging system
- Advanced system monitoring
- Multiple battery pack fusing locations
- High voltage interlocks to prevent damage and electric shock
- Advanced Battery Management System (BMS)

### Operating Environment

The e-Agitator is designed for operation in typical environments that a heavy vehicle of this class is generally operated in.

- Temperature: -5 to +40 degrees centigrade
- Humidity: 10% - 90%

## 4 Instruments and Controls

### Dashboard

The e-Agitator dashboard provides driver feedback as to the current vehicle conditions, through several gauges and icons.

The instrument combination interface is composed of a battery level gauge, bowl RPM monitor and information about the status of the system.

The appearance of the instrument is shown in the following figure.



Figure 1: Gauge Cluster

## LCD Main Interface



Figure 2: LCD Display

The main interface is divided into segments containing different information.

### ***System Status***

This field displays the status of the control system.

### ***Function Status***

Displays commands from the wireless controller, as well as the charger cable status.

### ***Battery Capacity Level***

Displays the remaining battery capacity as a bar graph.

### ***Agitator Status***

This field displays the status of the agitator motor.

### ***Agitator Speed***

Displays the bowl RPM as a dial graph. Zero RPM is at the top of the dial. Forward bowl RPM (mixing) is shown as positive RPM to the right hand side, and Reverse bowl RPM (discharge) is shown to the left hand side.

### ***Battery Current***

Displays the current into or out of the battery pack (positive while charging, negative while discharging).

## ***Navigation Buttons***

It is possible to change the display settings and set the time using the navigation buttons.

Pressing the middle round button (3) will navigates to the main screen.



Pressing the settings button will open the settings menu.



From the settings menu it is possible to change the display from day to night mode, select the brightness level and change the time.

## Wireless Controller



Figure 3 Wireless Controller Button Functions

Note: Some vehicles do not have the horn feature connected to the truck. This is an optional extra that can be included when ordering a package.

## 5 Starting and Operating

### Pre-trip Safety Check

Before attempting to drive the e-Agitator, a vehicle walk around inspection or prestart is recommended.

Before operating the e-Agitator, ensure the battery charging lead is disconnected and the socket cover is firmly closed. The e-Agitator cannot be operated with the battery charger socket cover open.

### Normal Start Up Procedure

To start the e-Agitator under normal operation use the following steps.

1. Push the “stop charging” button and remove the charging plug
2. Close the charger door and check the system status on the display
3. On the controller, push the green start / stop button once to activate the system if it is not active already.

Note: The ignition key of the truck must be on for the screen to turn on.

### Isolated Startup Procedure

If the master switch has been turned off or the emergency stop button has been pushed the e-Agitator will require more time to start in which case use the following procedure:

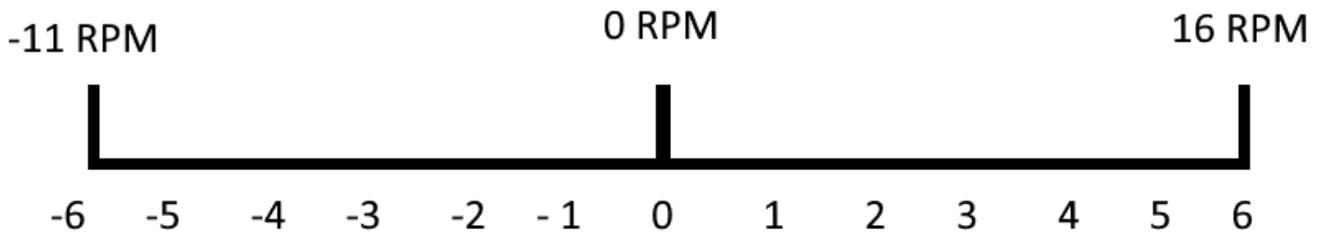
1. Check that the master switch is turned on, the socket cover door is closed, the emergency stop button on the controller is released
2. Push the green start / stop button once to activate the wireless controller system  
Note that the display will not turn on yet
3. Push the green start / stop button again to power up the system  
Note: The display should now turn on and after a moment show the vehicle state as “inactive”
4. Press the green start / stop button again to activate the e-Agitator. The system status on the display should show as “active”.

## Bowl Control

The bowl control operates in steps. There are 6 speed levels in mix and discharge that are set by using the two buttons for mix and discharge on the controller. When the system is started the default setting is zero. When the bowl control buttons are pressed the bowl speed will increment one speed level in the direction that is requested.

Holding down a bowl control button in either direction for 1 second will reset the speed to 0 RPM.

The pause button can be used to start and stop the bowl rotation at a particular speed setting.



## Eject Hold Function

When the agitator is ejecting, and the RPM is set to zero (including if the pause button is used) the system will hold the agitator bowl in position so that the weight of the concrete does not rotate the bowl backwards. This helps with unloading small amounts of concrete frequently, for example into wheelbarrows.

This function consumes a small amount of energy to hold the bowl stationary and so it is not enabled in the mixing direction. This will mean that the bowl will swing slightly and is normal.

## Timers and Interlocks

The water pump control has a timer that expires after a certain time. This time can be set in the control software and the purpose is to prevent the water pump running dry or being accidentally left on.

There is a road speed interlock on the work lights which will disable the work lights if the vehicle road speed is above 10kmh. This is to ensure that the white rear facing work lights are not left on while the vehicle is traveling down the road.

## 6 Charging

|   |   |
|---|---|
|  | <p><b>WARNING</b></p> <p>Only ever use a compatible charger with the vehicle. Using an incompatible charger could cause severe damage to the battery or vehicle.</p>  |
|  | <p><b>ATTENTION</b></p> <p>The charging socket in the vehicle has an automatic lock inside. If the charging plug is not releasing from the socket <b>DO NOT FORCE IT</b>. Instead contact a maintenance technician.</p> |

Before beginning to charge ensure the vehicle is stopped on flat ground with the parking brake applied.

During the charging process the e-Agitator cooling system may activate which will run the radiator fan to regulate the temperature of the charging components. This is normal behaviour and should not be interrupted.

Isolating the vehicle while charging will not unlock the plug and should only be done in an emergency. If the plug becomes stuck in the socket do not force it. Call for a service technician to aid in manually unlocking the plug. The plug lock will unlock automatically when the system is started, and every time the stop charging button is pushed.

## Slow Charging (Mode 2)

### ***To begin slow charging***

1. Open the charger socket cover door
2. Turn the charging cable switch on at the wall
3. Plug in the slow charger cable
4. The blue status light next to the socket will illuminate when charging and the display will indicate the charger is connected and the system is charging

### ***To stop slow charging***

1. Push the Stop Charging button
2. Wait a moment while the socket unlocks
3. Remove the charging plug from the vehicle and return the cable to the wall hanger
4. Close the charger socket cover lid
5. Start the vehicle e-Agitator using the normal start up procedure



*Figure 4: CCS Mode 2 Slow Charging Connector*

## 7 Key Features

### ***Emergency Stop***

The e-Agitator emergency stop button brings the agitator bowl to a controlled stop.

If the emergency stop button has been pressed the full system needs restarting by turning off the main isolator master switch waiting 10 seconds and switching it on again.

|   |   |
|---|---|
|  | <p>The emergency stop button is located on the wireless controller to allow the operator to immediately shut down the e-Agitator. If there is ever any doubt about the machine safety, immediately press the emergency stop button. The emergency stop button should not be used to shut the e-Agitator down under normal operating states.</p> |
|---|---|

### **Battery Pack Isolation**

Full battery isolation is achieved when the low voltage master switch is turned to the off position.

If battery isolation is desired the master switch should be turned off when the e-Agitator bowl motor is shut down. The master switch may be switched off when the charger is unplugged, and the vehicle has been shut down using the green on / off switch.

Once the battery pack is isolated, all vehicle components related to the control of the high voltage battery pack and other EV components will lose power.

The master switch may be located on either side of the battery box depending on the location of the 24v truck batteries.

### ***Welding***

Welding is permitted on the vehicle as long as the main low voltage isolator is turned off and the truck 24v battery circuit has been isolated by a switch or by removing the earth battery terminal.

|   |   |
|---|---|
|  | <p><b>WARNING</b></p> <p>Even while isolated, any component painted bright orange is considered hazardous.</p> <p>These components should never be opened, regardless of isolation state, unless properly trained to do so.</p> |
|---|---|



Figure 5: Main Isolator Switch

## 8 Storage

Care must be taken when storing the vehicle for periods of time. Non-optimal storage conditions can decrease the lifetime of the vehicle main and auxiliary battery.

### Out of Service Storage

The e-Agitator can sit in “sleep mode” for around two weeks before the main battery becomes depleted. This time frame may be lower if the battery of the vehicle is below 50% at the start of the storage period or the outside ambient temperature is dropping below zero degrees Centigrade.

If the machine is known to be unused for more than one week it should be shut down and isolated using the master isolation switch.

While in storage the machine should be periodically turned on every 4 weeks to ensure the main traction and the auxiliary battery are kept in good health. The optimum storage charge is 50% and the e-Agitator will require some extra charging if the battery capacity drops below 40%.



#### **ATTENTION**

Care should be taken when taking the machine out of long storage. A full and detailed inspection should be performed to ensure the vehicle is in working order.

## 9 Maintenance and Care

### Cell Balancing

Cell balancing is a process that lengthens the total battery life and enables efficient operation. Cell balancing is automatically managed across the entire battery level but is more effective as the battery pack becomes full. To ensure optimal battery life it is recommended to fully charge the vehicle at least once per week to allow adequate battery cell balancing. The ideal time for this is to leave the e-Agitator on the charger overnight.

### Visual Inspection

A visual inspection should be performed on the machine on a regular basis. The visual inspection should cover the whole of the vehicle and its components on a high level. No removal of parts or opening of sealed components is needed for the visual inspection.

### Vehicle Chassis

The vehicle's chassis should be looked over for signs of corrosion. Any signs of rust, cracks or fracture should immediately be reported to the maintenance technician and may compromise the safety of the vehicle. Of note to inspect on the chassis are the battery boxes. These boxes should be sealed, with no parts exposed.

### Componentry

All vehicle components are mounted and installed in a fixed location. No components should be loose or free to move.

### Jumpstarting Vehicle

The e-Agitator shares the auxiliary battery with the truck. If the truck battery runs flat the e-Agitator is unable to start. If this happens the truck can be jumpstarted as usual although the e-Agitator master isolation switch should be switched off and remain off until the truck battery is sufficiently charged.

# 10 Troubleshooting

## Vehicle Does Not Start

Electric machines are highly complex and there are several self-checks that the system performs every time the e-Agitator is started. If one of these checks fails, then the machine will not start to prevent a hazard that might be present from operating out of spec machinery.

If the e-Agitator will not start after performing the isolated startup procedure call your Kahu EV account manager to provide assistance.

## Reduced Battery Performance

Reduced range can also arise if the battery has been damaged or has poor health. If the e-Agitator no longer seems to get the same performance per charge consult Kahu EV to perform a battery health check.

## Low Voltage Power & Fuses

There is a section of the battery box identifiable by a cover and sticker that says “24V Fuses”. The fuses for the low voltage electrical components are located under this cover and a regular automotive electrician is permitted to check the system in this section of the battery box. High voltage electricity is not accessible behind this cover.

To access wiring and fuse diagrams please contact Kahu EV.

