# ECOBITE II
## Base

*Electronic spreader controller*
Version 3.1


# User manual
Revision 15.10

SPREADING

ACE
*Take control*

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# GENERAL PRESENTATION

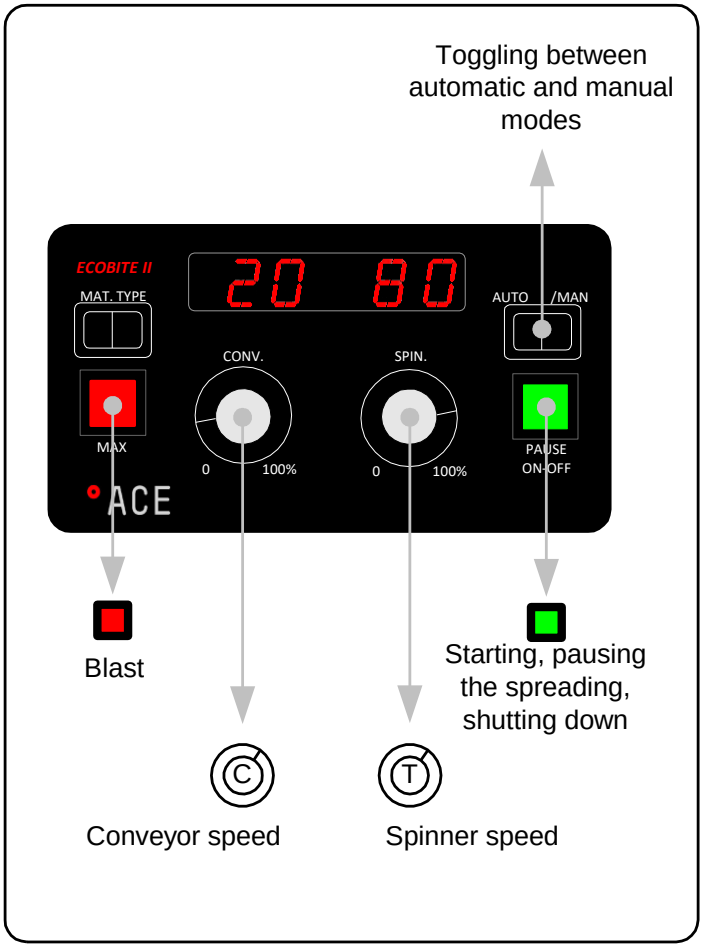
## ECOBITE II OBJECTIF

This system has been designed to easily and economically control the spreading of solid materials (salt, crushed stone, or sand). It allows for a constant spreading independent of the type of vehicle carrying the spreader.

## CONSOLE ECOBITE II

The console of the ECOBITE II controller allows the user to :

- Define the spreading rate of solid material (between 0 and 100%);
- Adjust the spreading width (between 0 and 100%);
- Perform at any time a blast according to the preprogramed parameters;
- Unload the speading vehicle.



# CONFIGURATION

***WARNING :*** *When proceeding with the configuration, the access to some menus may trigger the start of the conveyor or the spinner due to the implementation of values programmed either in the factory or from the previous configuration.*

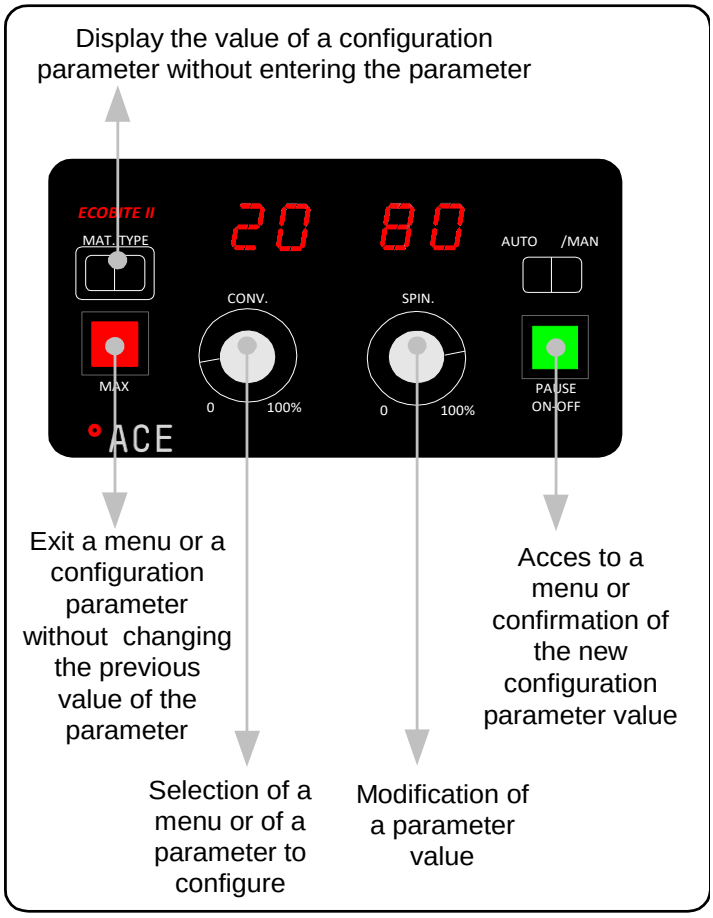
*Make sure that the start of the conveyor and the spinner cannot cause any dangerous situations.*

1 .To enter the configuration mode : Press, at the same time, the MAX and PAUSE buttons for 2 seconds. A beep is emitted to confirm that the system is in the Configuration mode and the word CONFIG is displayed on screen.

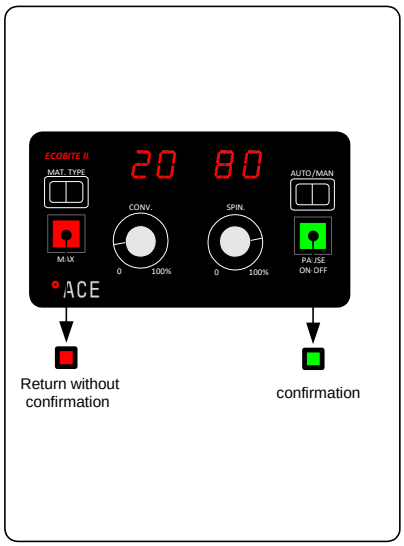
*If the controller prompts you for an access code, this means that the default one (1234) has been modified. If you have forgotten the access code, only an ACE technician can unlock the controller.*

2 .Turn the CONV button to access the configuration menu options.

3 .Press the PAUSE button to select or validate a modification and the MAX button to cancel a selection or go back.



# CONFIGURATION MENU ECOBITE II BASE V3.1




## Acces to the configuration

The 1234 acces code (by default) is not requested to acces the configuration menu, but any other one will be needed.

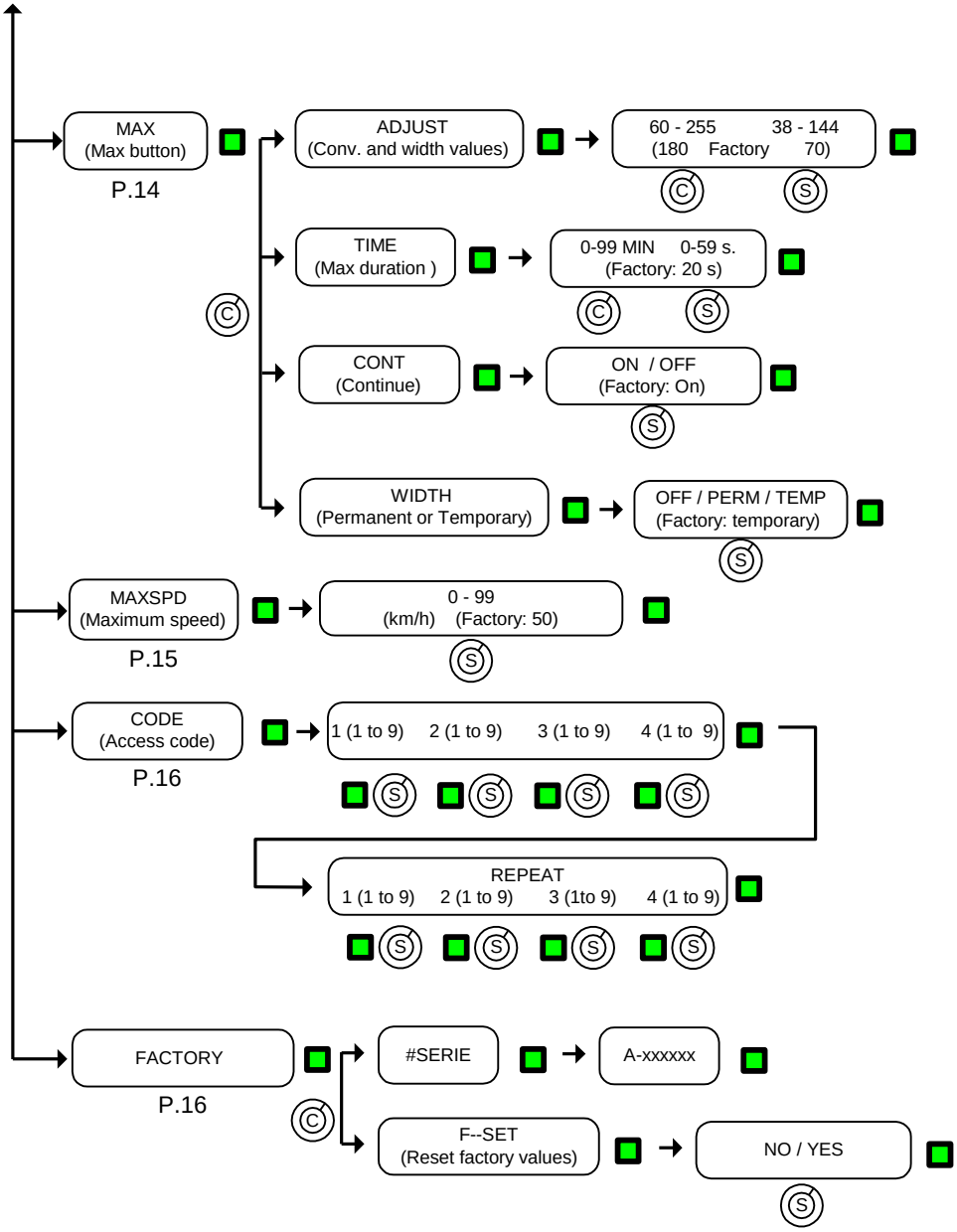
2 sec.

X X X X
(Access code)

1 (1 to 9) 2 (1 to 9) 3 (1 to 9) 4 (1 to 9)

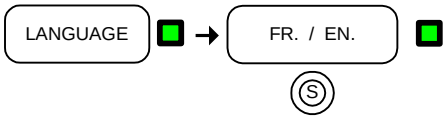
Exit
(Hold 2 s.)

- LANGUAGE → FR. / EN. (S)
  P.7
- DIST (Distance)
  P.7
  - SPDTST (Calibration speed) → xxx KMH
  - 1 KM (Factory:16000) (Adjustment over 1 km) → START (Starts the meter on the first pulse)
  - KM/H (Ajustment in motion) → KM/H (real) KM/H (desired) (Actual speed adjustment km/h) (S)
  - SPDSIM (Speed simulator) → xxx (in km/h) (S)
- VALVE (Type) → DEF (Factory) (S)
  P.9
- CONV (Conveyor)
  P.9
  - MIN → 20 - 100 (Factory 60) (C) (S)
  - MAX → 100 - 250 (Factory:180) (C) (S)
  - SPDREF (Reference speed) → 20 - 60 km/h (Factory:45km/h) (S)
  - BOOST (Boost Conv. PWM + s) → 0 - 255 0 à 25.5s (per 0.5s) (75 Factory 1) (C) (S)
  - STEP (Scale) → 1 , 5 , 10% (Factory: 5%) (S)
- WIDTH
  P.12
  - MIN → 20 -120 (Factory:54) (C) (S)
  - MAX → 20 - 250 (Factory: 98) (C) (S)
  - BOOST (Boost Width. + s) → 0 - 100 0 to 10s (per 0.5s) (5 Factory 0.5) (C) (S)
  - STOP (Auto stop if 0 km/h) → ON / OFF (Factory: ON) (S)
  - STEP → 1 , 5 , 10% (Factory: 5%) (S)


MAX
(Max button)
P.14
ADJUST
(Conv. and width values)
60 - 255 38 - 144
(180 Factory 70)
TIME
(Max duration )
0-99 MIN 0-59 s.
(Factory: 20 s)
CONT
(Continue)
ON / OFF
(Factory: On)
WIDTH
(Permanent or Temporary)
OFF / PERM / TEMP
(Factory: temporary)
MAXSPD
(Maximum speed)
P.15
0 - 99
(km/h) (Factory: 50)
CODE
(Access code)
P.16
1 (1 to 9) 2 (1 to 9) 3 (1 to 9) 4 (1 to 9)
REPEAT
1 (1 to 9) 2 (1 to 9) 3 (1to 9) 4 (1 to 9)
FACTORY
P.16
#SERIE
A-xxxxxx
F--SET
(Reset factory values)
NO / YES

## LANGUAGE

The LANGUAGE function allows you to choose the display language (French or English).

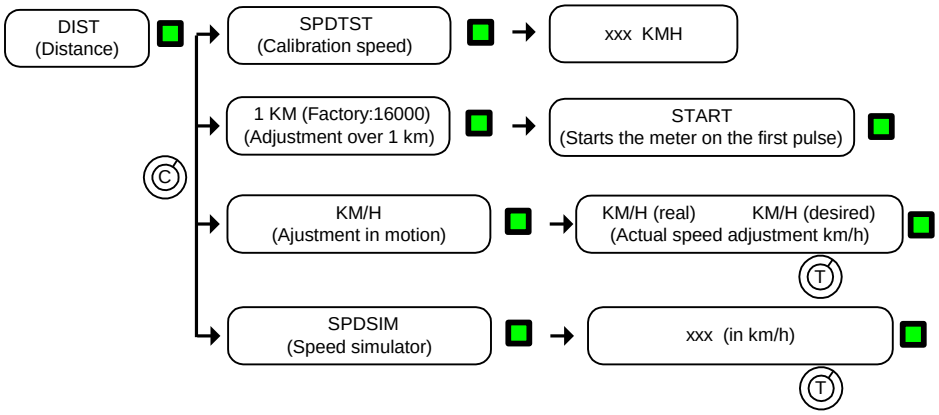



1. Turn the CONV button to display LANGUAGE and press the PAUSE button.
2. Turn the SPIN button to select FR (French) or EN (English).
3. Press the PAUSE button to confirm your choice.

## DIST

The signal/distance ratio adjustment is made through the DIST menu. This setting allows the controller to count the number of pulses that the transmission sends when the vehicle travels a given distance.

The accessible settings are: SPDTST, 1 KM , KM/H, and SPDSIM.




### [SPDTST]

The SPDTST function allows you to verify the adjusted speed. Turn the CONV button, select the SPDTST function, and press the PAUSE button.

The controller displays the speed in km/h, which is read in real time. If the displayed speed is different from the actual vehicle speed, there are 2 methods to make the adjustment. The method for ‘1 KM’ or the method in real time ‘KM/H’. Only use one of the 2 methods.

**[1KM]**

The 1KM function allows you to adjust the speed with regards to the distance.

1. Put the vehicle at the beginning of a measured kilometer.
2. Turn the CONV button to select the 1 KM function and press PAUSE. The controller displays START.
3. Start the vehicle. The controller counts and displays the pulses coming from the transmission.
4. Move the vehicle along the total kilometer. Once the kilometer is completed, press PAUSE to save the adjustment. The controller displays SAVED.

**[KM/H]**

The KM/H allows you to adjust the actual speed.

1. Turn the CONV button to select the KM/H function and press PAUSE. The controller displays the speed in km/h already calibrated on the left and the adjustment value on the right.
2. Turn the SPIN button to select the adjustment speed. For example, if you want the adjustment to be 40 km/h, display 40 on the right by turning the SPIN button.
3. When the actual vehicle speed is stabilized at 40 km/h on the odometer, press the PAUSE button to save the adjustment.
4. The controller displays SAVED.

*Important : During calibration it is important not exceed the maximum number of pulses of 90 000.*

**[SPDSIM]**

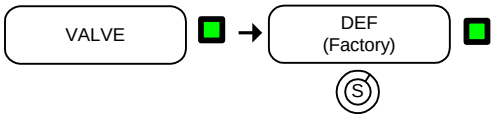
The SPD-SIM function allows you to simulate the vehicle moving speed and send it to the controller.

1. Turn the CONV button to select the SPDSIM function and press PAUSE. The controller displays 0.
2. Turn the SPIN button to select the simulation speed in km/h.
3. Press the PAUSE button to save the adjustment.

***Important** : The configuration of the simulated speed is reset to zero (0) when shutting down the ECOBITE II.*

## VALVE

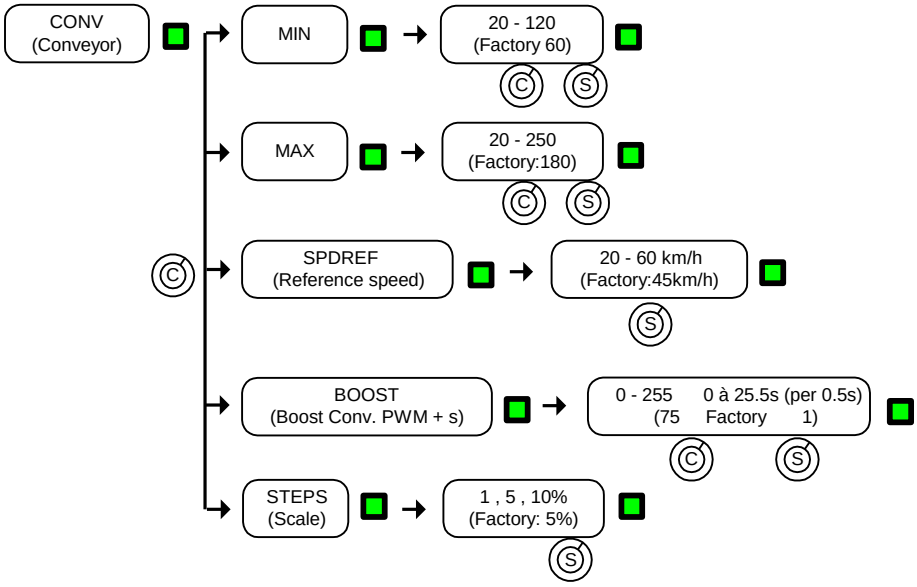
The VALVE function allows you to select the valve model used with controller.




1. Turn the CONV button to display VALVE and press the PAUSE button.
2. Turn the SPIN button to select your valve type.
3. Press the PAUSE button to confirm your choice.

## CONV

The adjustment of the conveyor speed is made through the CONV menu.




## WARNING

When proceeding with the configuration, the access to some menus may trigger the start of the conveyor or the spinner due to the implementation of values programmed either in the factory or from the previous configuration.

**MAKE SURE THAT THE START OF THE CONVEYOR AND THE SPINNER CANNOT CAUSE ANY DANGEROUS SITUATIONS.**

**[MIN]**

The MIN function allows you to adjust the conveyor startup in order to reduce the wait delay to a minimum.

1. Turn the CONV button to display MIN and press the PAUSE button.
2. Turn the CONV button to gradually increase the voltage until the conveyor starts to move.The value is in PWM (20 to 120).
3. Press the PAUSE button to save the minimum speed.

**[MAX]**

The MAX function allows you to limit the conveyor speed to a minimum.

1. Turn the CONV button to display the MAX function and press the PAUSE button.
2. Turn the CONV button to gradually increase the voltage until you reach the desired maximum speed. The value is in PWM (20 to 250).
3. Press th PAUSE button to save the maximum speed.

**[VITREF]**

The VITREF function allows you to adjust the reference speed of the automatic mode. The default value is set to «45 km/h». By reducing this value, the conveyor reaches its maximum speed more quickly. If you increase this value, the opposite occurs. In most cases, for optimal operation, adjust our reference speed to the same value as our maximum speed spreading.

1. Turn the CONV button to display the VITREF function and press the PAUSE button.
2. Turn the SPIN button to select your reference speed.
3. Press the PAUSE button to save your choice.

**NOTE**

PWM is the acronym for "pulse width modulation" which is a technique to get analogue results through digital means. Also referred to as MLI in French for "modulation de largeur d`impulsions".

**[BOOST]**

The BOOST function allows you to reduce the delay of the material arrival to the ground at the start of the spinner. The conveyor moves more rapidly for a while at the start of the vehicle in order to feed the spinner with materials faster. It is possible to select the conveyor speed and the duration of it.

1. Turn the CONV button to display BOOST and press the PAUSE button.
2. Turn the CONV button to select the desired speed.
3. Turn the SPIN button to select the desired duration.
4. Press the PAUSE button to confirm your choice.

*The duration can be adjusted between 0 and 25.5 seconds in steps of 0.5 second.*

**[STEPS]**

The STEPS function allows you to change the scale of the variation rate steps of the conveyor.

1. Turn the CONV button to display STEPS and press the PAUSE button.
2. The value currently use is displayed.
3. Turn the SPIN button to select the step of your choice and press the PAUSE button to confirm your choice.

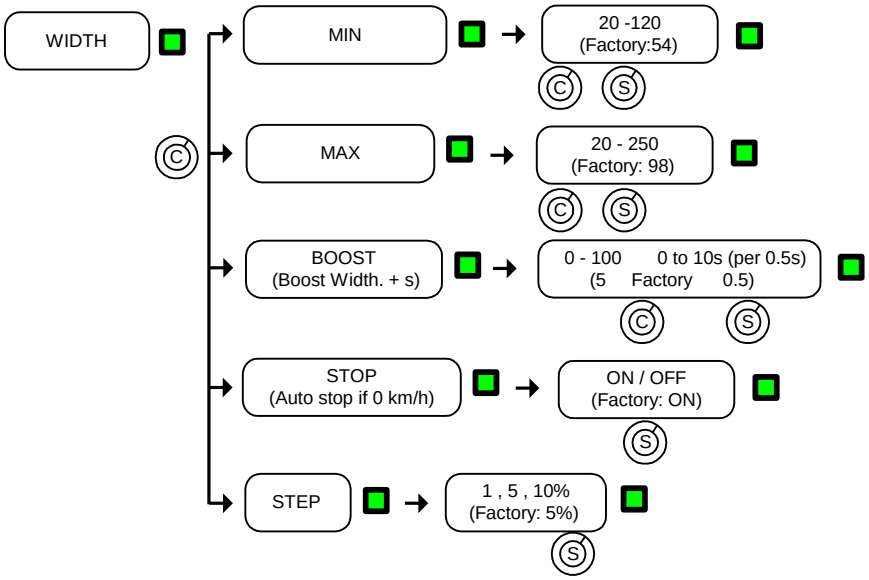
**IMPORTANT**

It is always possible to stop the conveyor and/or the spinner during an adjustment procedure by pressing the MAX button.

**MAKE SURE THAT STARTING THE CONVEYOR AND/OR THE SPINNER CANNOT CAUSE A HAZARDOUS SITUATION.**

## WIDTH

The WIDTH function allows you to insure the configuration of the spreading width by modifying the spinner speed.




**[MIN]**

The MIN function allows you to synchronize the minimum speed of the spinner with the zero position of the spinner button (SPIN).

1. Turn the CONV button to display MIN and press the PAUSE button.
2. Turn the CONV button to bring the material to the spinner.
3. Turn the SPIN button to adjust the spinner until desired minimum width speed.
4. Press PAUSE button to save the adjustment. The controller displays SAVED.

**[MAX]**

The MAX function allows you to synchronize the maximum speed of the spinner with the 100% position of the spinner button (SPIN).

1. Turn the CONV button to display MAX and press the PAUSE button.
2. Turn the CONV button to bring the material to the spinner.
3. Turn the SPIN button to adjust the spinner until desired maximum speed.
4. Press PAUSE button to save the adjustment. The controller displays SAVED.

**IMPORTANT**

It is always possible to stop the conveyor and/or the spinner during an adjustment procedure by pressing the MAX button.

**MAKE SURE THAT STARTING THE CONVEYOR AND/OR THE SPINNER CANNOT CAUSE A HAZARDOUS SITUATION.**

**[BOOST]**

The BOOST function allows you to increase the energy sent to the spinner motor solenoid for a certain duration at the start of the spinner in order to trigger the rotation of the spinner motor of low-displacement engine. It is possible to select the increase of the spinner energy and its duration.

1. Turn the CONV button to display BOOST and press the PAUSE button.
2. Turn the CONV button to select the increase of spinner energy.
3. Turn the SPIN button to select the desired duration.
4. Press the PAUSE button to confirm your choice.

*Note : The selected energy increase is added to the one of the spinner.*

*Note : The duration adjustment is between 0 and 10 seconds in steps of 0.5 seconds.*

**[STOP]**

The STOP function allows you to control the spinner rotation. If it is at the ON position, the spinner only rotates when the conveyor is in operation. If it is at the OFF position, the spinner rotates continually as long as the controller is in operation mode.

1. Turn the CONV button to display STOP and press the PAUSE button.
2. Turn the SPIN button to select ON or OFF and press the PAUSE button to confirm your choice.

*Note : Some valve models require that the spinner is in operation in order for the spinner to work. It will therefore not be possible to have the spinner work when the vehicle is stopped.*

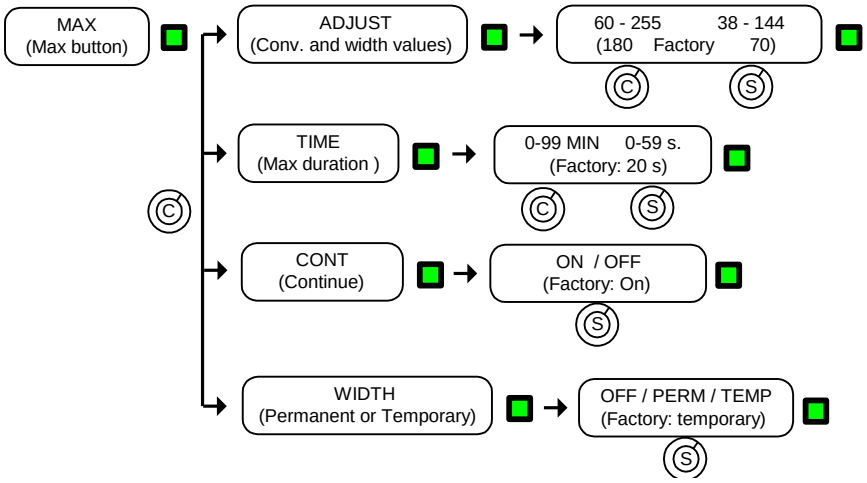
**[STEP]**

The STEPS function allows you to change the scale steps variation of the spreading width.

1. Turn the CONV button to display STEP and press PAUSE button.
2. The value currently use is displayed. Turn the SPIN button to select the step and press the PAUSE button to confirm your choice.

## MAX

The MAX button is used to start a blast, which is an increased spreading over a short distance. When the operator presses the MAX button, the controller automatically applies the configured rate, width, and duration. When a blast is in operation, the display intermittently indicates the word MAX. A beep confirms the end of the blast operation.




### [ADJUST]

The ADJUST function allows you to choose the speed of the conveyor and the spinner when a blast is in operation.

1. Turn the CONV button to display ADJUST and press the PAUSE button.
2. Turn the CONV button to select the conveyor blast speed.
3. Turn the SPIN button to select the blast width.
4. Press the PAUSE button to confirm your choices.

### [TIME]

The TIME function allows you to specify the blast duration.

1. Turn the CONV button to display TIME and press the PAUSE button.
2. Turn the CONV button to select the number of minutes.
3. Turn the SPIN button to select the number of seconds.
4. Press the PAUSE button to confirm your choices.

**[CONT]**

The CONT function allows you to choose to continue the blast even if the vehicle is immobile or that the spreading stops when it is immobile.

1. Turn the CONV button to display CONT and press the PAUSE button.
2. Turn the SPIN button to select ON to allow the blast when the vehicle is immobile or OFF in order for the spreading to stop when it is immobile.
3. Press the PAUSE button to confirm your choice.

**[WIDTH]**

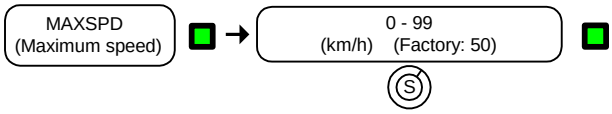
The WIDTH function allows you to control the spreading width in the blast mode 3 ways:

- The spreading width for the blast is the one permanently defined (PERM).
- The spreading width for the blast is the one defined, but is possible to vary it using the SPIN button during the blast (TEMP). In that case, at the end of the blast, the width value returns to the one defined before the blast.
- The spreading width for the blast remains the same as in normal spreading without taking into account the adjusted value in the blast configuration (OFF).

1. Turn the CONV button to display WIDTH and press the PAUSE button.
2. Turn the SPIN button to select OFF, PERM, or TEMP.
3. Press the PAUSE button to confirm your choice.

## MAXSPD

The MAXSPD function allows you to define the spreading maximum speed. If, while in the spreading operation, the vehicle moves at a greater speed than the maximum value defined, the controller emits a beep.

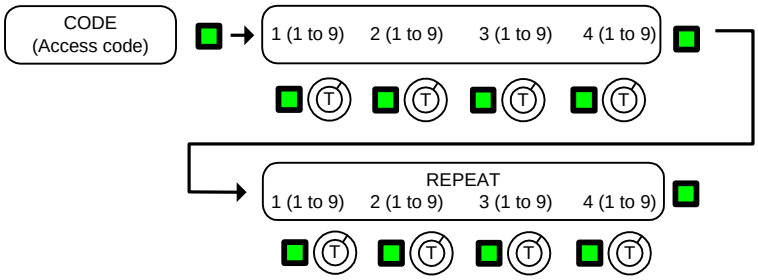



1. Turn the CONV button to display MAXSPD and press the PAUSE button.
2. Turn the SPIN button to select the maximum speed (between 0 and 99 km/h).
3. Press the PAUSE button to confirm your choice.

***Note** : If you select 0 km/h, the beep is deactivated.*

## CODE

The CODE function allows you to add or modify a 4 digit access code to the Configuration menu. The 1234 access code (by default) is not requested to access the Configuration menu, but any other one will be needed.

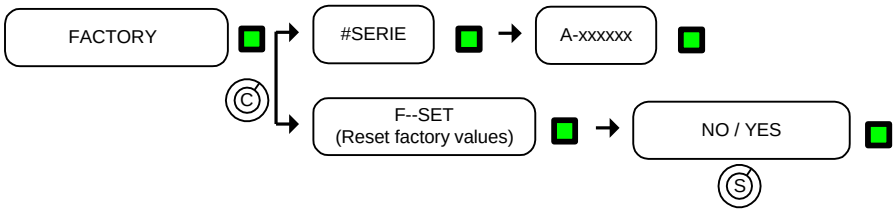



1. Turn the CONV button to display CODE and press the PAUSE button.
2. Turn the SPIN button to select the first digit of the code (between 1 and 9).
3. Press the PAUSE button to confirm our choice.
4. After confirmation of the fourth digit, repeat the setting of the following the same procedure.

***Important** : If you have forgotten the access code, only an ACE technician can unlock the controller.*

## FACTORY

The FACTORY menu allows you to display the unit serial number and reset all controller data to the factory values.




### [#SERIE]

The #SERIE function allows you to display the unit serial number.

1. Turn the CONV button to display #SERIE and press the PAUSE button. The serial number is displayed.

### [F--SET]

The F-SET function allows you to reset all controller data to the factory values.

1. Turn the CONV button to display F-SET and press PAUSE button.
2. Turn the SPIN button to select YES. The NO cancels the reset operation.

# OPERATION

The basic control functions for the operation of the ECOBITE II are: starting the controller, starting and stopping the spreading, shutting down the controller, selecting the Operation mode (optional), blast and altered functioning.

- To start the controller, press the PAUSE button.

- Press the PAUSE button once to start spreading.

- To stop spreading, press the PAUSE button once. PAUSE is displayed on the screen.

- To turn off the controller (shutting down), press the PAUSE button for 2 seconds.

NOTE: When the vehicle key is in the off position, the controller is not operational.

NOTE 2: To select either the manual or the automatic mode, press the AUTO/MAN button. According to your choice, AUTO or MANUAL is displayed on the screen.

### MANUAL MODE, MAN

In manual mode (AUTO/MAN button), the available speeds for the conveyor (between 0 and 100) and for the spinner (between 0 and 100) are directly linked to the positions of the CONV (conveyor) and SPIN (spinner) buttons. The controller adjusts the electro-hydraulic valves in order for that each movement of the SPIN and CONV choices are within their minimum values: conveyor at 0% and spinner at 0%, and maximum values: conveyor at 100% and spinner 100%.

** Use that mode to unload the spinner or for particular uses.*

### AUTOMATIC MODE, AUTO

In automatic mode automatic (AUTO/MAN button), the spreading rate is based on the rate selected with the CONV button and on the speed of the vehicle. The spreading width remains independent of the vehicle speed as in the manual Mode.

When the conveyor rate flashes, this indicates that the spreading hydraulic capacity is at its maximum.

# INSTALLATION

Position the ECOBITE II controller so that it is easily accessible by the operator. Leave enough space to connect the cables behind the console. When the controller will be used in automatic AUTO mode, a speed signal from the vehicle transmission is to be connected.

**Electrical connexion:**

1. Connected the WHITE wire to a 20 amp fuse to the + 12V BAT (constant power).
2. Connected the GREEN wire to a 5 amp fuse to a power supply + 12v ACC (controlled by the ignition switch).
3. Connected the BLACK wire to the vehicle chassis. (ground).

**Connecting the solenoids:**

1. Connect the solenoid valves with 5 meter cable included (910-CABDORDAS2) or other.
2. Attaching the cable to the solenoids connector of the harness ECOBITE II console.

**Connecting the speed signal (if automatic mode used):**

There are two common connections available to provide the speed signal to the controller.

1. The cable to a square wave DC (910-CABDORDAE) for vehicles with a connection of this type or some automatic transmission controller.
2. The cable for a sine wave signal (910-CABCOREAM) for vehicles with manual transmission.

**CAUTION :**

Most of the recent vehicles (1998 and over) have a motor management computer (ECM). It is extremely important to avoid any disruption of transmission speed sensor signal to the ECM. Any modification of that signal can cause an important engine failure and damage the transmission. Avoid making an electrical connection between the sensor and the ECM.

**Important :**

- To prevent short circuits, disconnect the negative battery terminal before installation.
- The maximum consumption of the system is 15 amperes. Make sure that the black ground wire and the white positive wire are fit to support the charge.
- Make sure that all wires and cables are correctly routed and secured to avoid any deterioration caused by excessive heat or wear by friction.
- Never cut the insulation of the controller power cable to share power with another device. An excessive drop of voltage can produce a malfunction of the ECOBITE II.
- Use dielectric grease on all external electrical connections to avoid the risk of future corrosion.
- Use the console mounting holes; do not make holes in the console casing.
- Cable of specific lengths are available on request, do not cut or modify the electrical cables of the controller.

## SPECIFICATIONS

### Overview

- Power……14,4 VDC (10,8V minimum)
- Ground……Negative pole
- Maximum consumption……15,0 A
- Dimensions…….(L x H x D) : 153 x 85 x 50 mm. (6 x 3.25 x 2 in.)
- Weight……570g (1 lb. 4 oz.)
- Operating temperature...……...-40ºC to 75 ºC (-40 ºF to +167 ºF)
- Humidity……95% (+25ºC to 55 ºC)

### Solenoid valves outputs

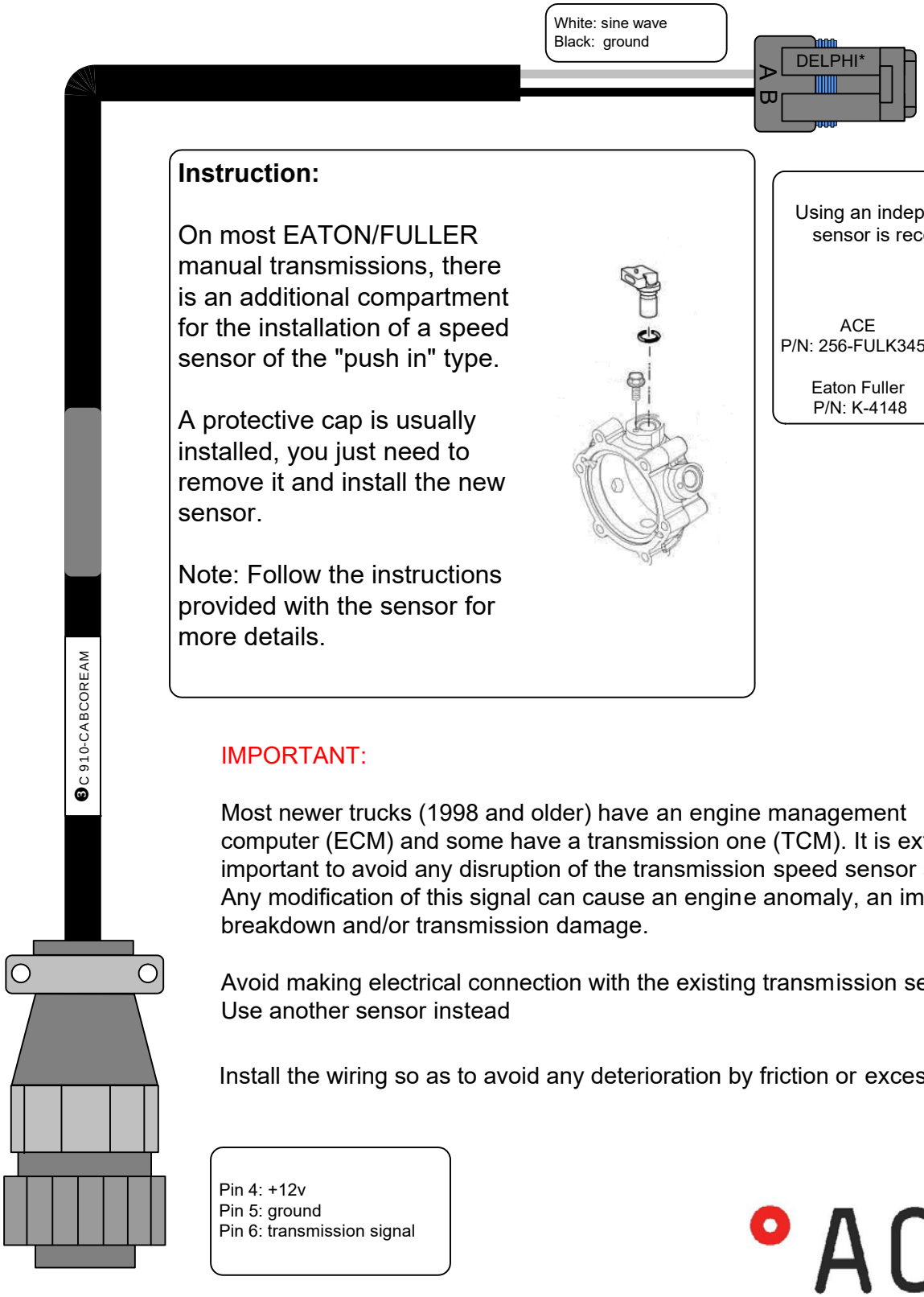
- Maximum power per output……5.0A (fuse 7.5A per output in the housing)
- Type of signal per output……..…….Pulse width modulation (PWM)
- Output frequency……225Hz (other frequencies available)
- Provided connector type……DIN 43650 / ISO 4400 (EN 175301-803)

**Note** :

The characteristics and the presentation may be changed without prior notice.

# *INSTALLATION OF THE SPEED CABLE FOR THE ACE CONTROLLER FOR MANUAL TRANSMISSION.*

## ❸C 910-CABCOREAM




**Instruction:**

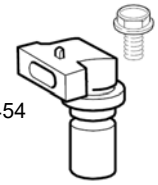
On most EATON/FULLER manual transmissions, there is an additional compartment for the installation of a speed sensor of the "push in" type.

A protective cap is usually installed, you just need to remove it and install the new sensor.

Note: Follow the instructions provided with the sensor for more details.



Using an independent speed sensor is recommended:



ACE
P/N: 256-FULK3454

Eaton Fuller
P/N: K-4148

IMPORTANT:

Most newer trucks (1998 and older) have an engine management computer (ECM) and some have a transmission one (TCM). It is extremely important to avoid any disruption of the transmission speed sensor signal. Any modification of this signal can cause an engine anomaly, an important breakdown and/or transmission damage.

Avoid making electrical connection with the existing transmission sensor. Use another sensor instead

Install the wiring so as to avoid any deterioration by friction or excessive heat.

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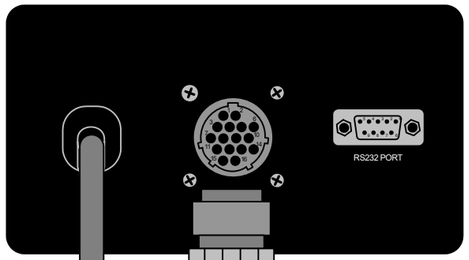
# Appendix VII :
# Electrical plan

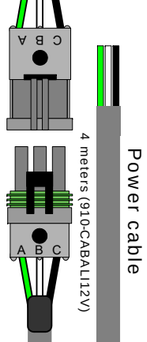



**Power**

Green (A): 12V ACC
(controlled by the ignition switch).
**5A fuse recommended**.

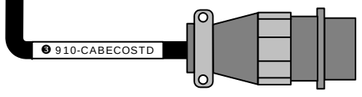
White (B): 12V BAT
(constant power supply).
**20A fuse recommanded.**

Black (C) : Ground
(vehicle body ground).




**Speed input signal**

Pin 4:+12v
Pin 5: Ground
Pin 6: Odometer signal input
Pin 7: 'A' bus
Pin 8: 'B' bus




**Conveyor output signal**
Pin 4:+12v
Pin 5: Ground pulsed output

**Spinner output signal**
Pin 6: +12v
Pin 7: Ground pulsed output

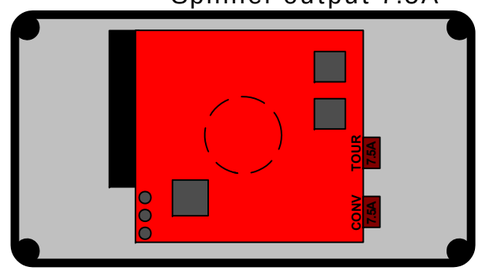



## Spinner and conveyor solenoid cable

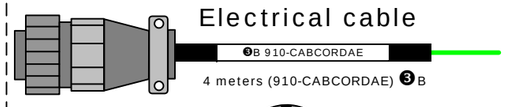
**Conveyor**
Pin 4: +12v
Pin 5: Ground pulsed output

**Spinner**
Pin 6: +12v
Pin 7: Ground pulsed output


## Fuses: Conveyor output 7.5A
## Spinner output 7.5A




## Electrical cable




Pin 6: Transmission input signal (green)

**Instructions:**

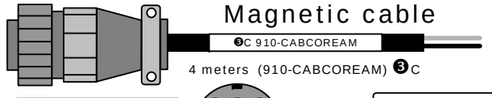
Connect the green wire to the speed output signal terminal (speed out, KPH,..) or use the 'Body Builder' connector provided by almost every vehicle manufacturer.

This output is mostly located in the fuse – relay block of the vehicle, at the exterior, in the frame behind the cabin or under the hood of the engine.

However, if the vehicle is not equiped with this output, it is possible to do a connection on some automatic transmission controllers « TCM », with this cable (ex. Allison) and on certain engine controllers « ECM » (ex. Internaltional).

Caution:
Make sure connecting the green wire correctly to the vehicle. If needed, see electrical diagrams of the vehicle to avoid any damage to the electrical system of the vehicle.

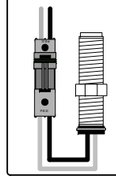
## Magnetic cable




Pin 4: +12v
Pin 5: Ground
Pin 6: Transmission signal

White: Sinusoidal wave
Black: Ground

Original magnetic transmission sensor connection



**Instructions:**

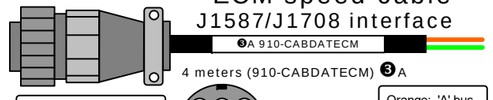
If your odometer operates with a magnetic speed sensor on the propeller output shaft, without Engine Controle Module (usally before 1998), you must use a two signal outputs threaded sensor.

Note 1: On certain vehicles, it is possible to install a second speed sensor at the propeller output shaft.

Note 2: Avoid this type of connection for vehicles equiped with an electronic controlled transmission (automatic transmission).

Warning :
The majority of the new trucks, built since 1998, are equiped with an Engine Control Module (ECM). It's very important to avoid any disruption of the transmission speed sensor signal at the ECM.
Any alteration of this signal can cause severe engine and/or transmission damages. Also, avoid to do electrical connection between the sensor and the ECM.

## ECM speed cable
## J1587/J1708 interface




Pin 5: Ground
Pin 7: 'A' bus (Orange)
Pin 8: 'B' bus (Green)
Pin 9: Link -> ground

Orange: 'A' bus
Green : 'B' bus

Caution :
**Only for 2009 vehicles and older.**

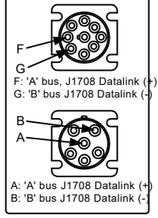
**Instructions:**

Connect orange and green wire of the J1587/ J1708 interface to the vehicle (A & B bus).

The J1587/J1708 connector is usually located left side of the vehicle dashboard. In some vehicles, there is a wiring connection block. In all other vehicles, a 6 or 9 Deutsch terminal block is available.

*Note : Make sure linking the interface correctly to the vehicle. If needed, see electrical diagrams of the vehicle.*

**Deutsch connectors**




F: 'A' bus, J1708 Datalink (+)
G: 'B' bus J1708 Datalink (-)
A: 'A' bus J1708 Datalink (+)
B: 'B' bus J1708 Datalink (-)

Available connection for speed signal (odometer):

- Electrical cable (910-CABCORDAE) ❸B
- Magnetic cable (910-CABCOREAM) ❸C
- ECM speed cable (910-CABDATECM) ❸A

Notes:
Two (2) protection fuses are located inside the case. When replacing a faulty fuse, use only same amp rated fuse.

Caution:
Install and fix wiring in a way to avoid it's deterioration due to friction or excessive heat.

ver. 171016

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