



HOW-TO

How-to Set Up Keyboards with Encoders in PMU

Document version: 1.0

Software version: 120.0 or later

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1. Description

This guide explains how to configure CANbus keyboards with rotary encoders in the Ecumaster PMU. From firmware version 120.0, two types of such keyboards are supported:

- **5x3MT Ecumaster Keyboard** – equipped with 13 standard buttons and 2 rotary encoders.
- **RacePad** – equipped with 8 standard buttons and 4 encoders. Mounted on a steering wheel.

This document focuses mainly on the configuration options for the encoders. For more general information on CAN bus keyboard support, see the PMU Manual: https://www.ecumaster.com/files/PMU/PMU_Manual.pdf

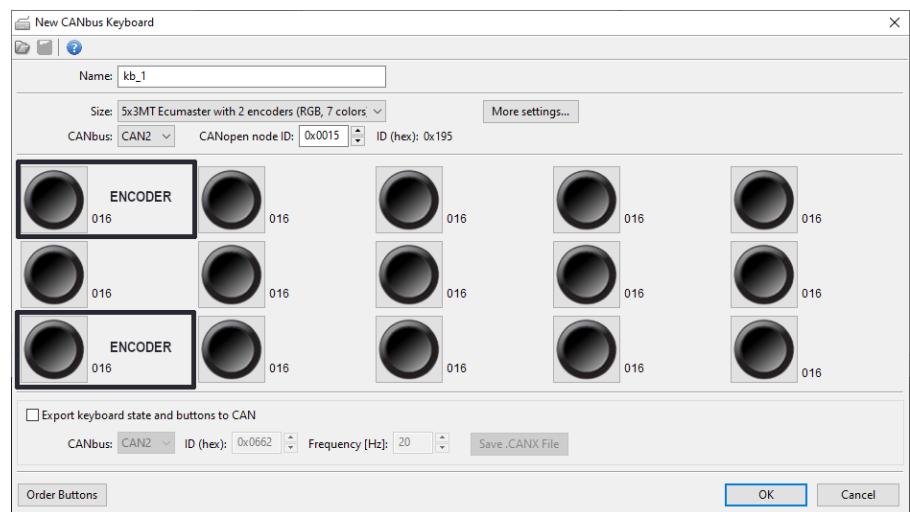
Basic Configuration

To configure any keyboard, click **Add** in the **Project Tree** and select **CANbus Keyboard** from the list, or click the keyboard icon in the toolbar.

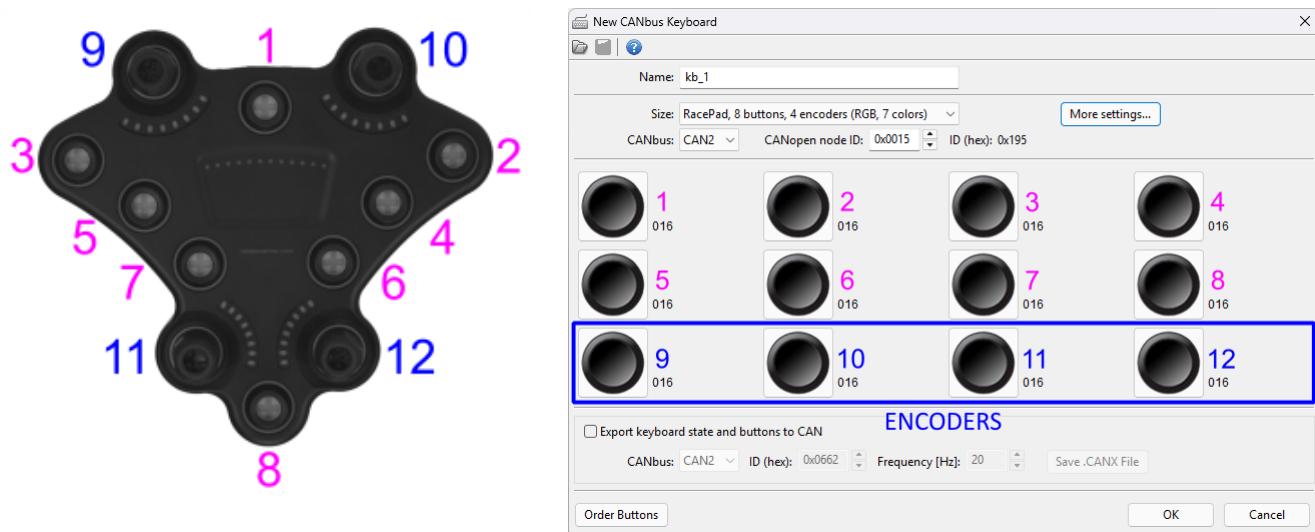
Then, select the appropriate keyboard from the **Size** dropdown menu:

- 5x3MT Ecumaster with 2 encoders (RGB, 7 colors)
- RacePad, 8 buttons, 4 encoders (RGB, 7 colors)

5x3MT Ecumaster Keyboard configuration window:



RacePad configuration window:



Keyboard-Specific Settings

5x3MT Ecumaster Keyboard

Surrounding each encoder are 16 LEDs that visually represent the current state of the encoder. The default starting LED is at 9 o'clock, numbered clockwise.

To change this, go to **More settings** and adjust the **Start offset for encoder LEDs** from 0 to 15, where 0 corresponds to the 9 o'clock position.

RacePad

Each encoder features 8 arc-shaped LEDs. Additionally, a central LED bar with 12 LEDs is positioned in the middle of the device.

RacePad has several dedicated settings available in **More settings**:

Parameter	Description
Invert LEDs encoder #1–4	Reverses the direction in which the LEDs light up for each encoder.
Invert encoder direction #1–4	Reverses the rotation logic. By default, turning clockwise increases value.
Enable central LEDs	Enables the center 12-LED strip.

Parameter	Description
Bi-directional	Enables symmetric (centered) visualization, e.g., for G-force or time gain/loss channels. In default mode, LEDs progressively light up from left to right. In bi-directional mode, LEDs light up outward from the center to the left or right, depending on the channel value.
Central LEDs channel	Assigns a channel to control the center LED strip, based on the channel's value.
Channel min value	Lower bound of the channel value range.
Channel max value	Upper bound of the channel value range.
Channel central value	Midpoint value used for symmetric LED visualization.

Encoder Operation Modes

Knowing the three types of encoder operations is essential for getting the best configuration:

1. *encoder*

Rotating the encoder adjusts the associated channel's value. Unlike a rotary switch, you have the flexibility to configure the encoder's range of values.

- *First state* - the lowest encoder state
- *Last state* - the highest encoder state
- *Default state* - After startup, the encoder will adopt its default state unless the *Autosaved channels* feature is used. (Refer to the how-to guide document for detailed instructions on using *Autosaved channels* https://www.ecumaster.com/files/PMU/How-to/How-to_Configure_Autosaved_Channels_in_PMU.pdf)

2. *changer*

Operation in *changer* mode is similar to *encoder* mode but its main use is to change pages in the ADU. Turning the encoder clockwise moves to the next page, while turning counter-clockwise goes back to the previous page.

In changer mode, the LEDs illuminate in a fan-like pattern, offering a visual indication of the operating mode.

- *First state* - the number of the first page
- *Last state* - the number of pages in the ADU

- *Default state* - after startup, the page you want to start on
- *Wrap pages* - decide if the encoder should jump from the last page to the first and vice versa

For more information about the operation of the *changer* mode, see [Example \(on page 5\)](#).

3. **parameter controller** and **parameter selector**

You can use the keyboard encoder to control multiple settings. This is possible by setting it to *parameter controller* mode. For each setting you want to manage, select a button and set its mode to *parameter selector* mode. These selector buttons function like radio buttons, allowing you to choose one active parameter at a time that is modified by the knob.

Each *parameter selector* comes with its own range and state, updating the *parameter controller* when pressed.

- a. If there are no button presses defined as a *parameter selector*, *parameter controller* remains neutral and rotation has no effect.
- b. Pressing the button defined as a *parameter selector*, conveys the parameter information to the encoder. Encoder can change the state of the *parameter selector*.
- c. After pressing the currently selected *parameter selector* button again or pressing the *parameter controller*, the encoder returns to the neutral behaviour. (Pressing any other button (not defined as a *parameter selector*) will not cause the encoder to lose control of the *parameter selector*.)

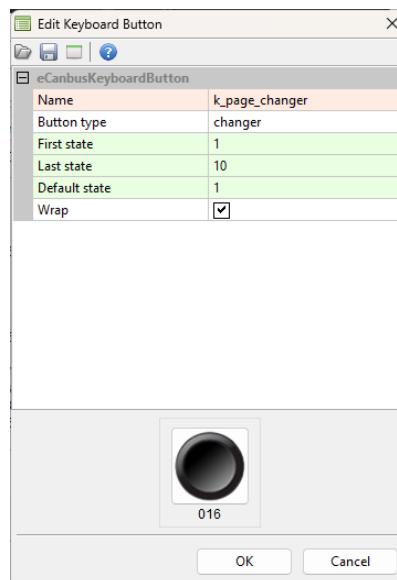
2. Example

We're configuring the 5x3MT to quickly navigate pages in ADU and finely adjust four parameters with the two rotary encoders. In this example, we'll use the top encoder for pages and the bottom one to control parameters.

Changing pages in the ADU via the PMU

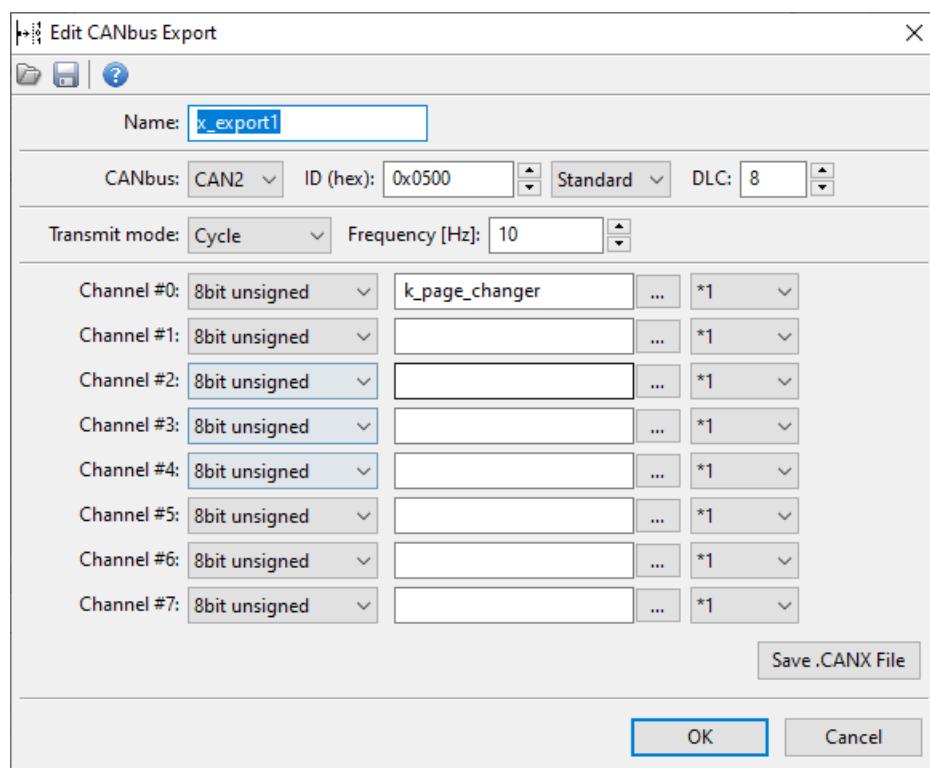
In the keyboard settings, select the top-left box for the rotary encoder. Set it as a *changer*. Determine the following parameters:

- *First state* - set to 1, to avoid confusion in page counting
- *Last state* - the number of pages in the ADU (remembering that it is not updated automatically - when you add or remove a page in ADU, it must be changed)
- *Default state* - after startup, the page you want to start on
- *Wrap pages* - decide if the encoder should jump from the last page to the first and vice versa

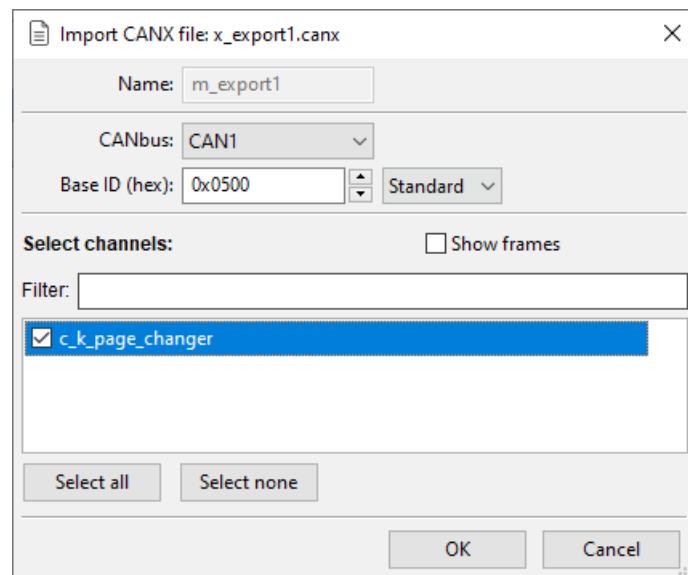


To enable page changes in the ADU, both the ADU and the PMU must be connected to the same CAN bus. Start in PMU, by adding CAN export in the Project tree. Remember to set correct CAN bus and an unoccupied ID. Select the channel that corresponds to the keyboard encoder set up in the previous step (*k_page_changer* in our example).

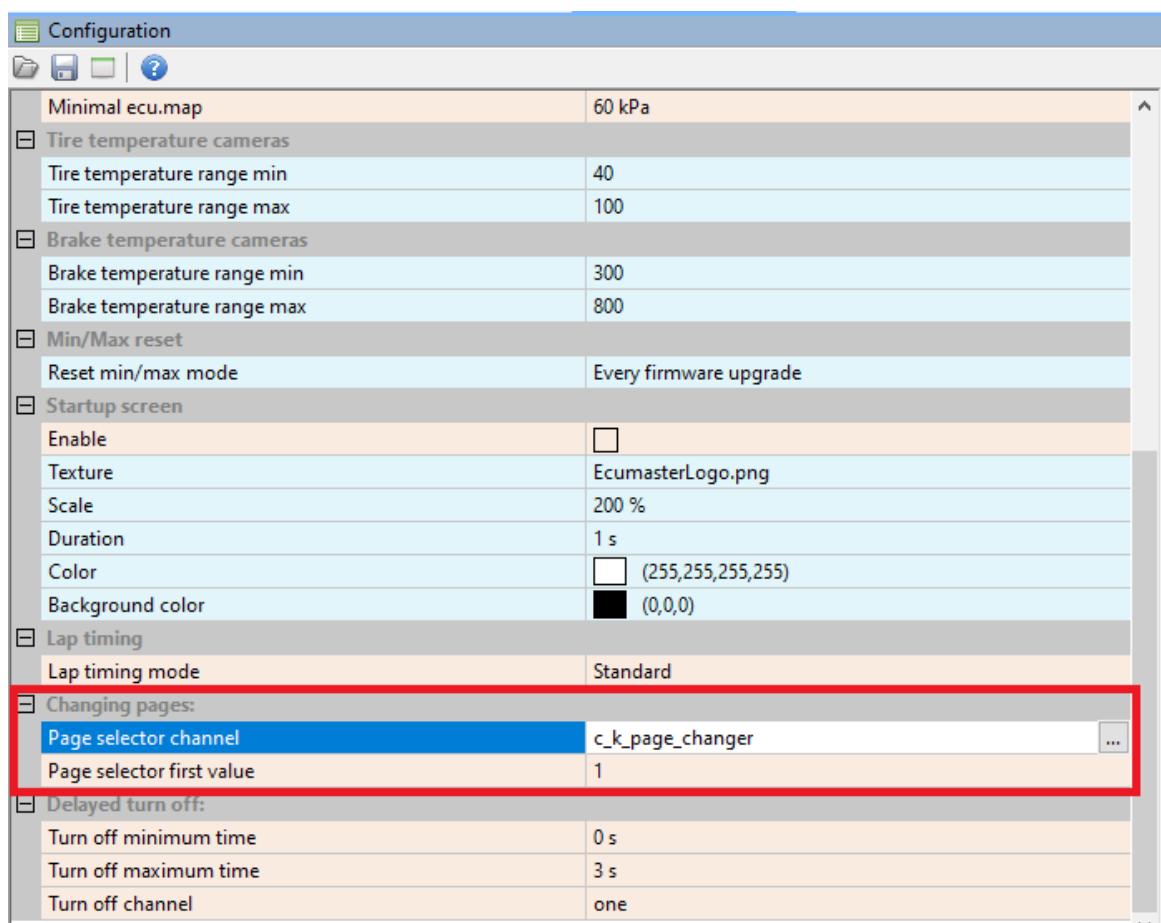
To streamline the import in the ADU, use *Save .CANX File* button.



In the next step, import the .CANX file created in the previous step into the ADU project.

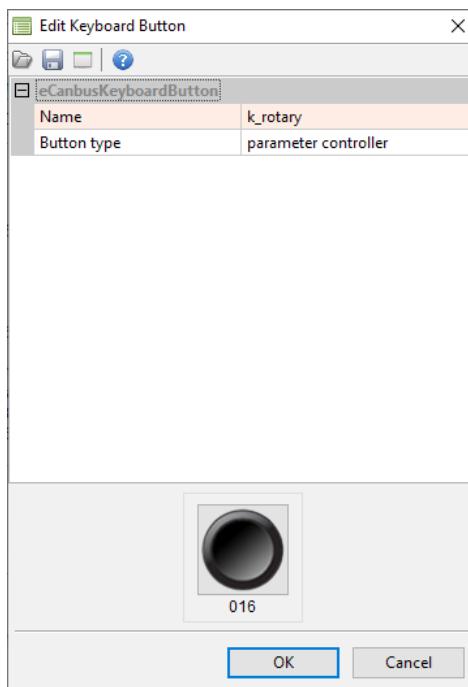


Then assign this imported channel in the *Configuration* panel to the *Page selector channel* and set *Page selector first value* as in the PMU configuration, equal to 1:

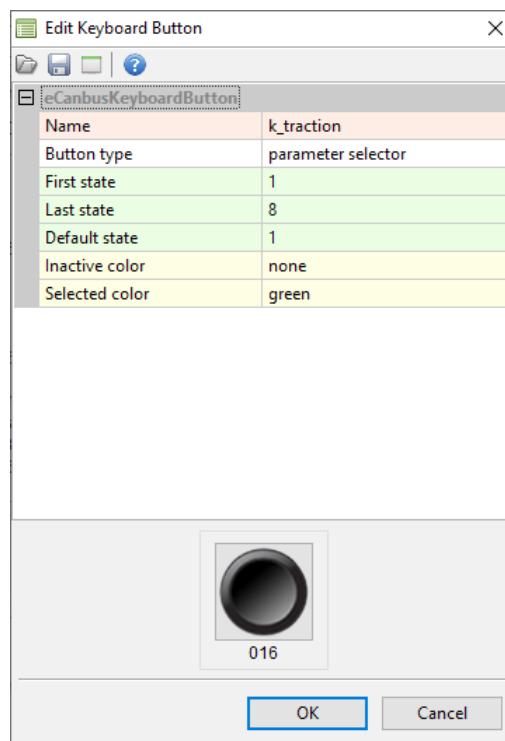


Controlling multiple parameters

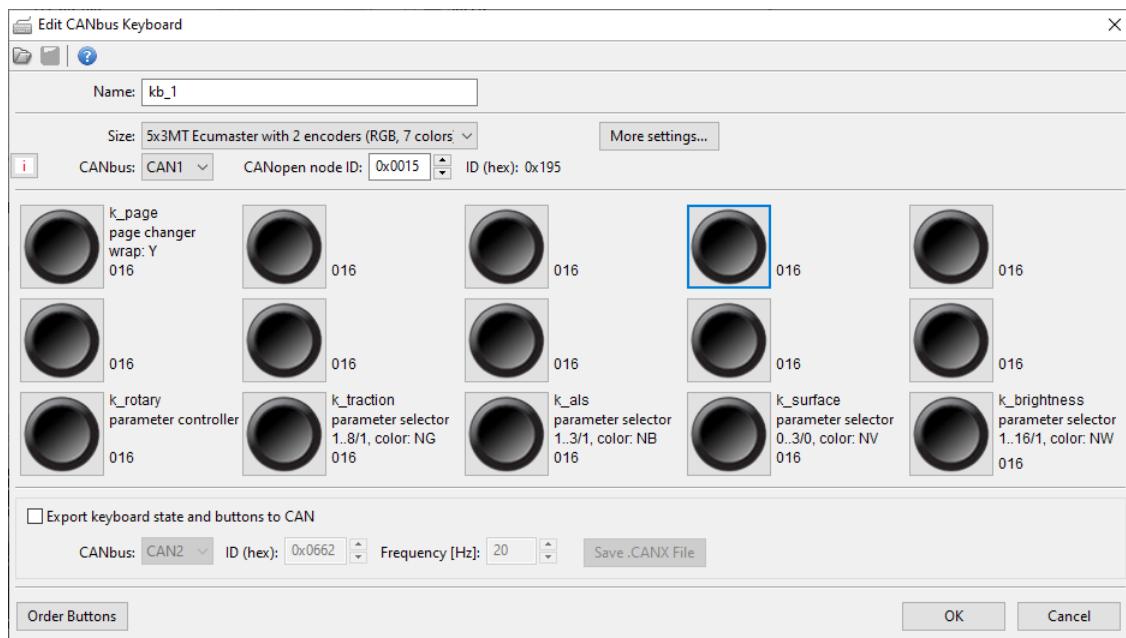
Back to the PMU software, we aim to use the other encoder for controlling four parameters. Begin by selecting the bottom-left box and designate it as a *parameter controller*.



Now proceed to configure each parameter. For each of the four, choose one button, change its type to *parameter selector* and set the first, last, and default states to adjust their value range.



The final setup of our example keyboard looks as follows:



When the driver wishes to adjust a setting, they can press the corresponding button. The rotary encoder will activate, enabling them to change the parameter by turning it.

3. Document history

Version	Data	Changes
1.0	2025.01.09	Initial release