Start Guide

HID: Keypad + LCM + Buzzer with 86EVA

86Duino Coding IDE 500

EtherCAT Library

(Version 1.1)

Revision

Date	Version	Description
2024/1/8	VERSION1.0	NEW RELEASE.
2024/11/20	VERSION1.1	SPLIT THE DEVELOPMENT STEPS INTO TWO DOCUMENTS.

Preface

In this guide, we will show you how to use the EtherCAT Master QEC-M-01P and the QEC-RXXHUX Series (EtherCAT HID Slave).

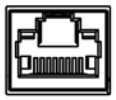
Notes QEC's PoE (Power over Ethernet)

In QEC product installations, users can easily distinguish between PoE and non-PoE: if the RJ45 house is red, it is PoE type, and if the RJ45 house is black, it is non-PoE type.

	
Non-PoE type	PoE type

PoE (Power over Ethernet) is a function that delivers power over the network. QEC can be equipped with an optional PoE function to reduce cabling. In practice, PoE is selected based on system equipment, so please pay attention to the following points while evaluating and testing:

1. The PoE function of QEC is different and incompatible with EtherCAT P, and the PoE function of QEC is based on PoE Type B, and the pin functions are as follows:

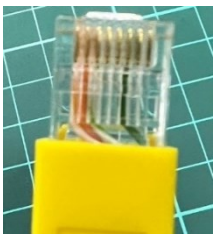


Pin #	Signal Name	Pin #	Signal Name
1	LAN1_TX+	2	LAN1_TX-
3	LAN1_RX+	4	VS+
5	VP+	6	LAN1_RX-
7	VS-(GND)	8	VP-(GND)

* PoE LAN with the Red Housing; Regular LAN with Black Housing.

* L4, L5, L7, L8 pins are option, for RJ45 Power IN/OUT.

2. When connecting PoE and non-PoE devices, make sure to disconnect Ethernet cables at pins 4, 5, 7, and 8 (e.g., when a PoE-supported QEC EtherCAT master connects with a third-party EtherCAT slave).

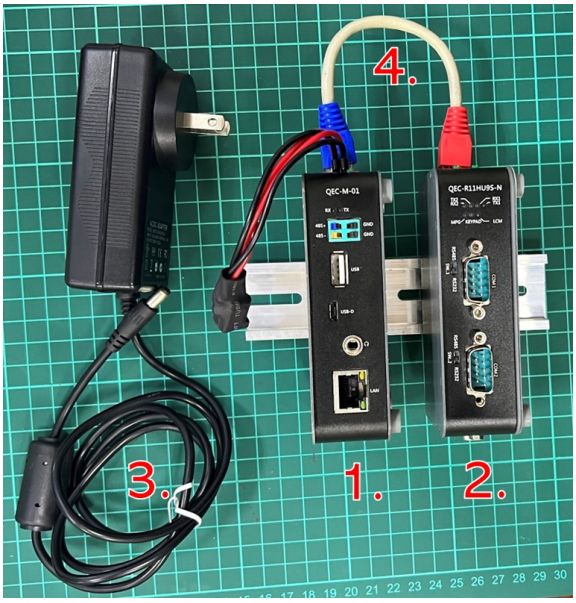


3. QEC's PoE power supply is up to 24V/3A.

1. Connection and wiring hardware

The following devices are used here:

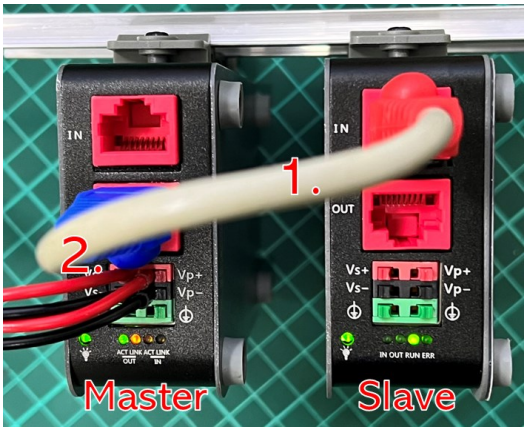
1. QEC-M-01P（EtherCAT Master/PoE）
2. QEC-R11HU9S-N (EtherCAT HID Slave, supports 2 UART, 1 MPG, 1 Keypad, 1 LCM)
3. 24V power supply & EU-type terminal cable
4. RS232 cable & LAN cable



1.1 QEC-M-01P & QEC-R11HU9S-N

QEC EtherCAT master with PoE function.

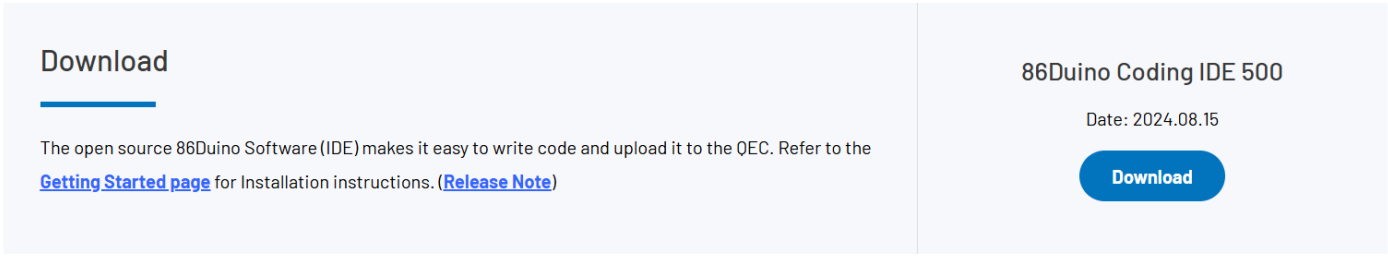
1. Using the EtherCAT Out port (top side) connected to the EtherCAT In port of QEC-R11HU9S via RJ45 cable (powered by PoE).
2. Connect to Vs+/Vs- and Vp+/Vp- power supplies via EU terminals for 24V power.



We will use the keypad, LCM, and Buzzer features onboard the QEC-R11HU9S-N device.

2. Software/Development Environment

Download 86duino IDE from https://www.qec.tw/software/.



About how to update the QEC Master (QEC-M series products) with the latest version of the 86Duino IDE, please see this page.

After downloading, please unzip the downloaded zip file, no additional software installation is required, just double-click 86duino.exe to start the IDE.

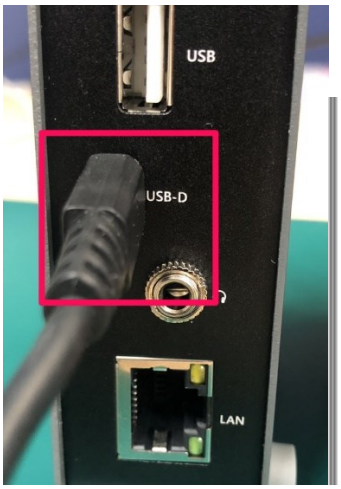
Note:
If Windows displays a warning, click Details once and then click the Continue Run button once.

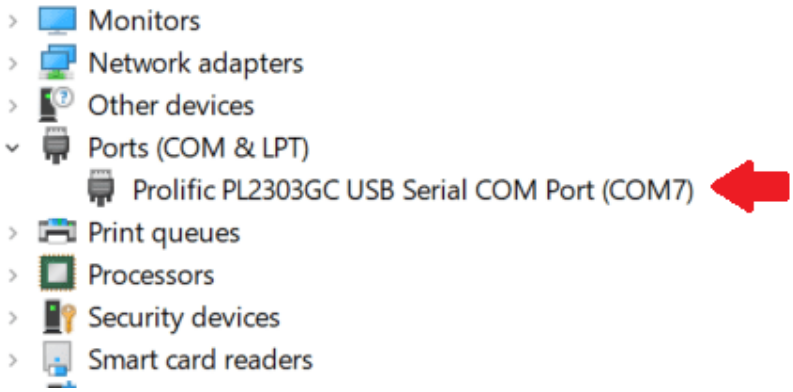
86Duino Coding IDE 500+ looks like below.

3. Connect to PC and set up the environment

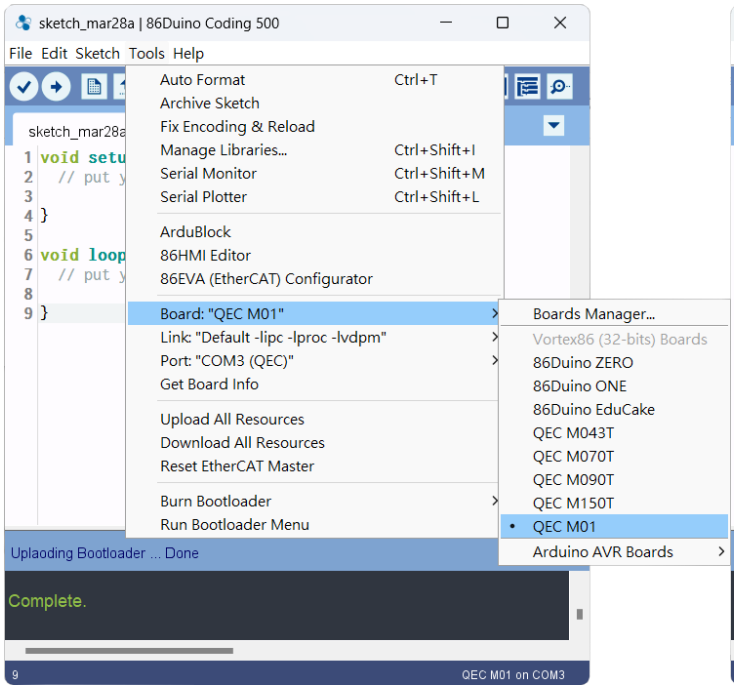
Follow the steps below to set up the environment:

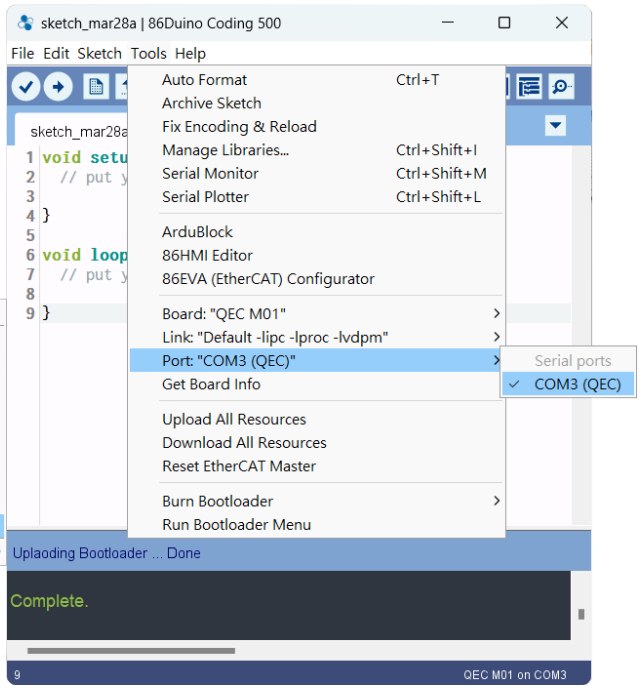
1. Connect the QEC-M-01P to your PC via a Micro USB to USB cable (86Duino IDE installed).
2. Turn on the QEC power.
3. Open “Device Manager” (select in the menu after pressing Win+X) ->” Ports (COM & LPT)” in your PC and expand the ports; you should see that the “Prolific PL2303GC USB Serial COM Port (COMx)” is detected; if not, you will need to install the required drivers.
   (For Windows PL2303 driver, you can download here)





4. Open the 86Duino IDE.
5. Select the correct board: In the IDE's menu, select Tools> Board > QEC-M-01 (or the QEC-M master model you use).
6. Select Port: In the IDE's menu, select Tools > Port and select the USB port to connect to the QEC-M master (in this case, COM3 (QEC)).





4. Use 86EVA with code

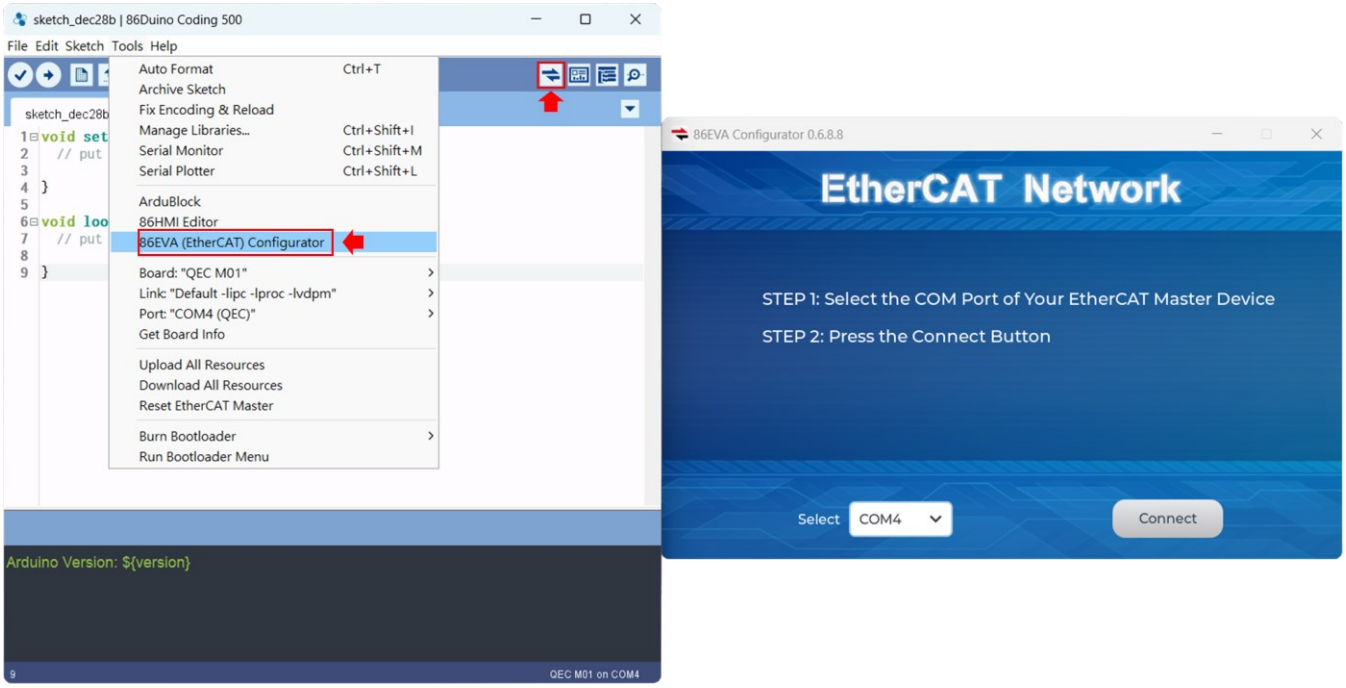
This example is reading the keypad input data and printing on the specific positions of LCM according to it. Buzzer will buzz when the keypad is pressed; among them, '#' is a clear LCM display and sets the print position to the first row, and '*' is a clear LCM display and sets the print position to the second row.

Software Tools Description:

- 86EVA (EVA, EtherCAT-Based Virtual Arduino):
  is a graphical EtherCAT configuration tool based on the EtherCAT Library in the 86Duino IDE and is one of the development kits for 86Duino.

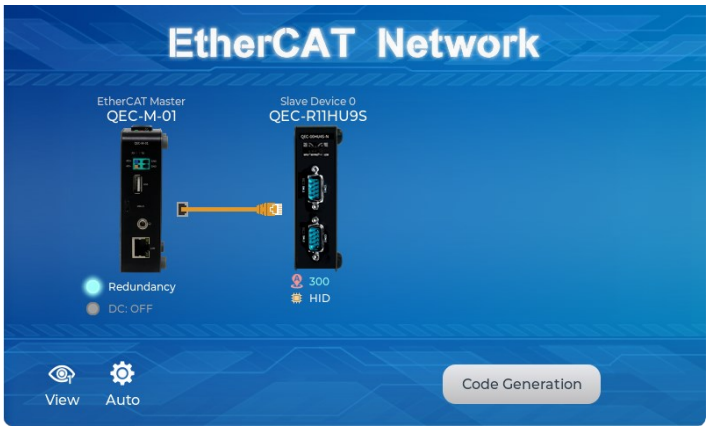
Step 1: Turn on 86EVA and scan

The 86EVA tool can be opened via the following buttons.

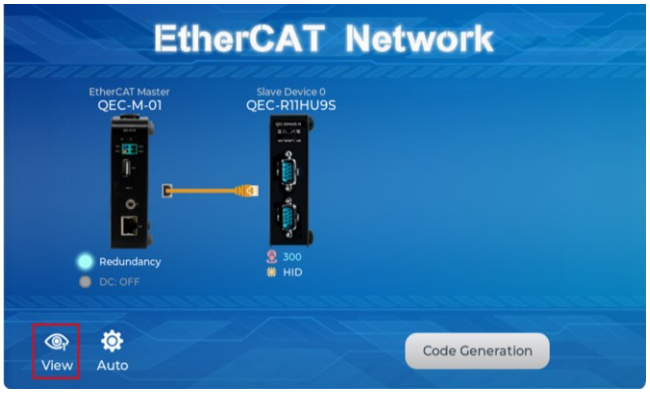


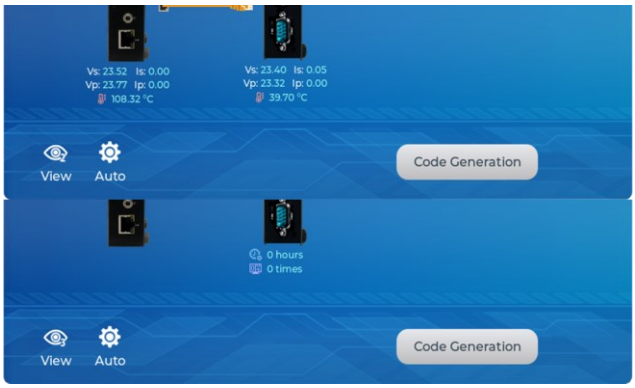
Once you have confirmed that the correct COM port has been selected of QEC-M-01P, press the Connect button to start scanning the EtherCAT network.

The connected devices will be displayed after the EtherCAT network has been scanned.



Press the "View" button in the lower left corner to check the device's status (Voltage, Current, and Temperature; View2) and operating time (Hours; View3).





Step 2: Set the parameters

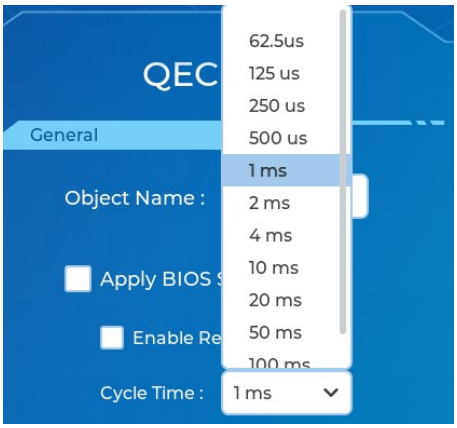
Press twice on the scanned device image to enter the corresponding parameter setting screen.

QEC-M-01

Press twice on the image of the QEC-M-01 to see the parameter settings.

Please check the following configures.

1. Turn off the “Apply BIOS Settings”.
2. Select “1ms” to the Cycle Time.

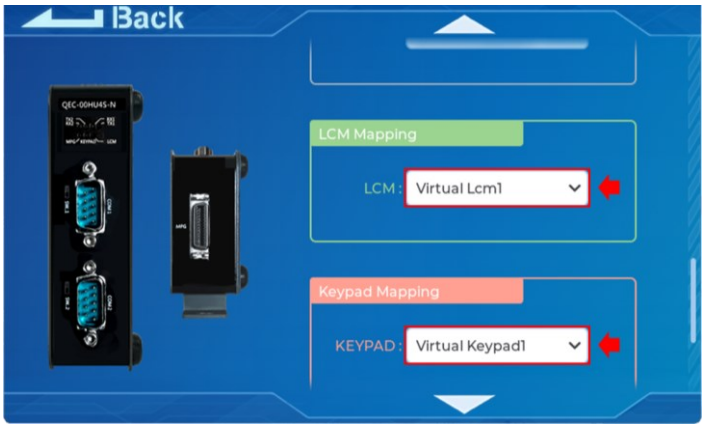


Click "Back" in the upper left corner to return.

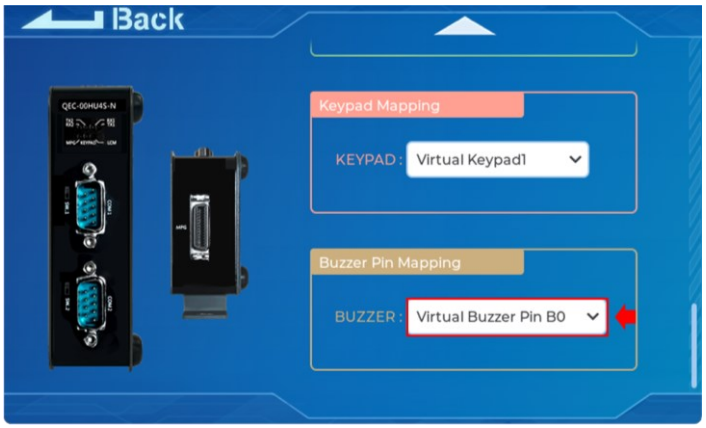
QEC-R11HU9S-N

Press twice on the image of the QEC-R11HU9S to see the parameter settings.

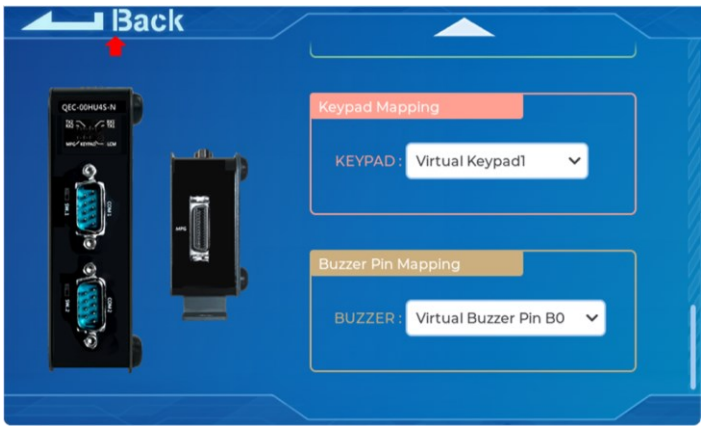
Go to the “LCM Mapping” area and “Keypad Mapping” area. Among them, we select “Virtual Lcm1” in the drop-down box of LCM in “LCM Mapping”, and then we select “Virtual Keypad1” in the drop-down box of KEYPAD in “Keypad Mapping”.



And we select “Virtual Buzzer Pin B0” in the drop-down box of BUZZER in “Buzzer Pin Mapping”.



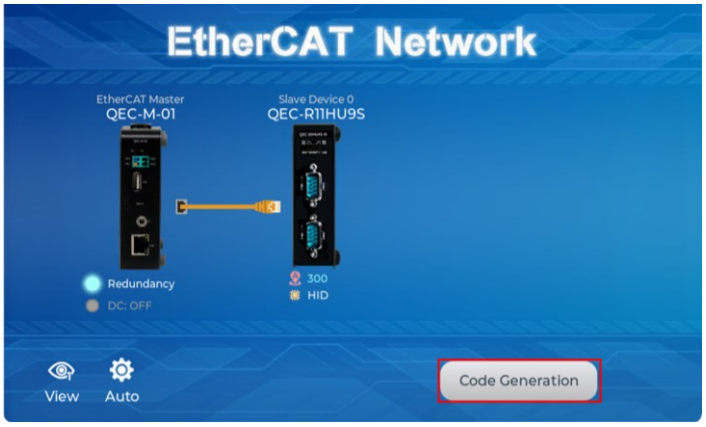
After finishing, click "Back" in the upper left corner to return.



These actions are to set the QEC-R11HU9S's LCM to virtual Lcm1 of EVA; set Keypad to virtual Keypad1 of EVA; and set Buzzer to virtual buzzer pin B0 of EVA.

Step 3: Generate the code

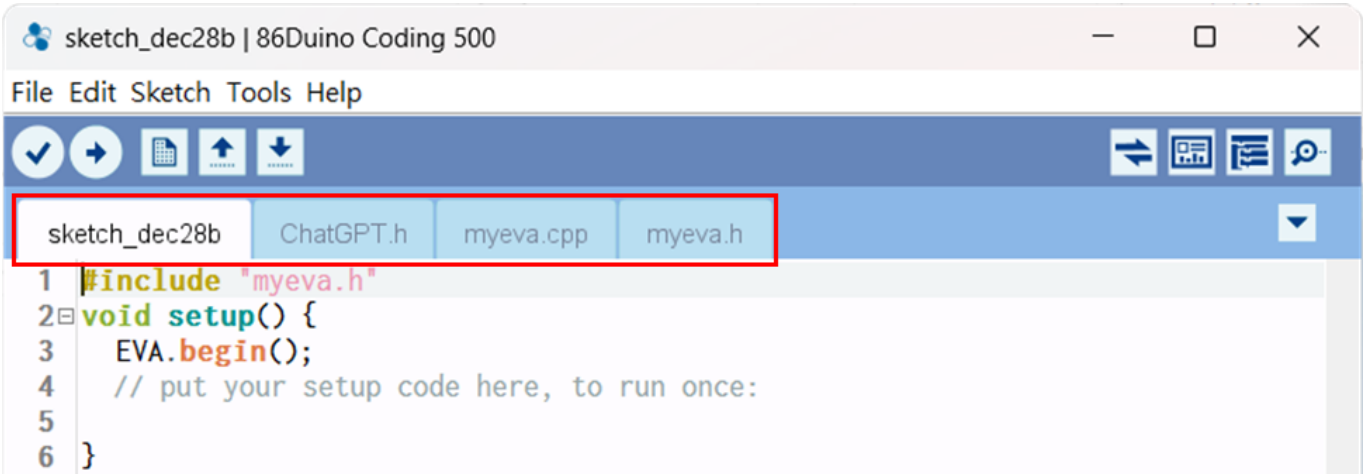
Once you've set your device's parameters, go back to the home screen and press the "Code Generation" button in the bottom right corner.



When you're done, double-click the OK button to turn off 86EVA, or it will close in 10 seconds.

The generated code and files are as follows:

- sketch_dec28b: Main Project (.ino, depending on your project name)
- ChatGPT.h: Parameters to provide to ChatGPT referred
- myeva.cpp: C++ program code of 86EVA
- myeva.h: Header file of 86EVA



Additional note:

After 86EVA generates code, the following code will be automatically generated in the main program (.ino), and any of them missing will cause 86EVA not to work.

1. #include “myeva.h” : Include EVA Header file
2. EVA.begin(); in setup(){} : Initialize the EVA function

Step 4: Write the code

The programming code from 86EVA are set as the following by default:

- QEC-M-01: EthercatMaster object
- QEC-R11HU9S: EthercatDevice_QECR11HU9S object.
- EtherCAT mode: ECAT_FREERUN_AUTO.

And here is the setting by users:

- EtherCAT Cycle time: 1 millisecond.
- Device Object Name: QEC-M-01 is “EcatMaster”, and QEC-R11HU9S is “Slave0”.
- Keypad is “Virtual Keypad1”.
- LCM is “Virtual Lcm1”.
- Buzzer is “Virtual Buzzer Pin B0”.

1. **In Setup Function:**
   - Initialize EVA function.
   - Initialize VirtualLcm1.
   - Initialize VirtualKeypad1.
2. **In Loop Function:**
   The loop function continuously checks the VirtualKeypad1 for user input and performs the following actions:
   - Keypad Input:
     - Reads input from VirtualKeypad1 and stores it in “keyPadInput”.
   - Input Display:
     - If a digit (0–9) is pressed, it is displayed on VirtualLcm1 at a specific position.
     - If a letter (A–D) is pressed, it is displayed on VirtualLcm1 in another position.
     - If the '#' key is pressed, the screen clears, and the cursor resets to the first line.
     - If the '*' key is pressed, the screen clears, and the cursor moves to the second line.
   - Buzzer Feedback:
     - The buzzer beeps briefly whenever a key is pressed.

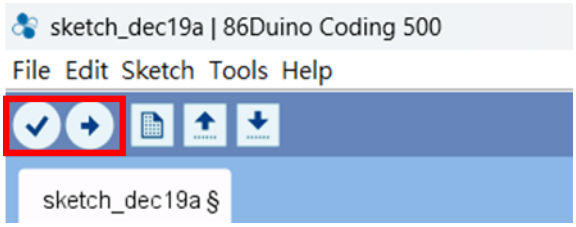
In summary, this code makes the system interactive, showing input on the LCD and giving sound feedback for every key press.

Here is the code:

```
#include "myeva.h"

void setup() {
  EVA.begin();

  VirtualLcm1.begin();
  VirtualKeypad1.begin();
}

int lcmY = 1;
void loop() {
  char keyPadInput = VirtualKeypad1.getKey();

  if (keyPadInput >= '0' && keyPadInput <= '9') {
    VirtualLcm1.setCursor(keyPadInput - '0' + 1, lcmY);
    VirtualLcm1.print(keyPadInput);
  } else if (keyPadInput >= 'A' && keyPadInput <= 'D') {
    VirtualLcm1.setCursor(keyPadInput - 'A' + 11, lcmY);
    VirtualLcm1.print(keyPadInput);
  } else if (keyPadInput == '#') {
    lcmY = 1;
    VirtualLcm1.clear();
  } else if (keyPadInput == '*') {
    lcmY = 2;
    VirtualLcm1.clear();
  }

  if (keyPadInput != 0) EVA.tone(0, 3000, 200);
}
```

Note:

Once the code is written, click on the toolbar to compile, and to confirm that the compilation is complete and error-free, you can click to upload. The program will run when the upload is complete.

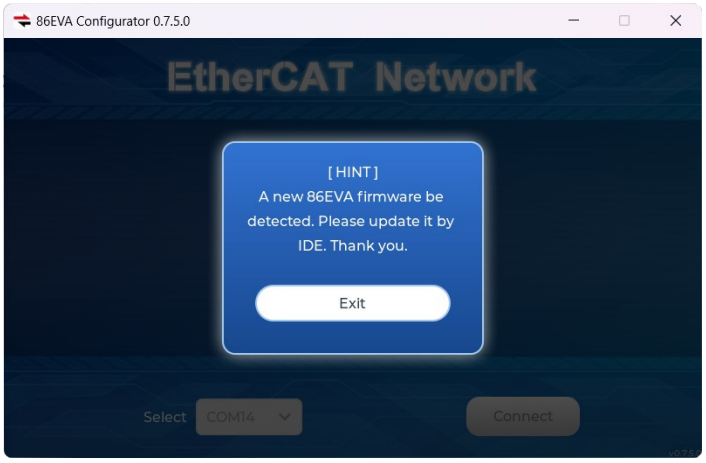


After uploading, you can press the keypad on the QEC-R11HU9S-N's side and printing on the specific positions of LCM according to it. Buzzer will buzz when the keypad is pressed; among them, '#' is a clear LCM display and sets the print position to the first row, and '*' is a clear LCM display and sets the print position to the second row.

Troubleshooting

QEC-M-01 cannot successfully upload code

When you are unable to successfully upload code, please open 86EVA to check if your QEC EtherCAT Master's environment is abnormal. As shown in the figure below, please try updating your QEC EtherCAT Master's environment, which will include the following three items: Bootloader, EtherCAT firmware, and EtherCAT tool.



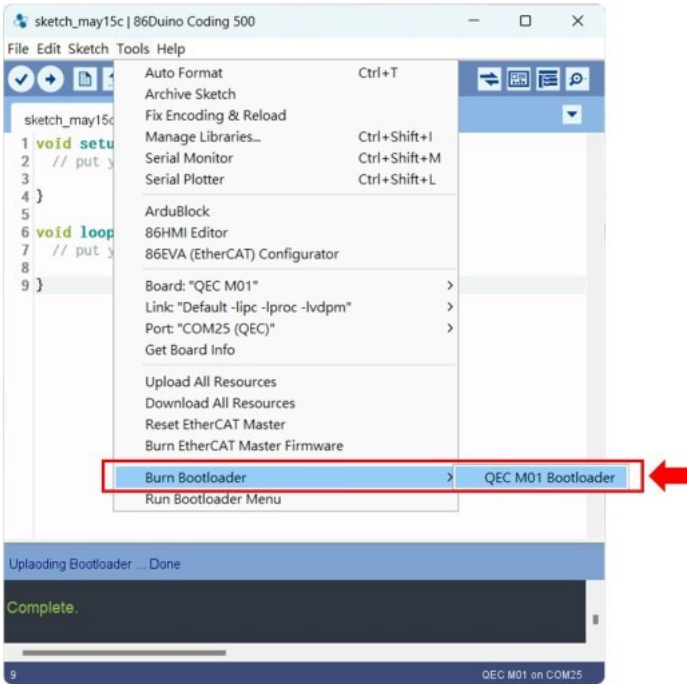
Now, we will further explain how to proceed with the update:

Step 1: Setting up QEC-M

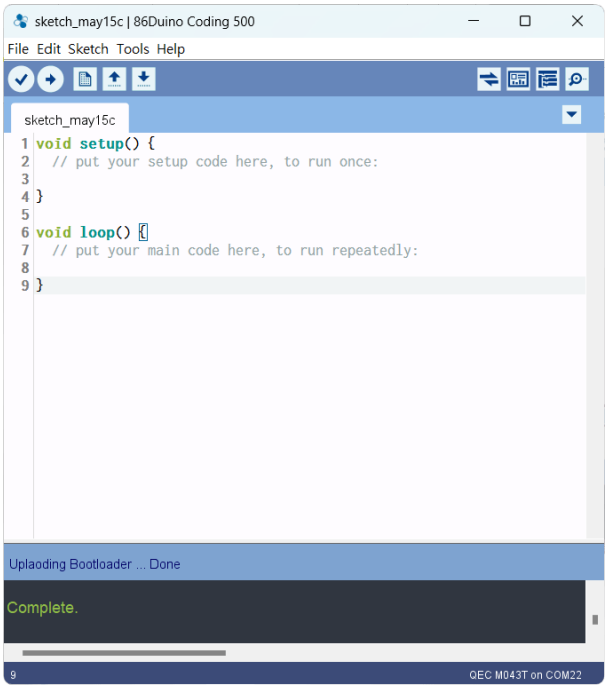
1. Download and install 86Duino IDE 500 (or a newer version): You can download it from Software.
2. Connect the QEC-M: Use a USB cable to connect the QEC-M to your computer.
3. Open 86Duino IDE: After the installation is complete, open the 86Duino IDE software.
4. Select Board: From the IDE menu, choose “Tools” > “Board” > “QEC-M-01” (or the specific model of QEC-M you are using).
5. Select Port: From the IDE menu, choose “Tools” > “Port” and select the USB port to which the QEC-M is connected.

Step 2: Click “Burn Bootloader” button

After connecting to your QEC-M product, go to “Tools”> “Burn Bootloader”. The currently selected QEC-M name will appear. Clicking on it will start the update process, which will take approximately 5-20 minutes.
QEC-M-01:



Step 3: Complete the Update



After completing the above steps, your QEC-M has been successfully updated to the latest version of the development environment.

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.