



Communication CODESYS-CollineIO

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Distribution list

Tabla 1: Distribution List

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Revision History

Tabla 2: Revision history

Version	Issue Date	Brief description of Change
V1.0		First Version of this document

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1 INTRODUCTION

This guide shows the operation of the CollinelO card controlled from CODESYS. The first step will be the installation of the development software and an expansion package.

Once installed, a DEMO program can be executed for the CollinelO card where an HMI will be opened for control via MODBUS through a USB-RS485 cable or a raspberry embedded in the CollinelO. In addition, it includes communication via local web no matter which of the 2 communication modes is used.

1.1 Acronyms

AC, Alternating current

ADC, Analog Digital Converter

ASIC, Application Specific Integrated Circuit

BGA, Ball Grid Array

BOM, Bill Of materials

CAN, Controller Area Network

DAC, Digital Analog Converter

DC, Direct Current

DSP, Digital Signal Processor

EEPROM, Electrically Erasable PROM

FPGA, Field Programmable Gate Array

HMI, Human Machine Interface

ICD, Interface Control Document

I2C, Inter-Integrated Circuit, Serial bus data communication protocol

I/O, input/output

NO, Normally Open

NC, Normally Close

NDA, Non-Disclosure Agreement

OC, Open Circuit

PCB, Printed Circuit Board

PSOC, Programmable System On-Chip

RAM, Random Access Memory

RTC, Real Time Clock

RTU, Remote Terminal Unit

SC, Short Circuit

SMD, Surface Mount Device

SMT, Surface Mount Technology

SPI, Serial Peripheral Interface

TBD, To Be defined

TBC, To Be Confirmed

1.2 Document Property

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1.3 References

- Technical Specification, CP038_DOC1_UserGuide
- Schematic of CollineIO

2 CODESYS INSTALLATION

If you do not have Codesys installed on your computer, please follow the steps below:

1. Download "CODESYS Development System V3" from the official website:
<https://store.codesys.com/codesys.html>
This is the programming environment where the demonstration was developed.
2. Install the data package "CODESYS Development System V3".

Also, if you are going to use Codesys communicating Collinelo with a RaspberryPI and the Ethernet port, follow these steps:

3. Download the extension package: "CODESYS Control for Raspberry Pi SL" from the official website: [CODESYS para Raspberry](#).
4. Then, once Codesys is open, install the package "CODESYS Control for Raspberry Pi SL" from the "Tools" menu, as shown in the next figures.

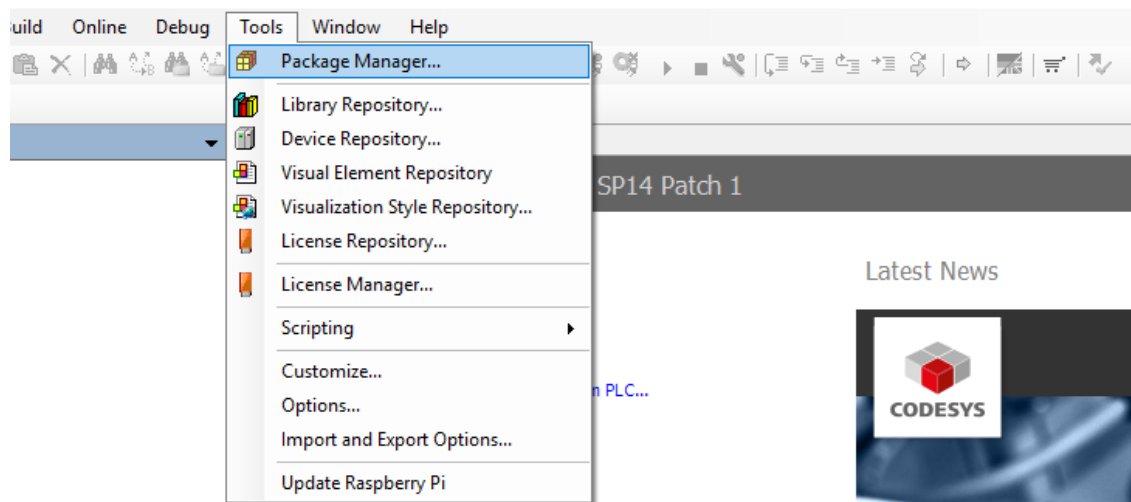


Figura 23. Menu of the CODESYS program tools

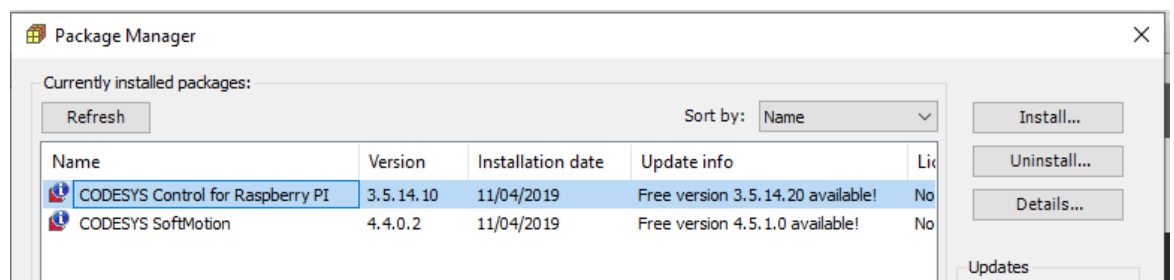


Figura 24. Install CODESYS Control for Raspberry PI package

3 CODESYS & COLLINEIO USING RS485

In this section we will use the RS485 port to communicate a Codesys project with the CollineIO card using a small graphic application.

The hardware configuration of the card must allow RS485 communication, default configuration. If in doubt consult CP038-DOC02-COLLINEIO-UserGuide, chapter 6.

Please follow the following steps:

1. Open the project "colline.project" directly or by starting CODESYS. It is located in the "RS-485" folder. You may see an error that is later corrected.
2. Use a USB to RS-485 converter (for example, FTDI, model USB-RS485-WE-1800-BT, Farnell code 1740357) to connect the Colline card to a PC (See CP038-DOC03-ComProtocol, chapter 2.1. 1 Test Using a USB-RS385 Converter)
3. To know in which port Windows has connected the card, go to the "Device Manager" of Windows and see the port assigned by the PC and then, configure it as shown in the following figures.

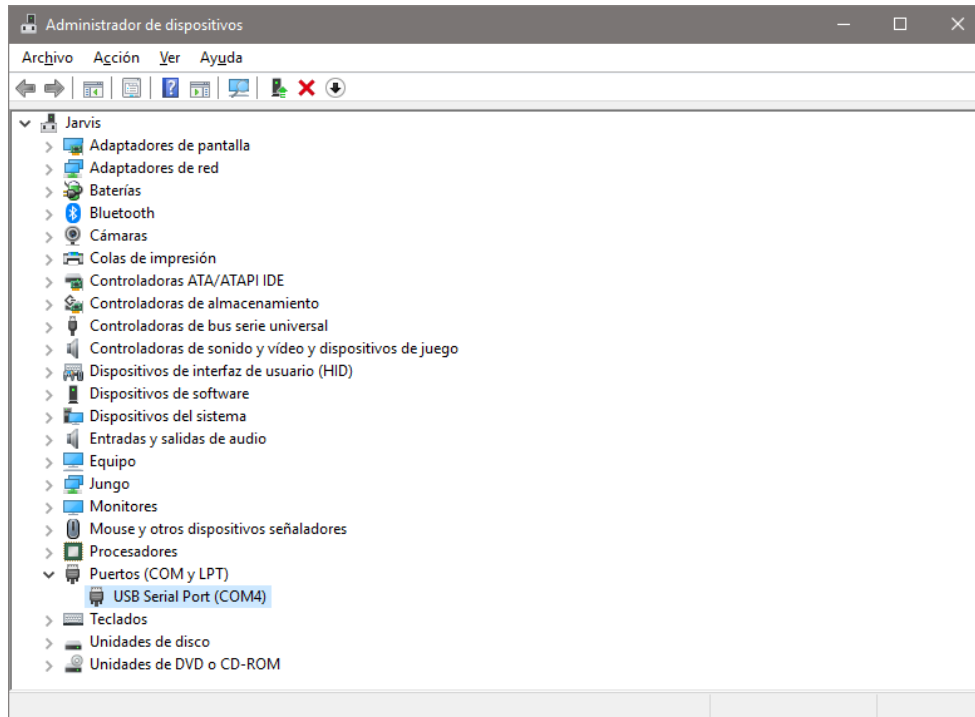


Figura 1: Windows Device manager. Serial Port assigned to the USB to RS485 Converter

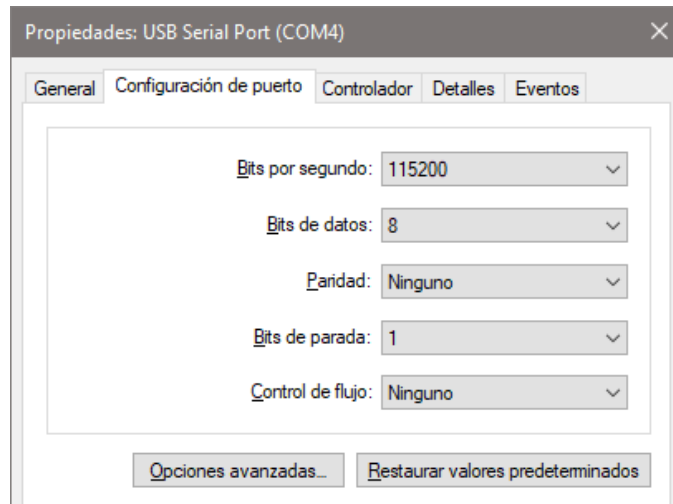


Figura 2: COM port assigned by the PC with the configuration that is needed to operate.

4. In Codesys, within the device tree, the main device "CODESYS_Control_Win_V3_x64" must be updated and restarted to work on a device other than the source device. To do this, click "right" to open the options.

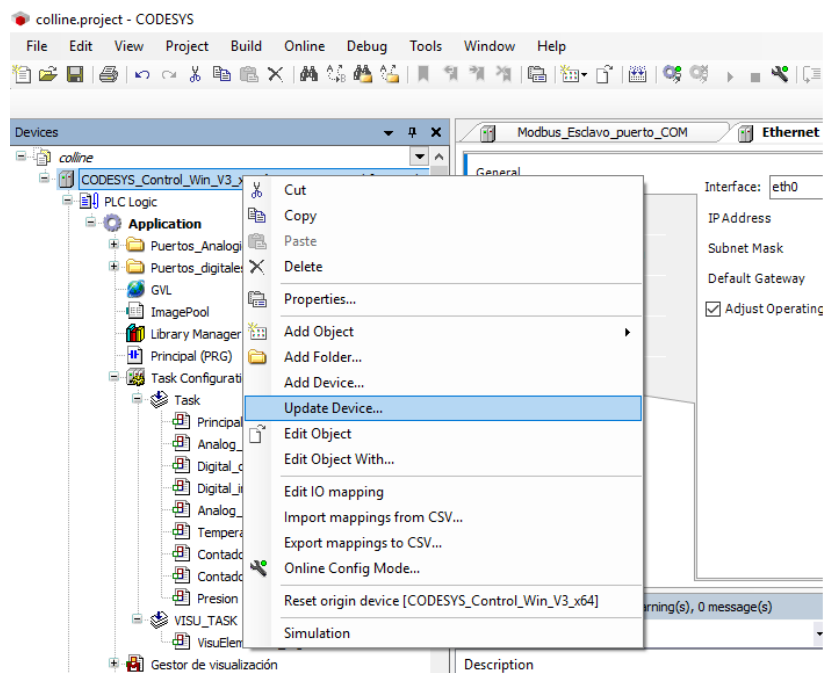


Figura 3: Update manager

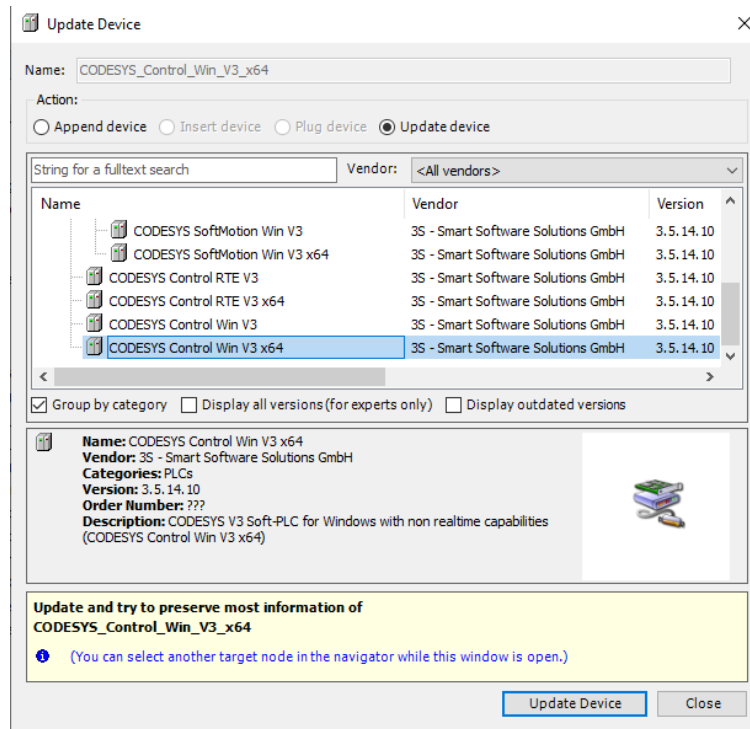


Figura 4: Dialog window for selecting the main device update

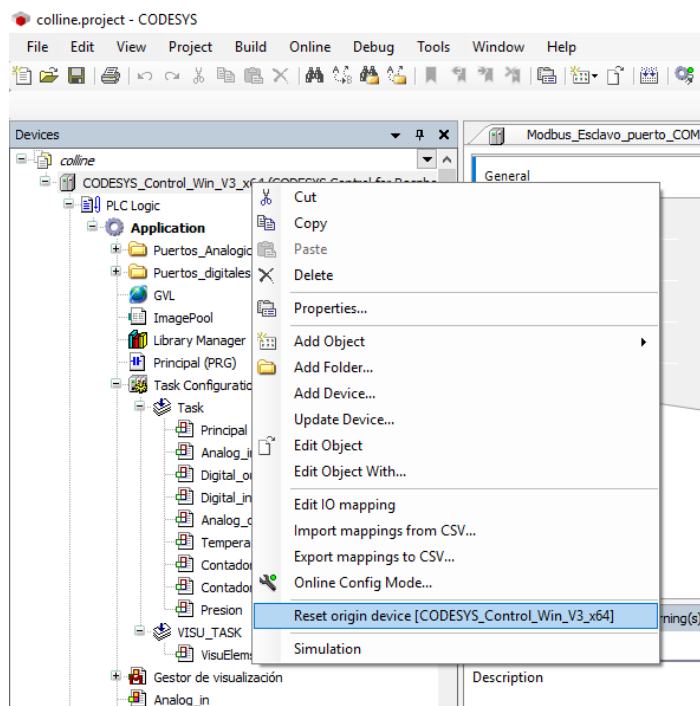


Figura 5: Reset Origin Device

5. Within Codesys, select the "Modbus_COM_Port" port to open the configuration window and assign it the port obtained in the previous point and the parameters as shown below.

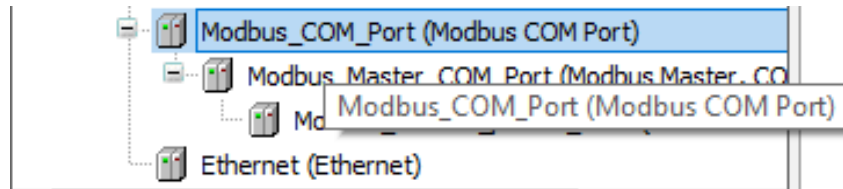


Figura 6: Modbus Port

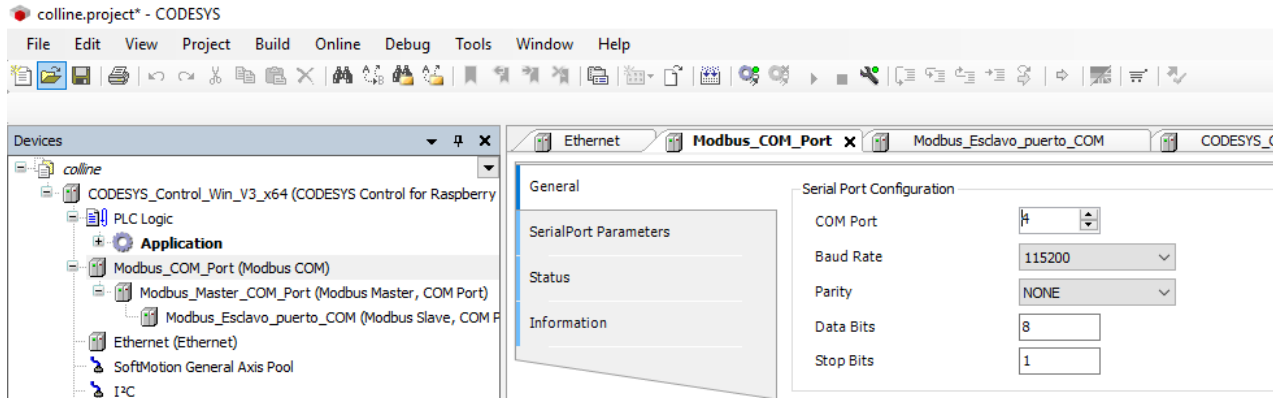


Figura 7: Port Com Configuration

- The CollineIO card has a number that identifies it (1 ... 7), it is configured directly on the CollineIO card through its microswitch. This identifier number must be declared in the device "Modbus_Escavo_puerto_COM" by double clicking on it to open the configuration window and in the "General" tab it is placed in the field "Slave address [1 ... 247]".

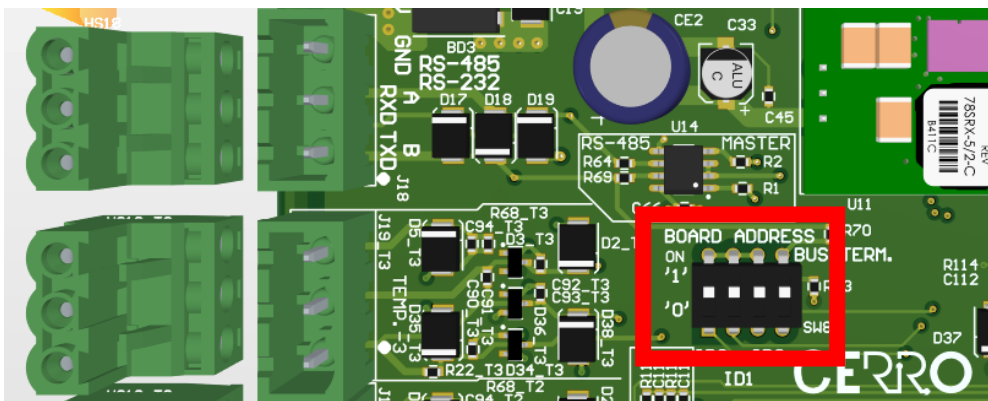


Figura 8: CollineIO identification assignment microswitch: Board Address

The on the "ModBus_Escavo_puerto_COM, we assign that number:

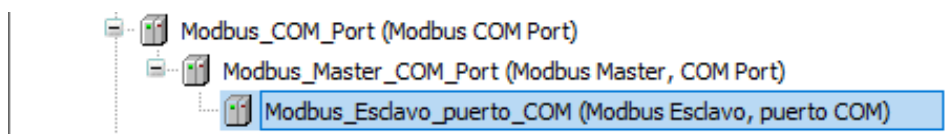


Figura 9: Slave Mobus port

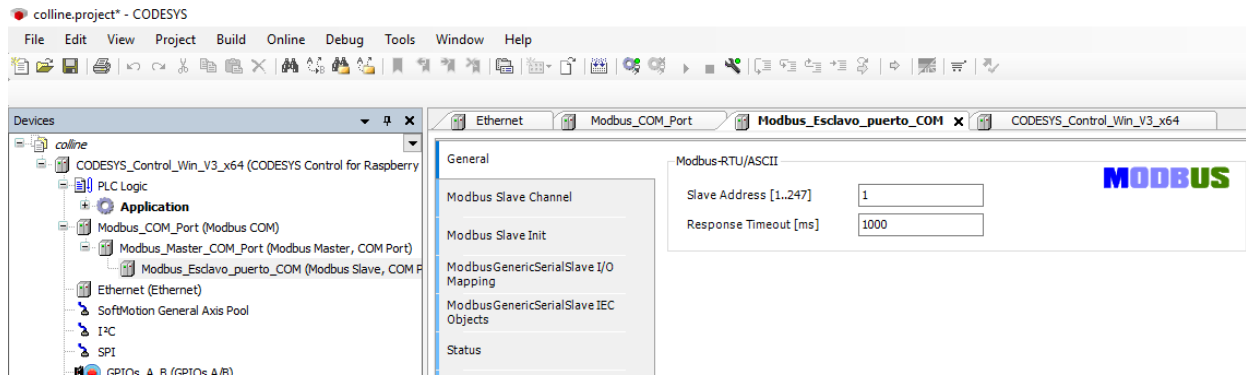


Figura 10: Declaración de la dirección del esclavo asignado a la tarjeta CollineIO

7. Inside the CODESYS data package, there is a virtual PLC called: "CODESYS Control Win SysTray - x64".



Figura 11: PLC virtual program

This program must be started from the start button and then in the taskbar, in order to start the session.

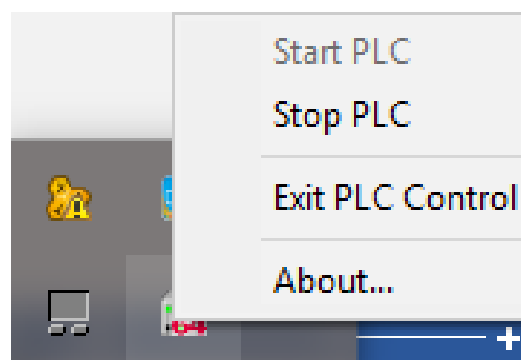


Figura 12: Start from the Windows task bar

8. The gateway (Gateway) must be configured to communicate the device with the PC. To do this, the "click" device on the device "CODESYS_Control_Win_V3_x64" is double-clicked to open a tab with the configuration options.

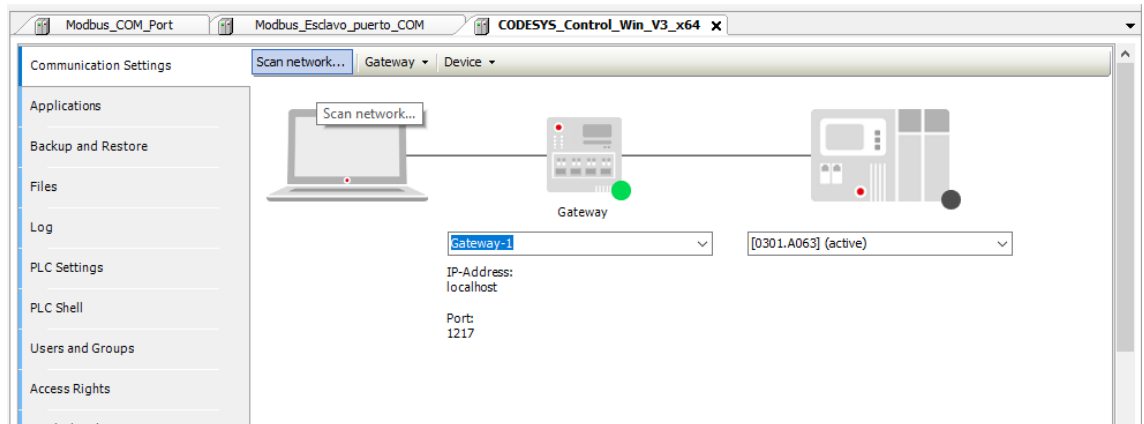


Figura 13: Pestaña de configuración de Gateway

Click on the "Scan network" button to check the devices connected to the network to choose one; choose the PC where the COLLINE is connected.

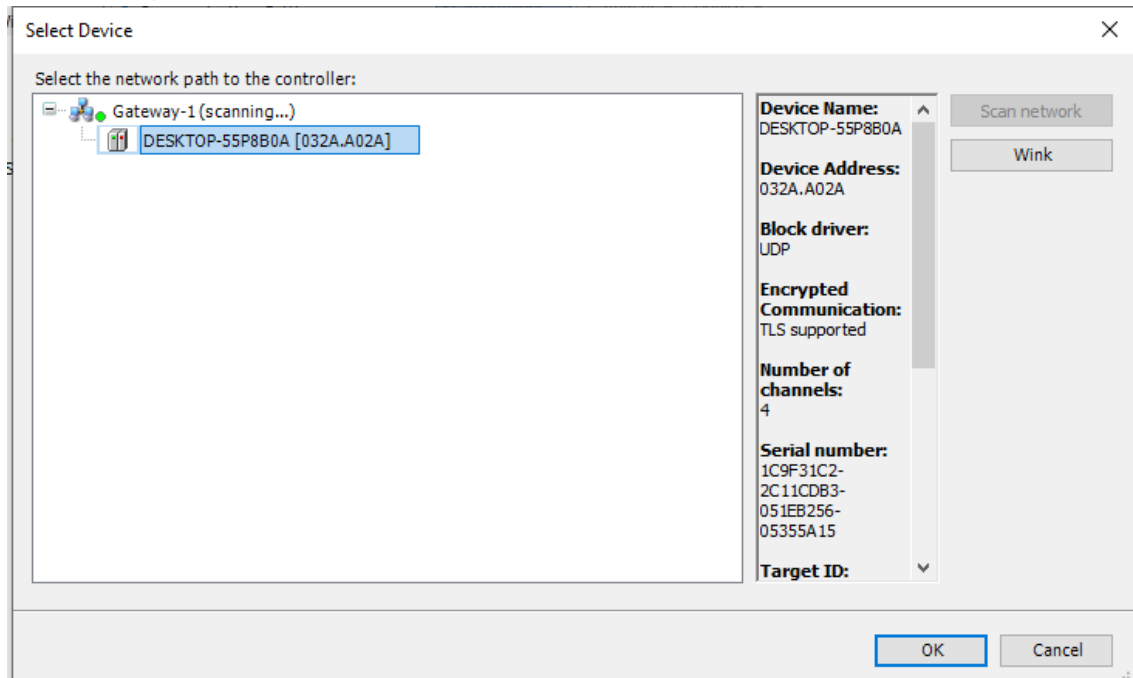


Figura 14: Select Device

9. In the "CODESYS_Control_Win_V3_x64" device window, in the "communication configuration" tab, the Gateway icons should appear with a green circle, indicating that it is configured and ready.

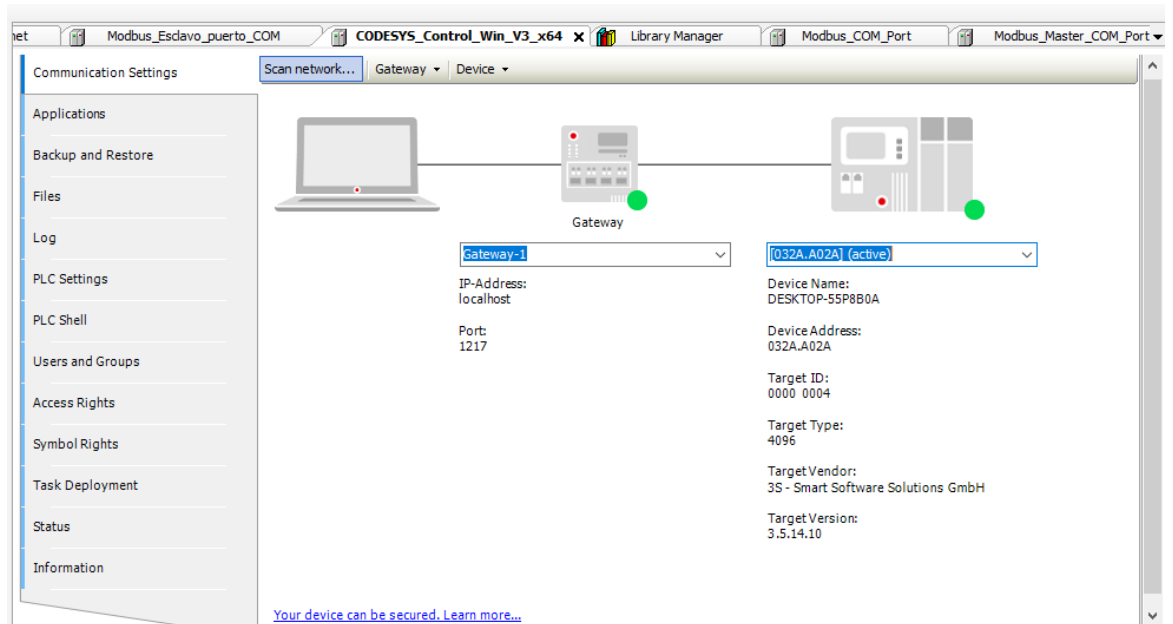


Figura 15: Device connection OK

In some cases the following message will be displayed:

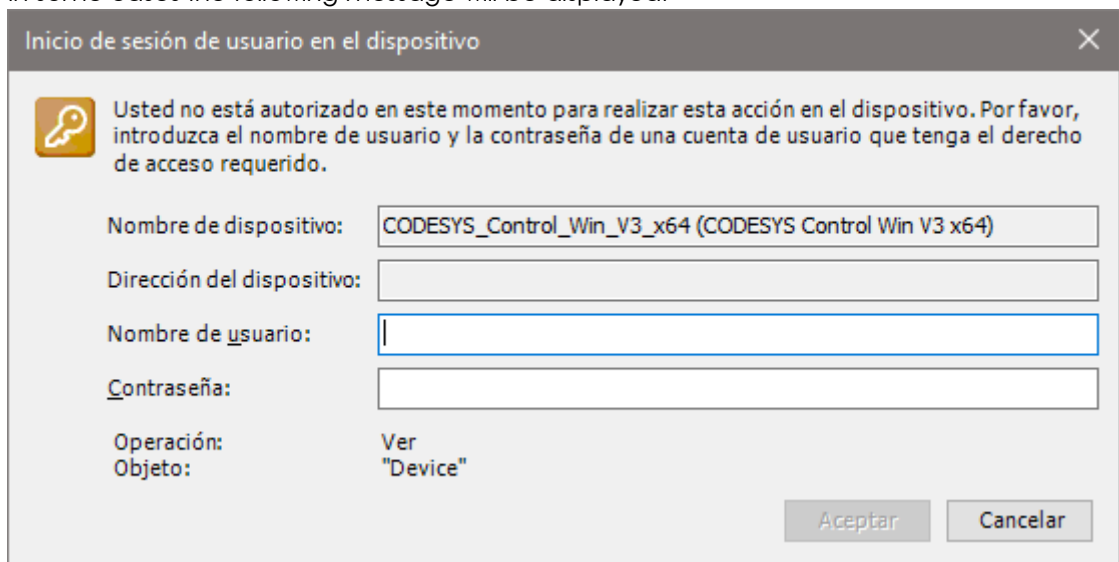


Figura 16: User login window within the CODESYS project

In this situation, the username is "Administrator" and the password "1234" for these projects, the default password is "Administrator". After this the PLC icon should have a green circle.

10. At this time, it is already possible to run the demo, by pressing the "login" button.



Figura 17: Login button of the project with the connected device

And then press the "Run" button.



Figura 18: Run

11. The graphical interface that appears is the one shown in the following image

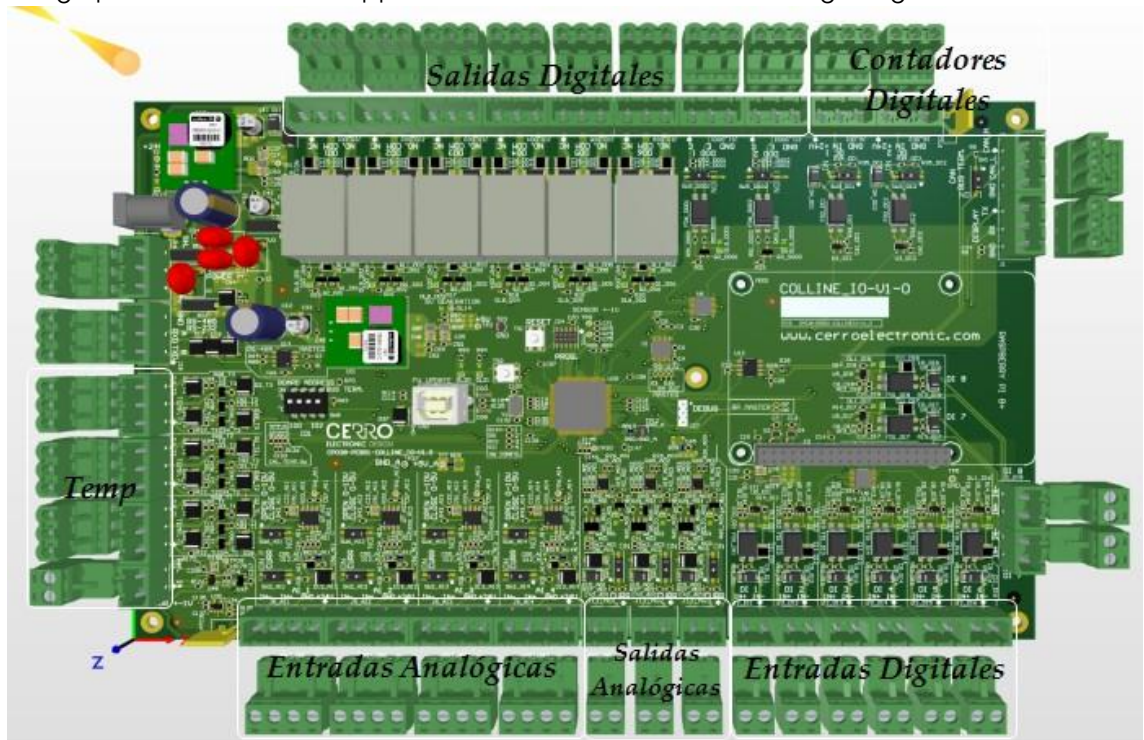


Figura 19: Graphical Interface

To establish an exit or read an entry click on the area concerned.

For example, if you want to set a digital output (a relay) click on the "Digital Outputs" area and pop-window appears in which you can set the output as 1 or 0, as shown in the following figure

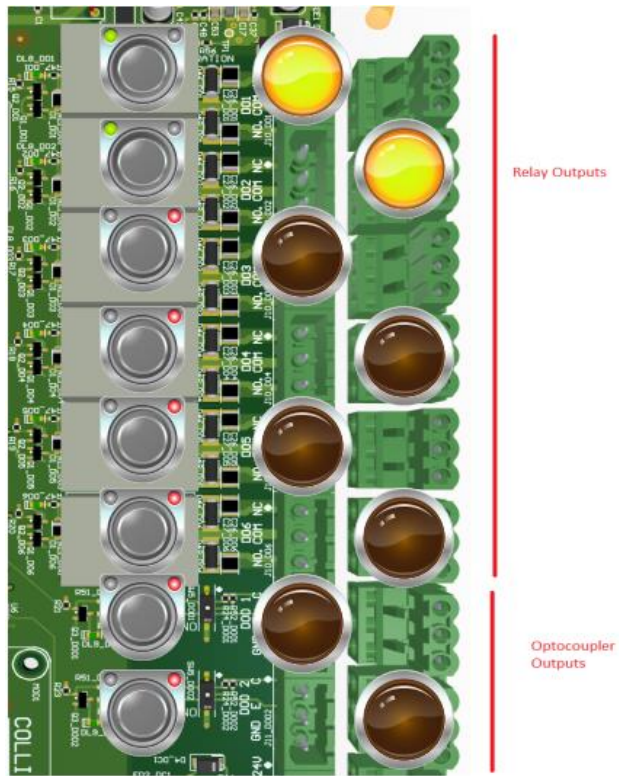


Figura 20: pop up window for digital outputs (the first two are active)

4 CODESYS & COLLINEIO USING ETHERNET

Another way to run Codesys and communicate with CollineIO is to use Ethernet. In order to use Ethernet, it is necessary that Colline is equipped with a RaspberryPi as shown in next figure.

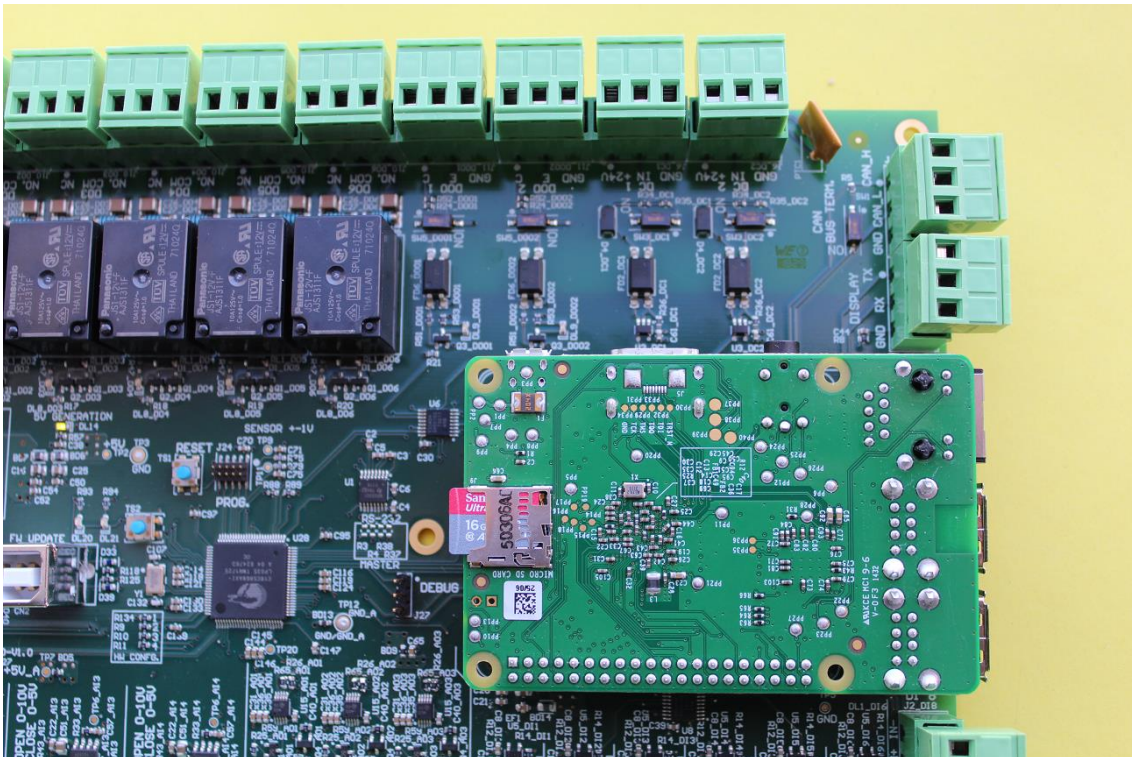


Figura 21: Colline is equipped with a RaspberryPi

In addition, it will be necessary that the hardware configuration of CollineIO be established to communicate with the RaspberryPi. If you have any questions, go to chapter 6 of document CP038-DOC02-UserGuide.

4.1 RaspberryPi initial Configuration

Before we can communicate with CollineIO through the ethernet port of the Raspberry we need to configure it.

The simplest way to perform the following configurations is to use a screen and keyboard directly connected to the RaspberryPi

RaspberryPi must have installed the Raspbian operating system. For more details about how to install Raspbian go to www.raspberrypi.org.

4.1.1 Enable SSH Service

An easy way to do it using the command: `sudo raspi-config`:

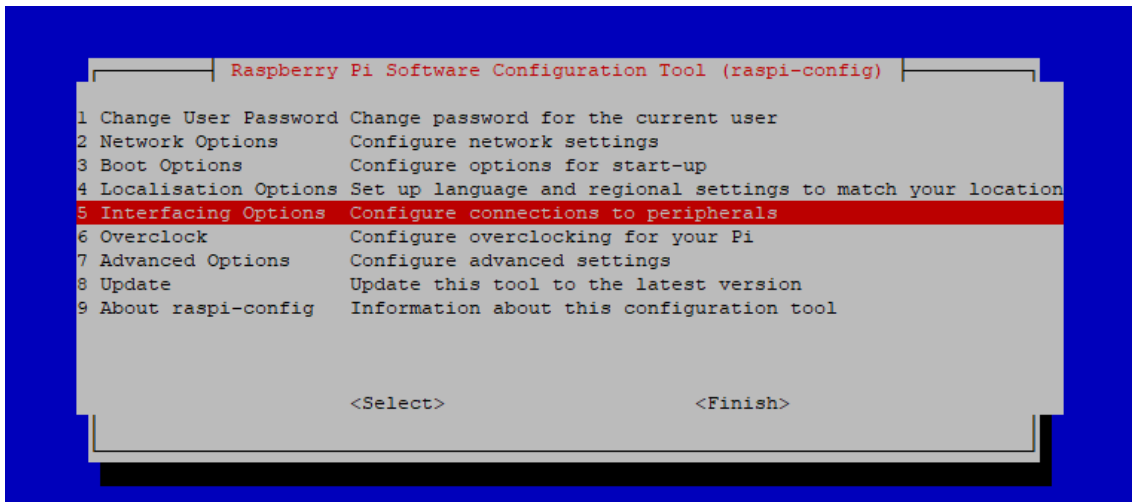


Figura 22: RaspberryPi software configuration tool

Chose "5- Interfacing Options" and then "P2 SSH" to enable the SSH service.



Figura 23: SSH service is enabled

4.1.2 Serial Port Enable

By default, the RaspberryPi has the serial port configured to be used as a terminal and therefore is not able to interpret the commands that arrive through it.

Run: `sudo raspi-config` and choose the option "5 Interface options", and then "P6 Serial". Disable "Login Shell" through the serial port as shown in the following figure:



Figura 24: No login Shell on serial Port

Then enable hardware of the serial port:

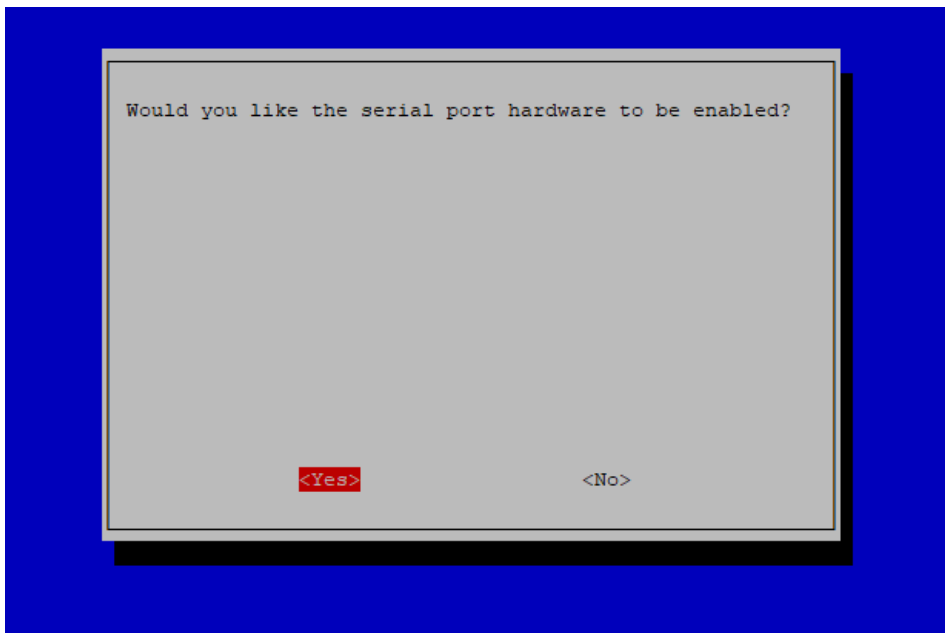


Figura 25: Serial Port hardware enabled

4.1.3 Raspbian Update and Upgrade

`sudo apt-get update`

`Sudo apt-get upgrade`

`Sudo reboot`

4.2 Codesys Configuration

The steps are similar to those made in the previous chapter for configuration by RS485 communications

1. Start Codesys and open the "colline.project" project located in the "Raspberry" folder
2. Connect the CollineIO card to the network with the embedded raspberry through its Ethernet port.
3. Within the device tree, the main device "CODESYS_Control_Win_V3_x64 (CODESYS Control for Raspberry Pi SL)" must be updated and restarted to work on a device other than the one of origin. To do this, click "right" to open the options.

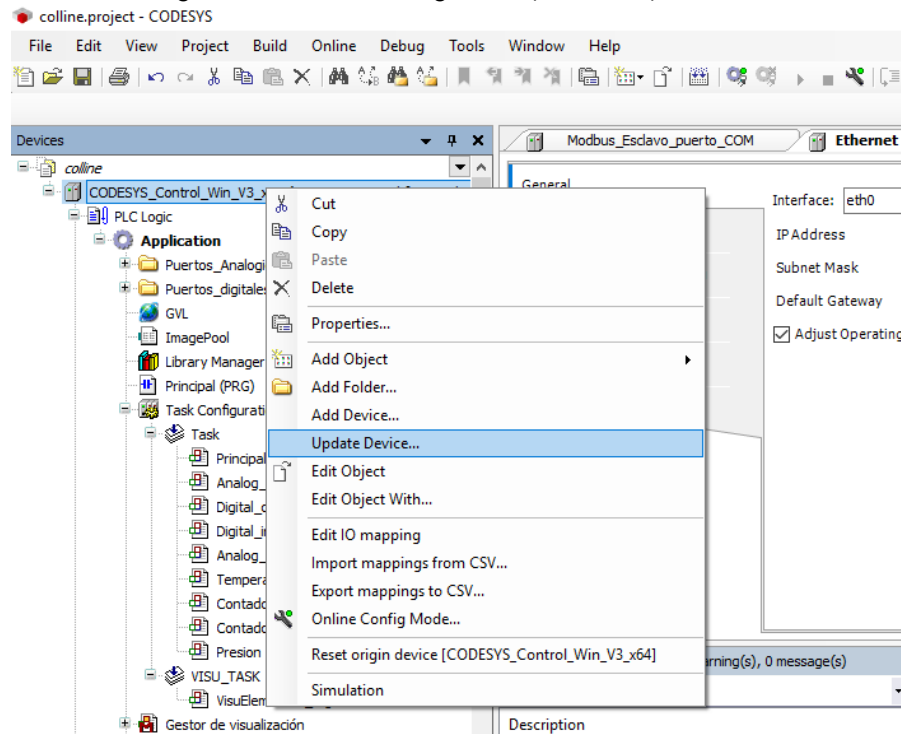


Figura 26: Update Manager

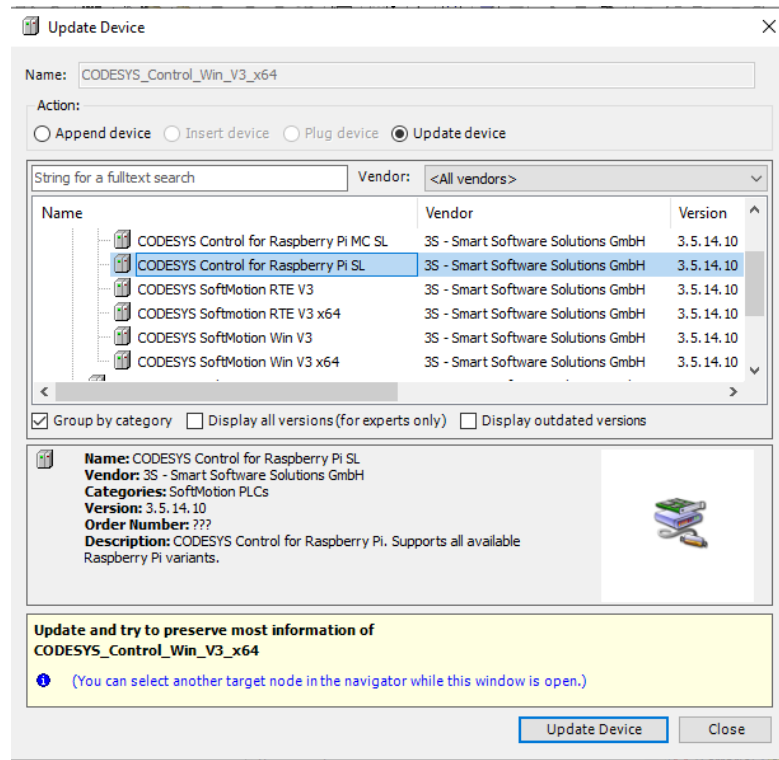


Figura 27: Update Codesys Control for Raspberry Pi SL

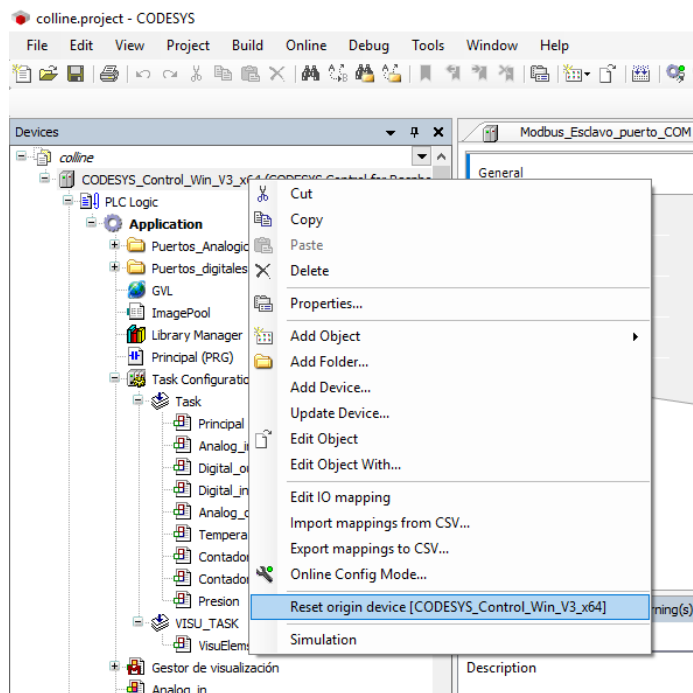


Figura 28: Reset Origin device

- The CollineIO card has a number that identifies it (1 ... 7), it is configured directly on the CollineIO card through its microswitch. This identifier number must be declared in the device "Modbus_Esclavo_puerto_COM" by double clicking on it to open the configuration window and in the "General" tab it is placed in the field "Slave address [1 ... 247]".

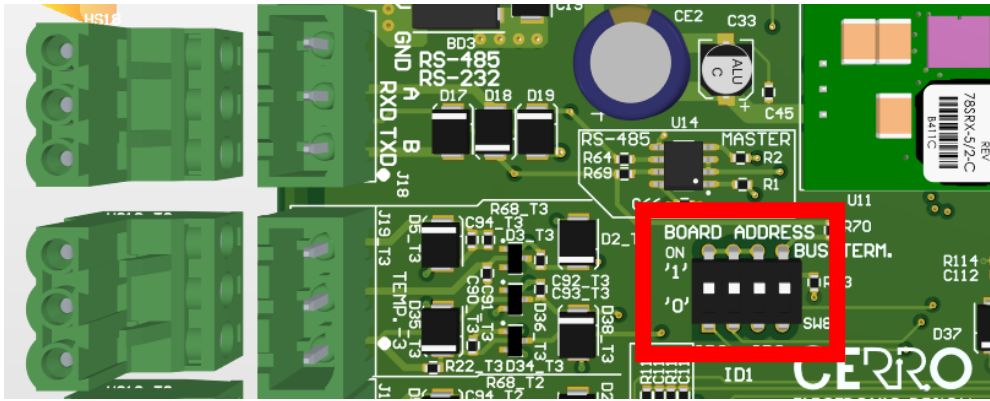


Figura 29: CollineIO identification assignment microswitch: Board Address

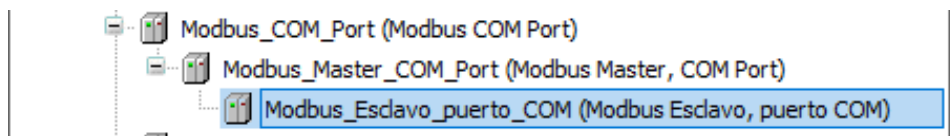


Figura 30: Slave Serial port configuration, "Modbus_Eslavo_puerto_COM"

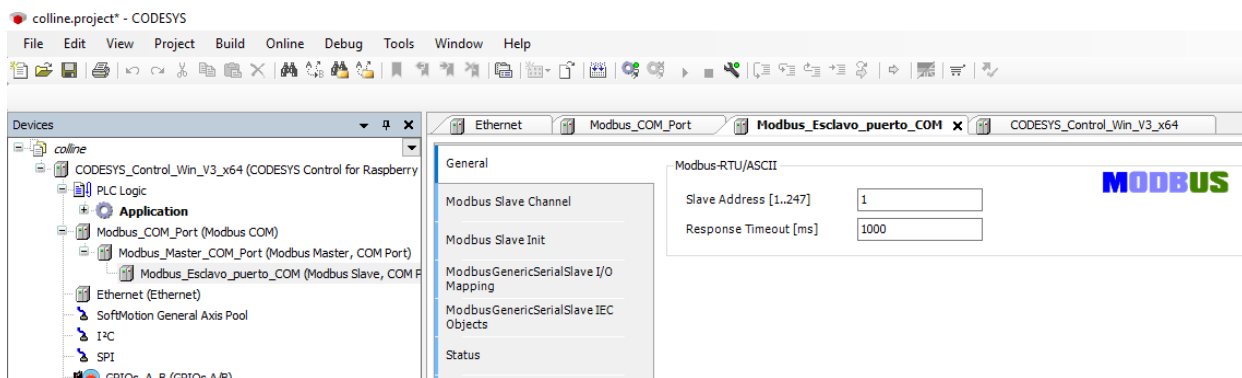


Figura 31: slave address configuration

5. Inside the CODESYS data package, there is a virtual PLC called: "CODESYS Control Win SysTray - x64".



Figura 32: PLC virtual program

This program must be started from the start button and then in the taskbar, in order to start the session.

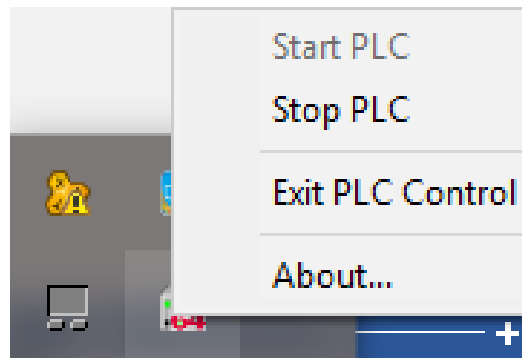


Figura 33: Start from the Windows task bar

6. To use the raspberry, you must log in to it by "SSH" from CODESYS; To do this, click on the "Tools" button and select the "Raspberry Pi Update" option.

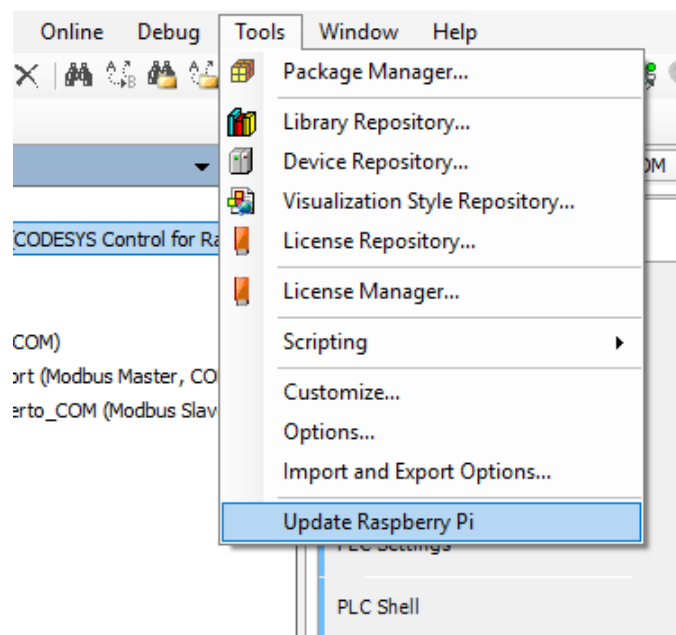


Figura 34: Update Raspberry Pi

7. Once the dialog is opened, the username "pi" and the password "raspberry" must be inserted; "click" on the "scan" button to detect the IP address of the raspberry

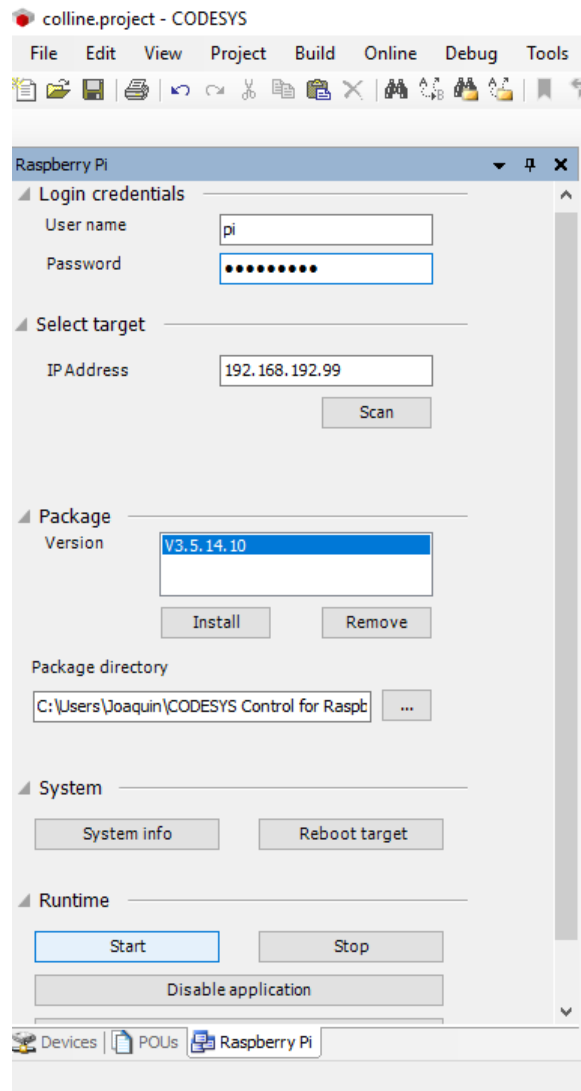


Figura 35: Ventana de inicio de sesión raspberry-CODESYS

8. Install the V3.5.14.10 package, by clicking "Install" (see Figure 31: Raspberry-CODESYS login window)

It is important to note that if it is already installed in the RaspberryPi, that is, it has already been done once, it MUST NOT be INSTALLED again, since it will create bus conflicts in the communication.

9. Press the "Start" button to start the SSH session. (see Figure 31: Start window session raspberry-CODESYS)

10. Once the package is installed, we must "retouch" the Codesys configuration on the RaspberryPi, so that it recognizes the UART as the COM1 port.

To do this, it is necessary to add some configuration lines in the file located in the path "/etc/CODESYSControl.cfg" of the RaspberryPi file system. The final content of the file will be the following:

[SysFile]

FilePath.1=/etc/, 3S.dat

PlcLogicPrefix=1

[CmpLog]

Logger.0.Name=/tmp/codesyscontrol.log

Logger.0.Filter=0x0000000F

Logger.0.Enable=1

Logger.0.MaxEntries=1000

Logger.0.MaxFileSize=1000000

Logger.0.MaxFiles=1

Logger.0.Backend.0.ClassId=0x00000104 ;writes logger messages in a file

Logger.0.Type=0x314 ;Set the timestamp to RTC

[CmpSettings]

FileReference.0=SysFileMap.cfg, SysFileMap

FileReference.1=/etc/CODESYSControl_User.cfg

[SysExcept]

Linux.DisableFpuOverflowException=1

Linux.DisableFpuUnderflowException=1

Linux.DisableFpuInvalidOperationException=1

[CmpBACnet]

IniFile=bacstacd.ini

[CmpWebServer]

ConnectionType=0

[CmpOpenSSL]

WebServer.Cert=server.cer

WebServer.PrivateKey=server.key

WebServer.CipherList=HIGH

[SysMem]

Linux.Memlock=0

```
[CmpCodeMeter]
```

```
InitLicenseFile.0=3SLicense.wbb
```

```
[SysEthernet]
```

```
Linux.ProtocolFilter=3
```

```
[CmpSchedule]
```

```
ProcessorLoad.Enable=1
```

```
ProcessorLoad.Maximum=95
```

```
ProcessorLoad.Interval=5000
```

```
DisableOmittedCycleWatchdog=1
```

```
[CmpSecureChannel]
```

```
CertificateHash=e5f5565a43e9bd928bb330676649f0dbfa189a84
```

```
[SysCom]
```

```
Linux.Devicefile=/dev/ttyAMA
```

```
portnum := COM.SysCom.SYS_COMPORT1;
```

The last lines, highlighted in bold, are those added to the content of the file.

To perform the above operation you can use Putty connecting to the IP of the Raspberry Pi in t port 22 and then, once in the / etc directory, execute the command:
sudo nano CODESYSControl.cfg

It will open a editor program.

11. The "Gateway" must be configured to communicate the device with the PC. To do this, "click" on the device "CODESYS_Control_Win_V3_x64 (CODESYS Control for Raspberry Pi SL)" to open a tab with the configuration options.

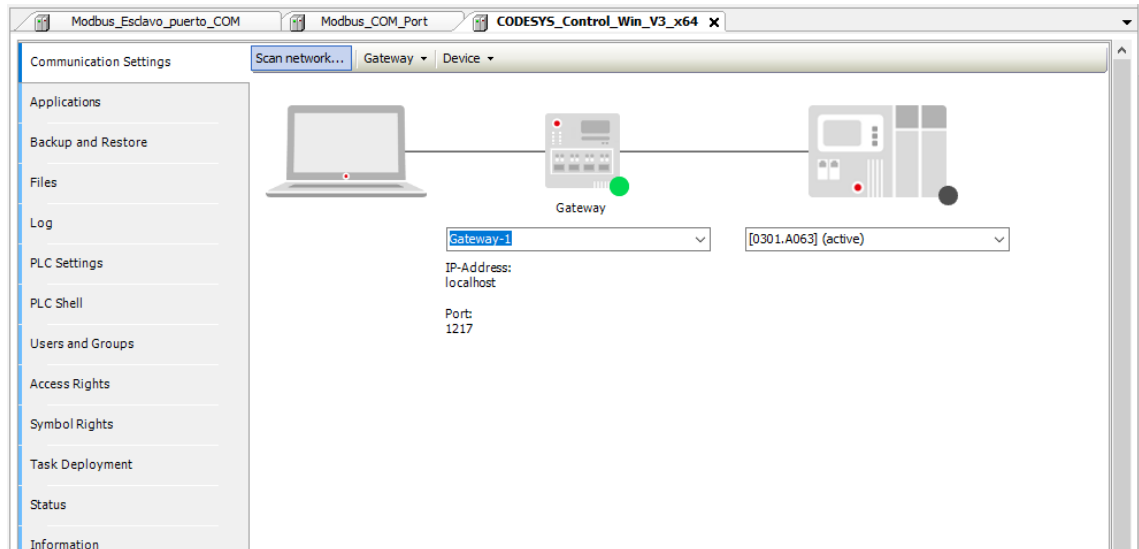


Figura 36: Gateway Configuration

Click on the "Scan network" button to check the devices connected to the network to choose one; choose the RaspberryPi that is connected in the COLLINA.

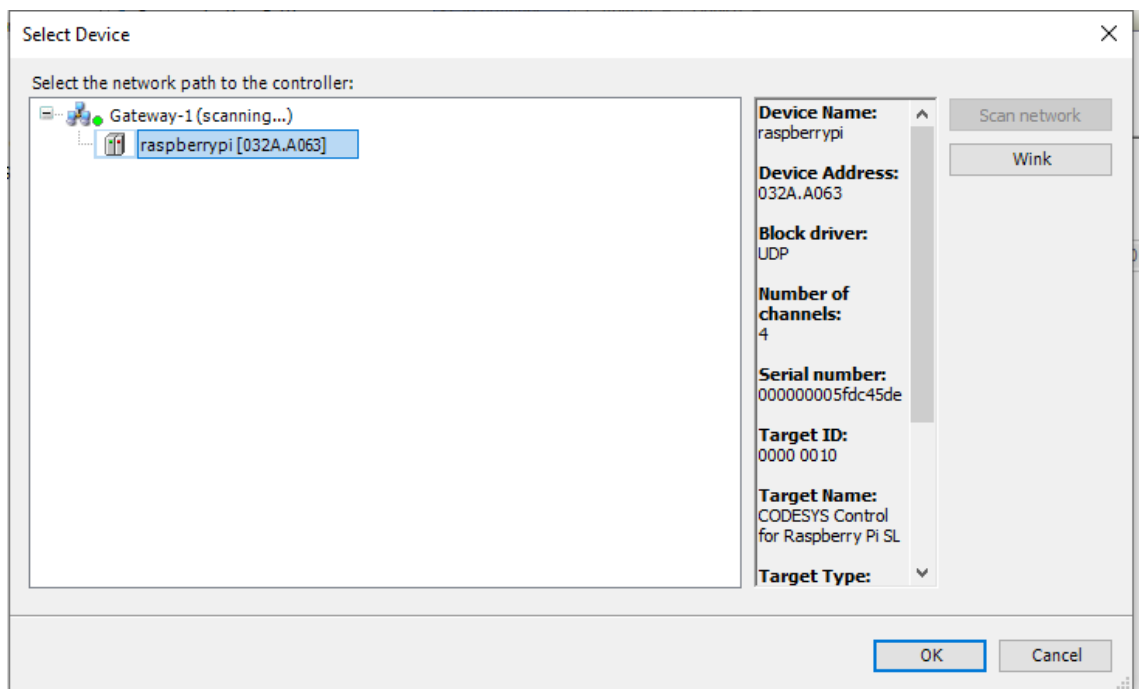


Figura 37: Select Device RaspberryPi

12. In the device window "CODESYS_Control_Win_V3_x64 (CODESYS Control for Raspberry Pi SL)", in the "communication configuration" tab, the Gateway icons should appear with a green circle, indicating that it is configured and ready.

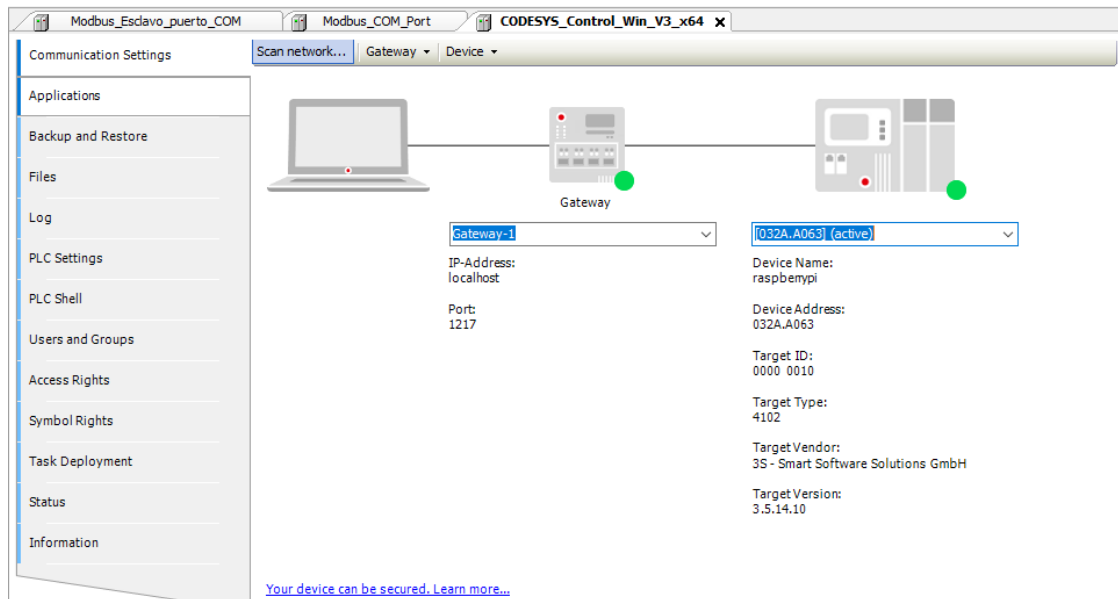


Figura 38: Connection done

In some cases the following message will be displayed:

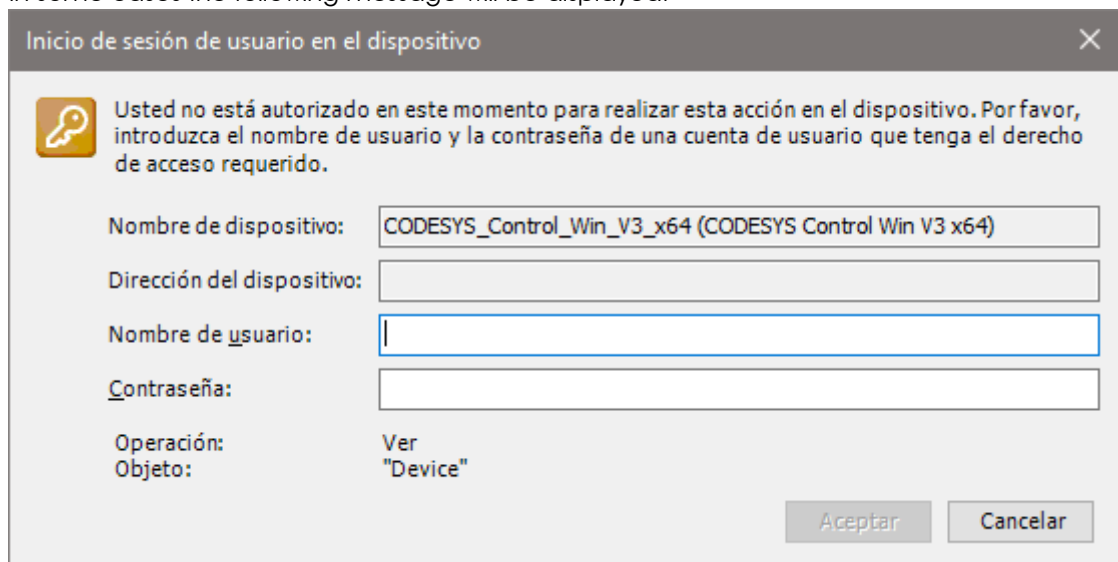


Figura 39: Ventana de inicio de sesión de usuario dentro del proyecto de CODESYS

In this situation, the username is "Administrator" and the password "1234" for these projects, the default password is "Administrator". After this the PLC icon should have a green circle.

- To configure communication via the network, you must configure the "Ethernet" device with the network connection type "etho" and the IP address of the Raspberry.

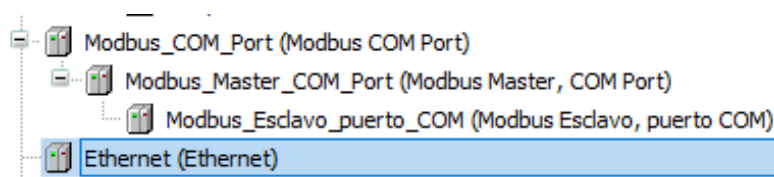


Figura 40: Ethernet Configuration

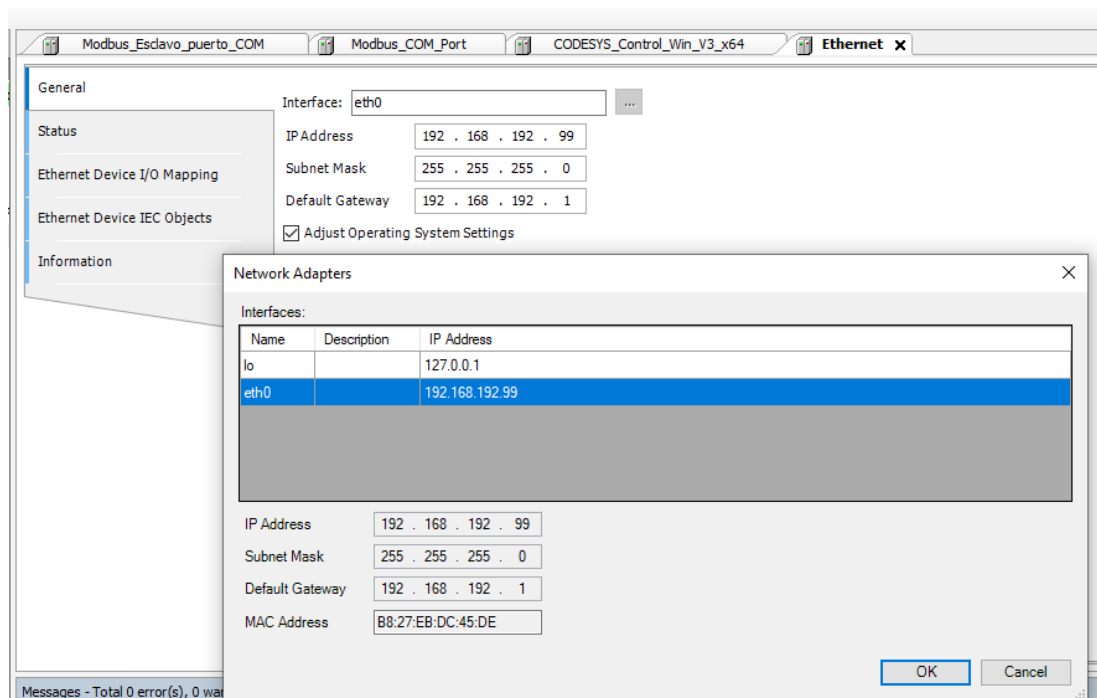


Figura 41: Ethernet setup

Figura 42: Diálogo de selección para interfaz de comunicación

14. Once this is done, you can “login” to the project and perform a program execution



Figura 43: Login button

Now we can “Run” the project



Figura 44: Run button at the right

At this point everything should be ok as shown in the next figure

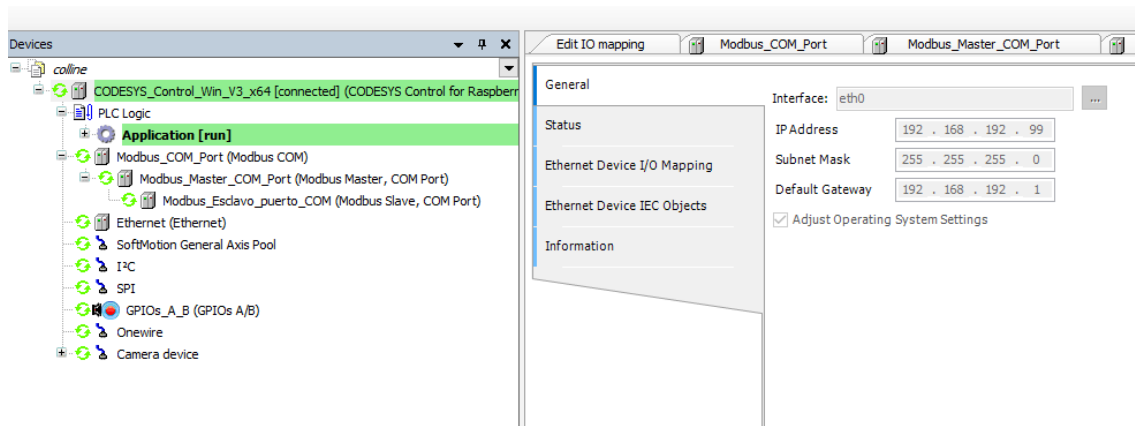


Figura 45: Codesys running OK

In case you have any problem try to do the Reset of the Origin Device as explained on point 3, Figura 28: Reset Origin device

15. After the start of the session, we can enter the IP address of the raspberryPI in a browser, for example: <http://192.168.192.99:8080> and then we see an image with which we can interact.

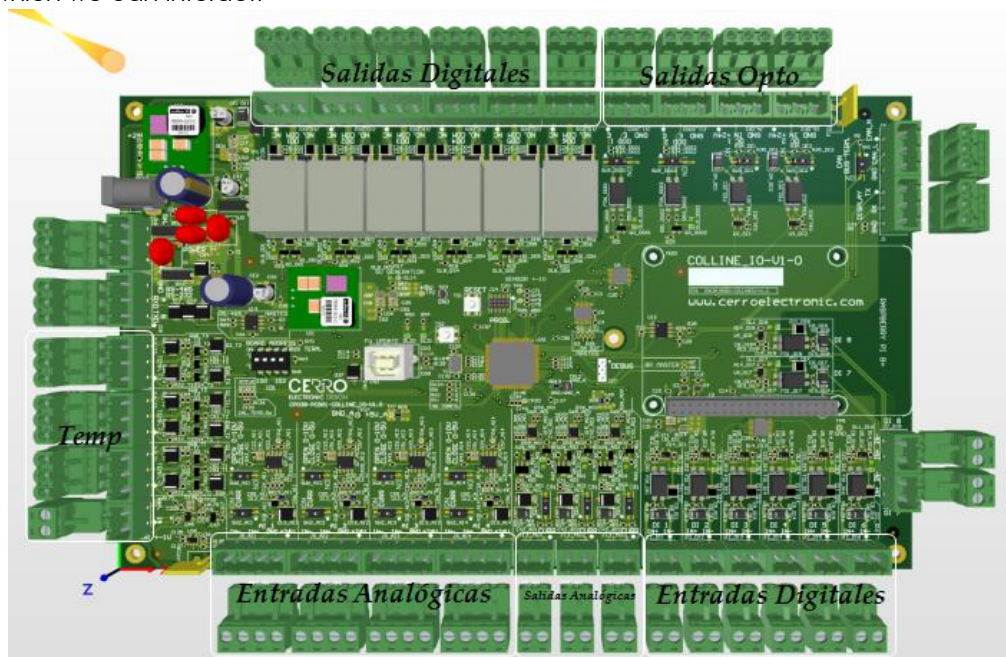


Figura 46: Interface window

For example, if you want to set a digital output (a relay) click on the "Digital Outputs" area and a sub-window appears in which you can set the output as 1 or 0, as shown in the following figure.

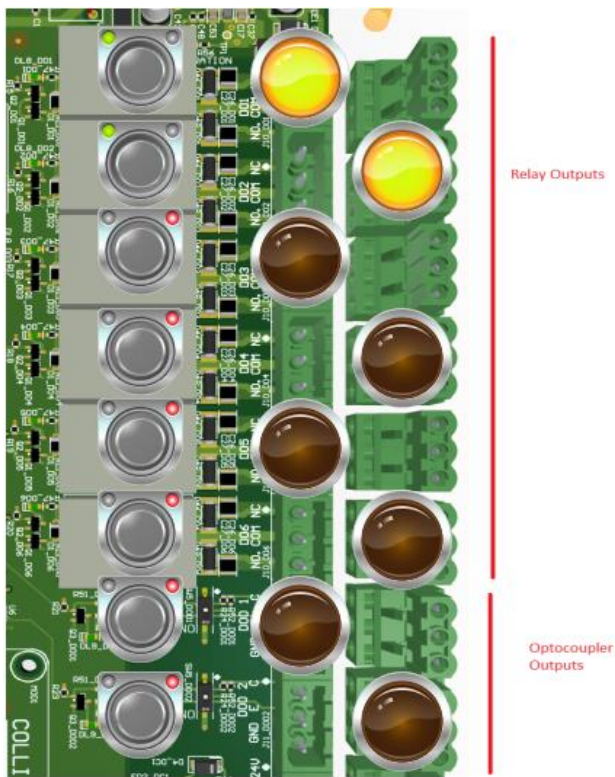


Figura 47: Pop up window for digital output (relays)