AX58101 EVB DIO User Guide

Revision 1.00
September 16th, 2025

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Revision History

Revision	Date	Description
1.00	2025/09/16	Initial release

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1. Introduction

This document introduces how to setup entire environment for demonstration of AX58101 EVB_DIO. The application of EtherCAT MainDevice side develops by PLC (Programmable Logic Controller) language through Beckhoff TwinCAT engineering (XAE). And the IDE relies on Microsoft Visual Studio 2013 / 2015. The EtherCAT MainDevice application can be executed through the mentioned IDE or pure Beckhoff runtime package (XAR). In addition, the EtherCAT SubDevice side employs AX58101 EVB board.

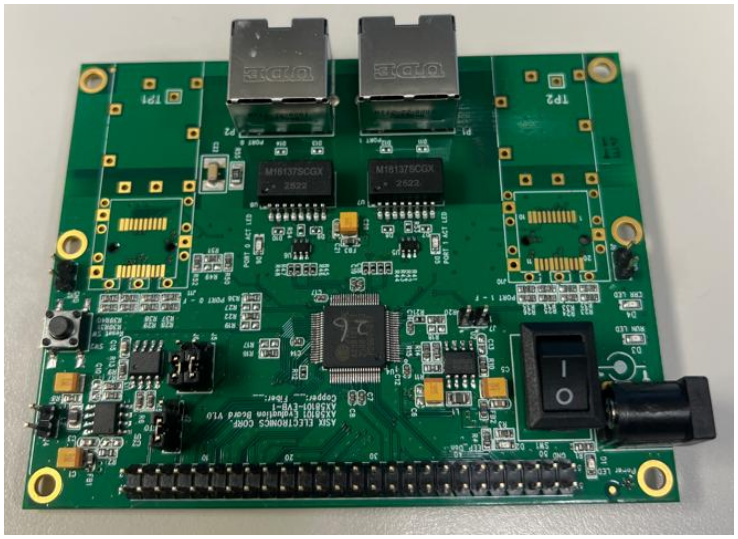

Figure-1. AX58101 EVB Board

2. Requirements

Before starting to setup, the demonstration environment that includes software and hardware. We list software / hardware requirements as following:

EtherCAT MainDevice Side

[Software]

- Windows 11/10 operation system
- Microsoft Visual Studio 2013 / 2015
- Beckhoff TwinCAT XAE (Version 4022.28 or higher)
- AX58101(2)_EVB_DIO ESI file (xml)

[Hardware]

- An INTEL Network Adapter

EtherCAT SubDevice Side

[Hardware]

- AX58101 EVB board

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3. System Topology

The system topology of demonstration is very simple. We only setup a TwinCAT MainDevice and let it connect to an EtherCAT SubDevice. Below figure illustrates topology and block diagram in system upper layer:

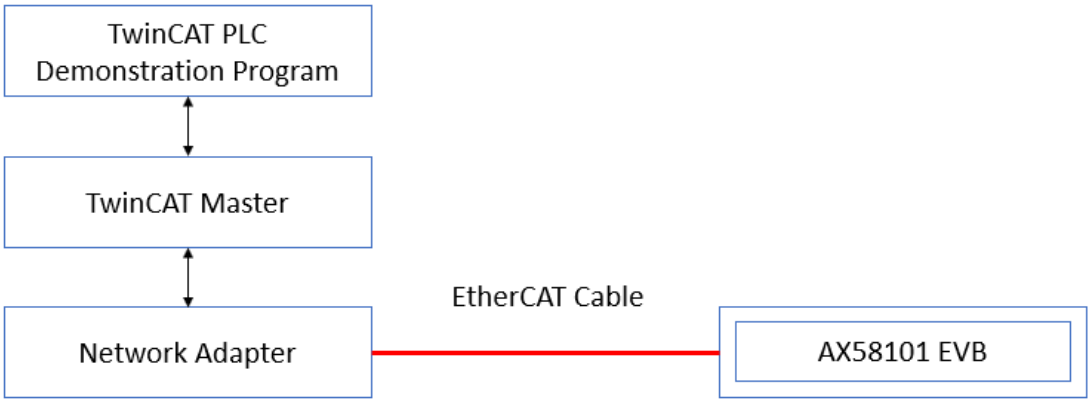

Figure-2. System topology

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4. Environment Setup

This chapter describes how to setup entire environment for demonstration of AX58101 EVB DIO. It contains 3 parts: TwinCAT Project / TwinCAT PLC / EtherCAT SubDevice.

4-1. EtherCAT SubDevice

The EtherCAT SubDevice of AX58101 EVB provides 32 GPIO indicate the Input/output status. In this demonstration, we should connect EtherCAT SubDevice with TwinCAT runtime PC. Please follow below steps:

- **Step 1:** Connect AX58101 EVB board with the PC you want to execute TwinCAT. AX58101 EVB board provided 2 Ethernet ports, port 0 and port 1, plug-in cable on port 0, another side plug-in on PC NIC port.

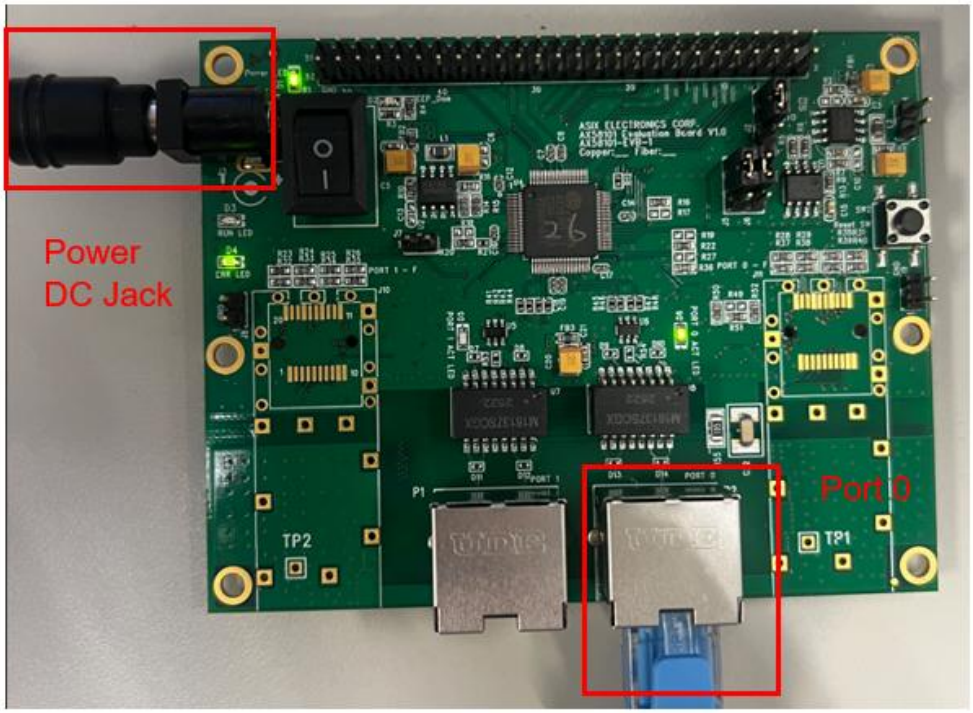

Figure-3. AX58101 EVB board

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- **Step 2:** Please check the **power led** light on and **PORT 0 ACT LED** is blinking

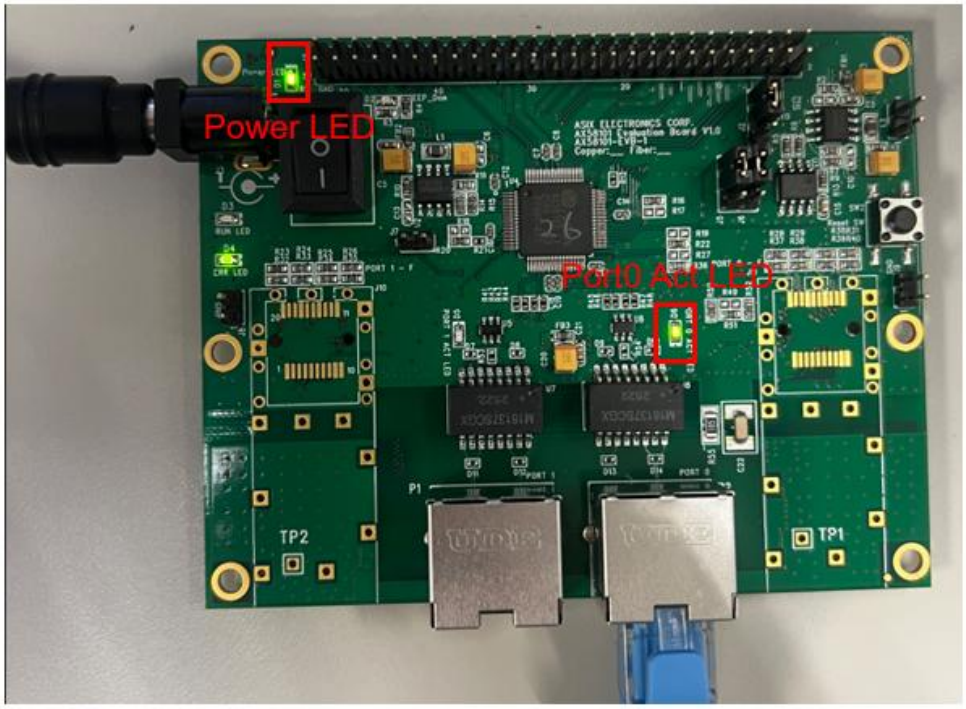

Figure-4. Connect

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4-2. TwinCAT Project

After installed TwinCAT XAE successfully, you can start the XAE through system try icon as below figure. The TwinCAT development environment is already integrated into Visual Studio. We can use Visual Studio 2015 as development IDE.

Figure-5. Open Visual Studio

Any common deployment or application through TwinCAT XAE should be processed under a TwinCAT project. We create an empty TwinCAT project and scan out EtherCAT SubDevices that linked to the MainDevice. If you have a Beckhoff real-time compatible network adapter (ex: Intel I-350) in the system, TwinCAT MainDevice can bundle the adapter as main EtherCAT port. If you have 2 adapters, the second adapter can be used for redundancy. Whatever affairs EtherCAT related must be under TwinCAT XAE. Create a TwinCAT project first and please refer to below steps:

- **Step 1:** Click "**New TwinCAT Project…**"

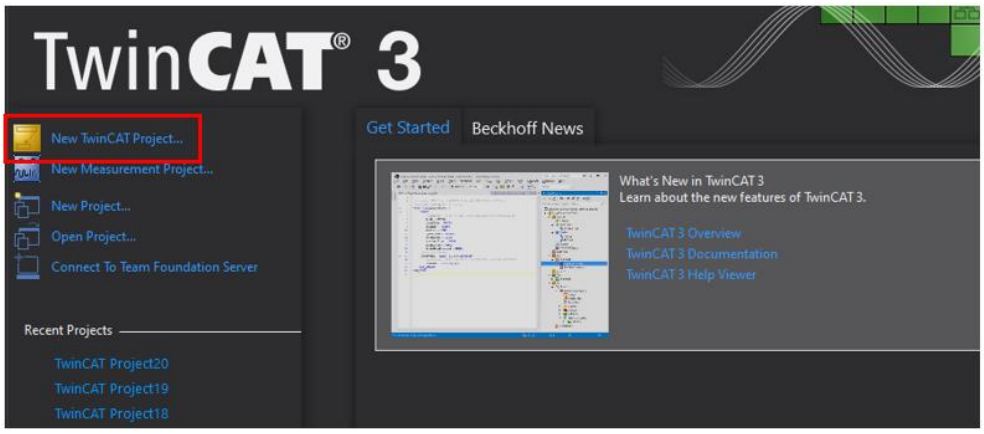

Figure-6. Create new empty TwinCAT project

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- **Step 2:** Specify "**Name**" and "**Location**", click "**OK**"

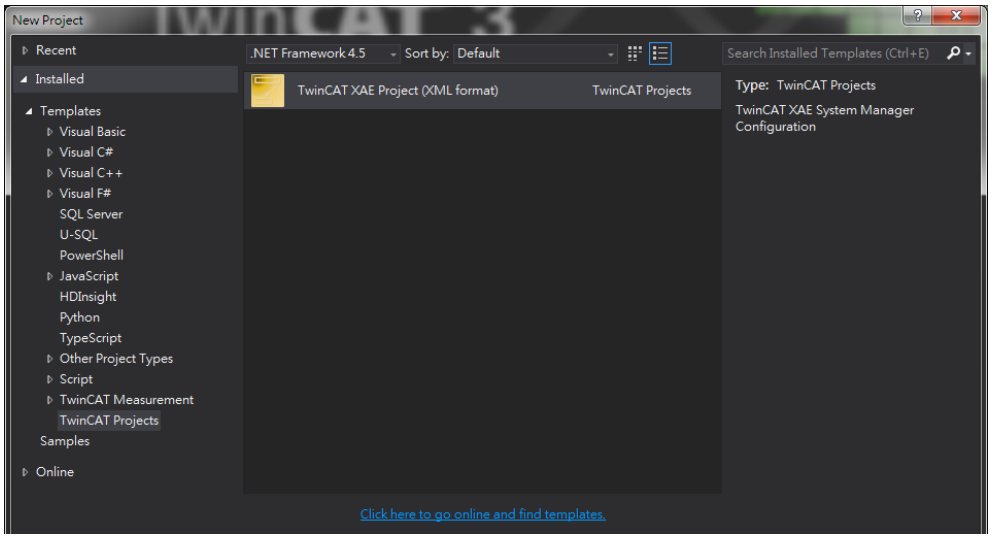

Figure-7. Set Project name

- **Step 3:** Click "**Show Realtime Ethernet Compatible Devices…**"

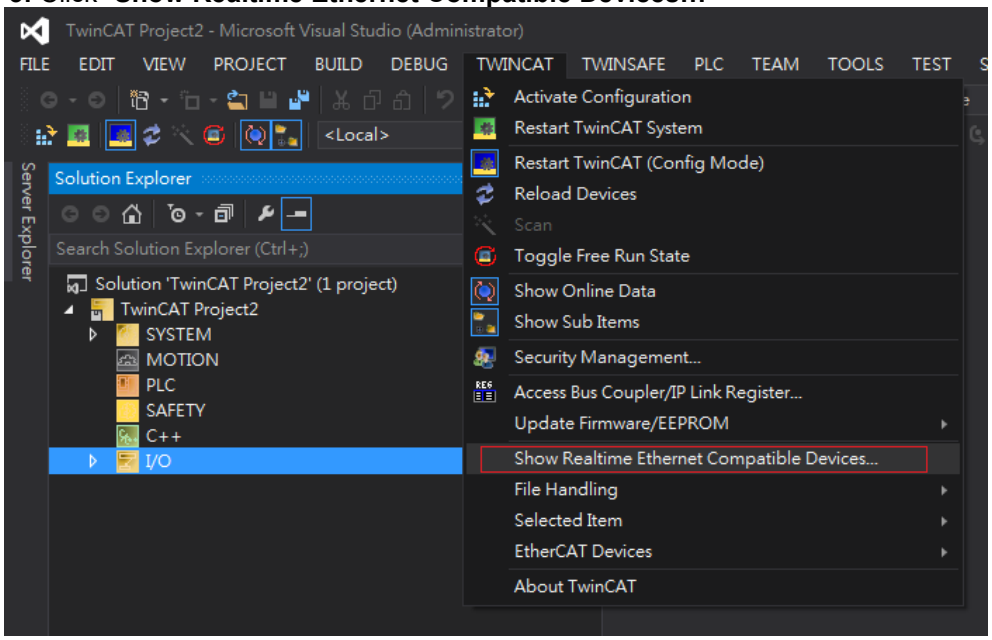

Figure-8. select "Realtime Ethernet Compatible Devices"

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- **Step 4:** Make sure your network adapter installed Beckhoff EtherCAT real-time driver. If your network adapter appears under "**Compatible**", select and click the "Install" button to install Beckhoff real-time driver.

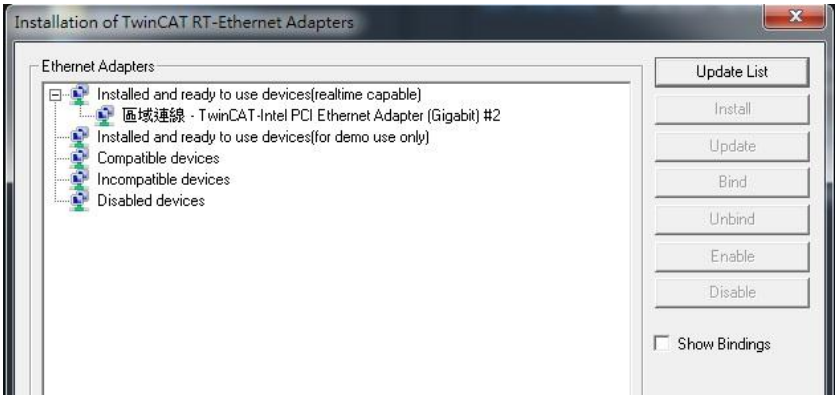

Figure-9. NIC list and drive install

- **Step 5:** Please copy the correct AX58101 ESI file (e.g. "**AX58101(2)_DIO_16Input_16Output.xml**", "**AX58101(2)_DIO_32Input.xml**", "**AX58101(2)_DIO_32Output.xml**") into TwinCAT ESI directory "**C:\TwinCAT\3.1\Config\Io\EtherCAT**".

Figure-10. ESI file location

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- **Step 6:** Click "**Reload Device Descriptions**"

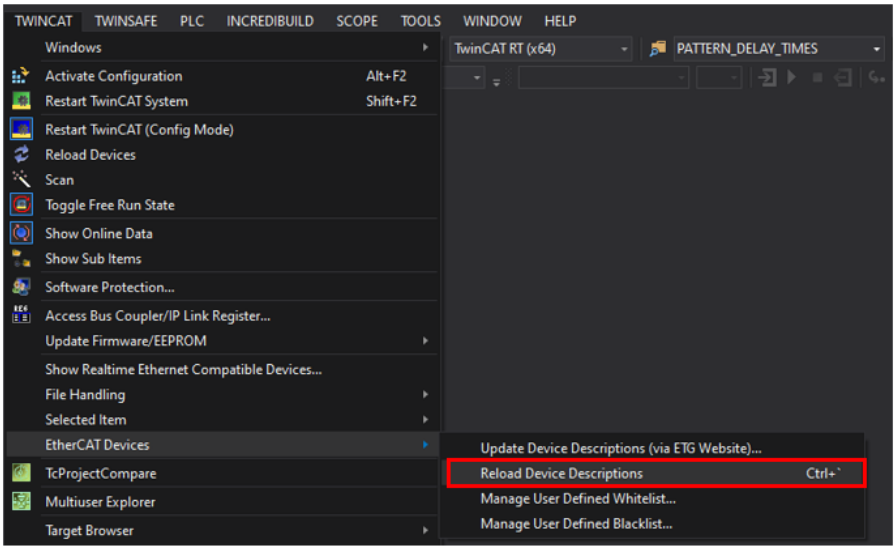

Figure-11. Reload device descriptions

- **Step 7:** Right-click on "**IO -> Devices**" and select "**Scan**"

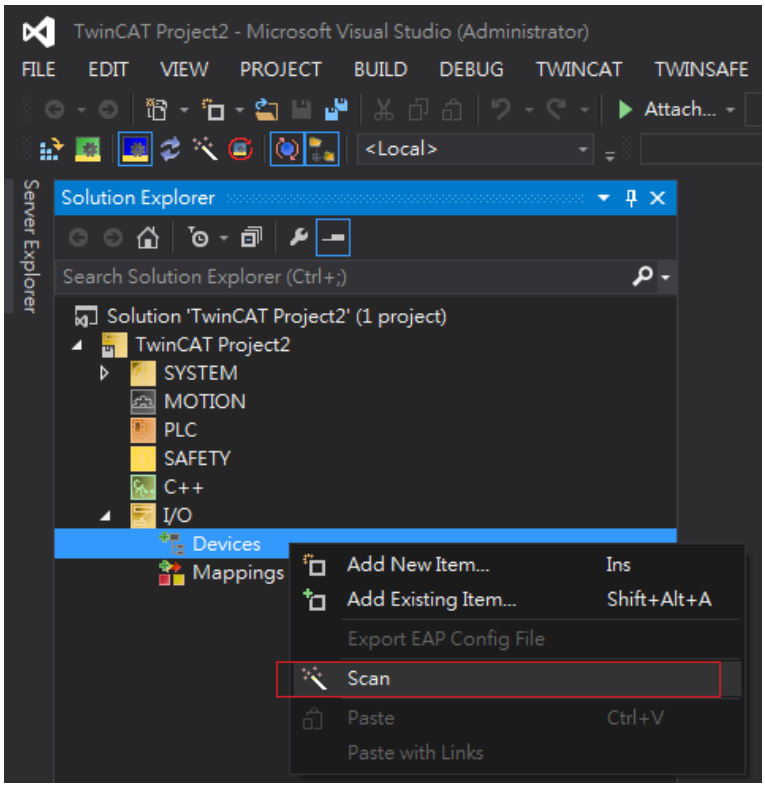

Figure-12. Scan device

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- **Step 8:** Click “OK” for below dialog.

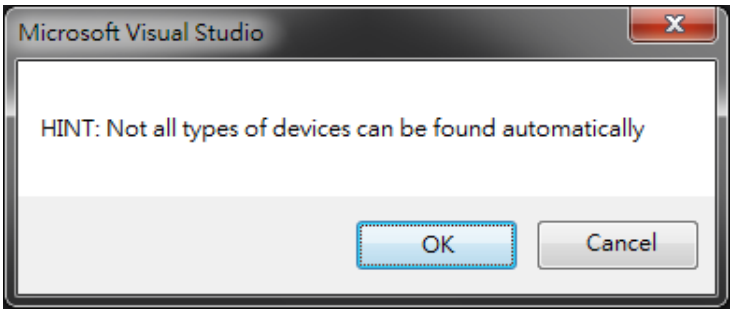

Figure-13. Attention dialog

- **Step 9:** Select correct local area connection that link to EtherCAT SubDevice and click “**OK**”.

Figure-14. Choose NIC

- **Step 10:** Click “**Yes**” for below dialog.

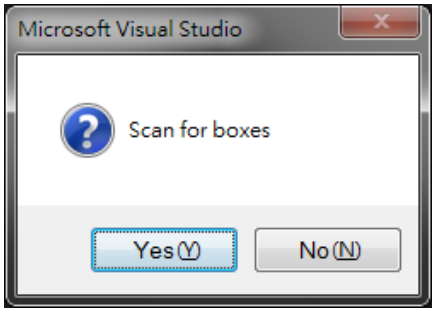

Figure-15. confirm

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- **Step 11:** Click "**Yes**" for below dialog.

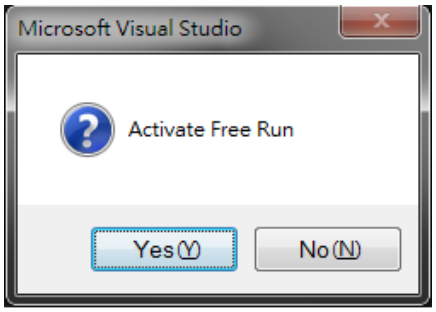

Figure-16. Auto into free run mode

- **Step 12:** TwinCAT MainDevice will scan out all EtherCAT SubDevices via Ethernet port of the network adapter. Now we double click "**I/O->Devices->Device X (EtherCAT)**", at the right-window shows the EtherCAT SubDevices that MainDevice found. In this example, we found **Box 1** (**AX58101(2)_EVB_DIO_16).**

  Note: Please confirm that SubDevice already at "**OP**" state and Run Led already light on.

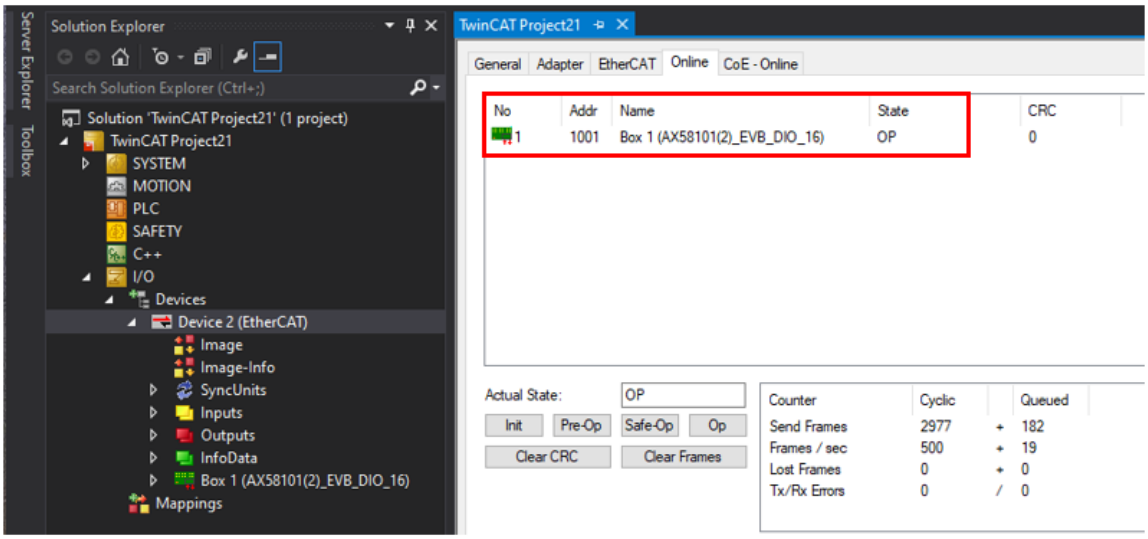

Figure-17. The EtherCAT SubDevice list

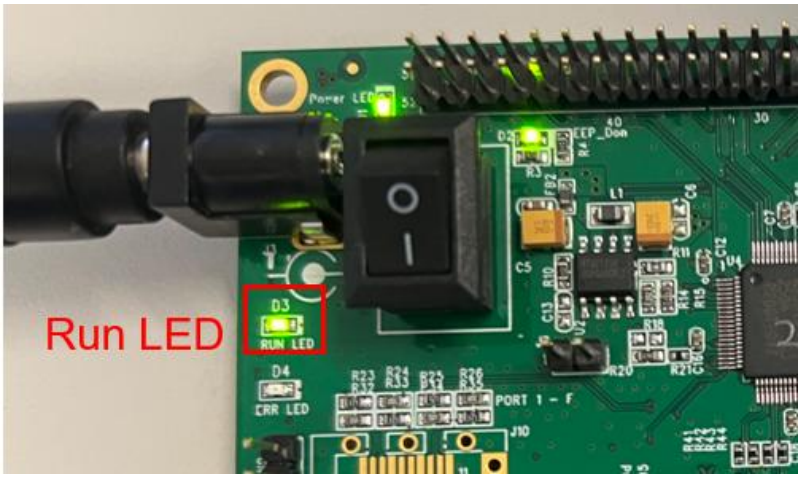

Figure-18. The Run LED lights on

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5. 16 Bit DIO Verify

If you finish the procedures above chapters mentioned, here we can start to verify 16 Bit DIO.

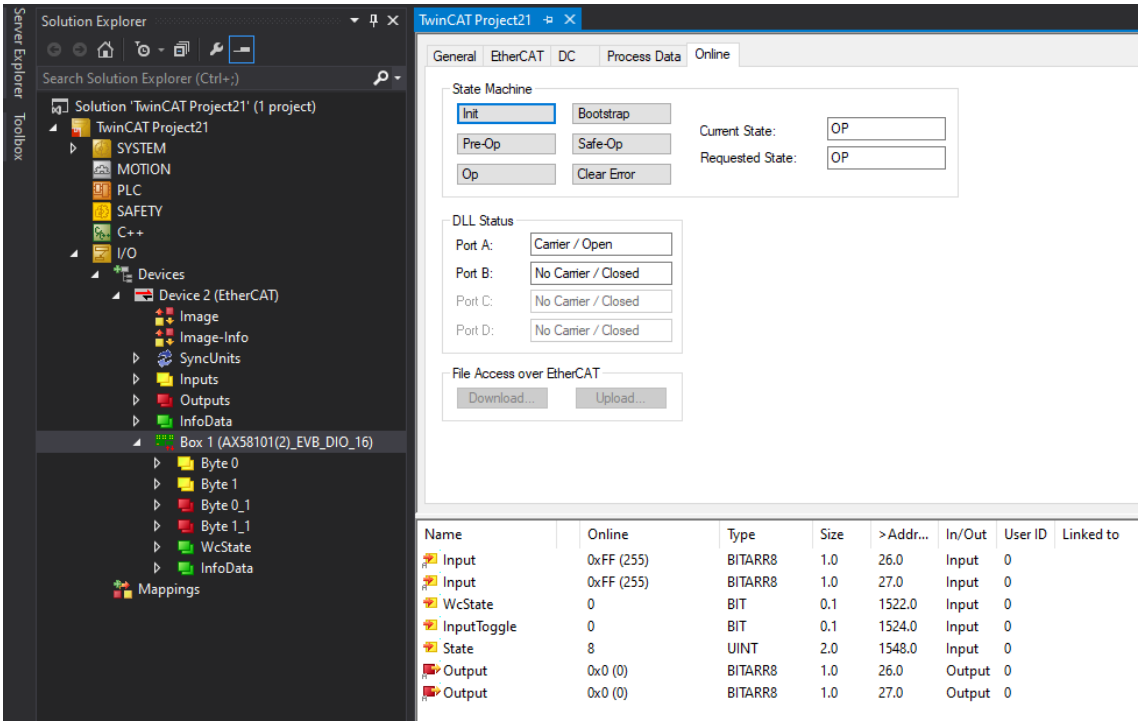

Figure-19. EtherCAT SubDevice list and active

5-1. GPIO Output

Please follow below steps to verify GPIO output.

- **Step 1:** Please choose the output pin which one you want to verify.

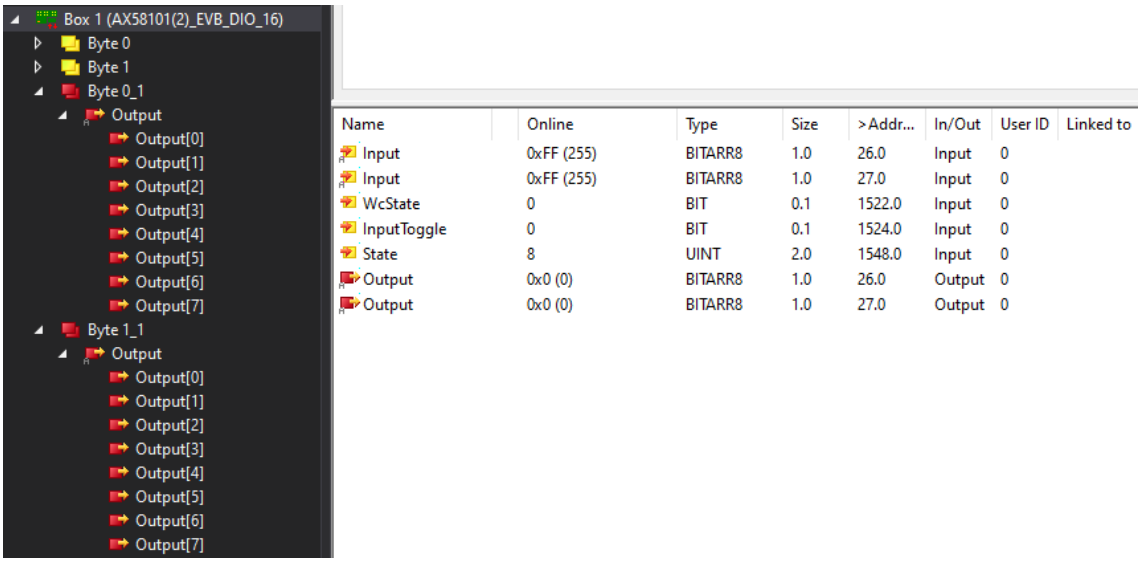

Figure-20. EtherCAT SubDevice GPIO output pin list

- **Step 2:** Please select the voltage status high/low to verify.

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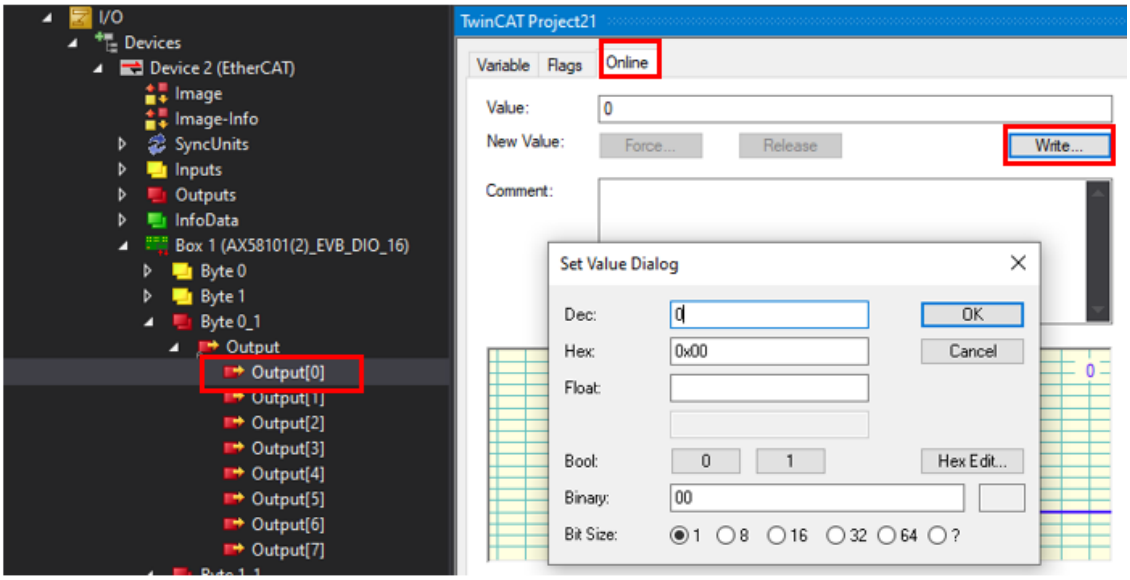

Figure-21. EtherCAT SubDevice GPIO output pin status selects.

- **Step 3:** Confirm the voltage change by multimeter is correct or not.

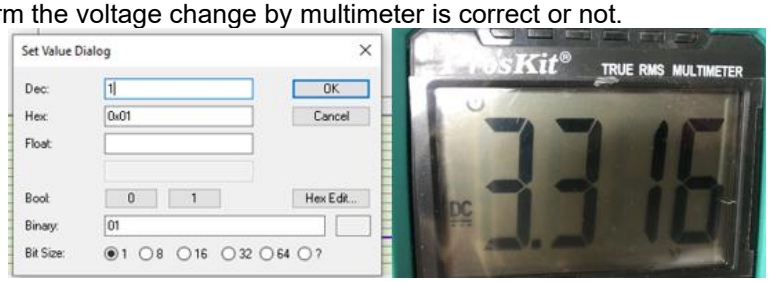

Figure-22. EtherCAT SubDevice GPIO output pin status=1.

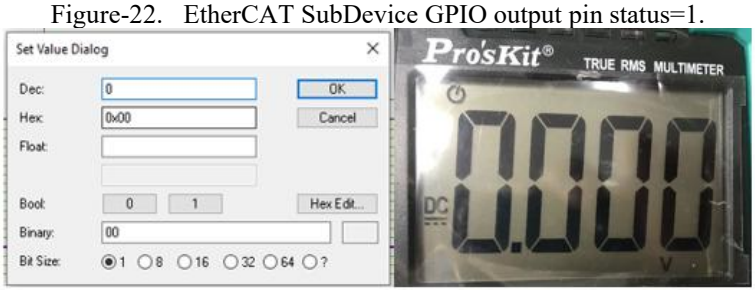

Figure-23. EtherCAT SubDevice GPIO output pin status=0.

- **Step 4:** Repeat step1 – step 3.

5-2. GPIO Input

- **Step 1:** Please choose the Input pin which one you want to verify.

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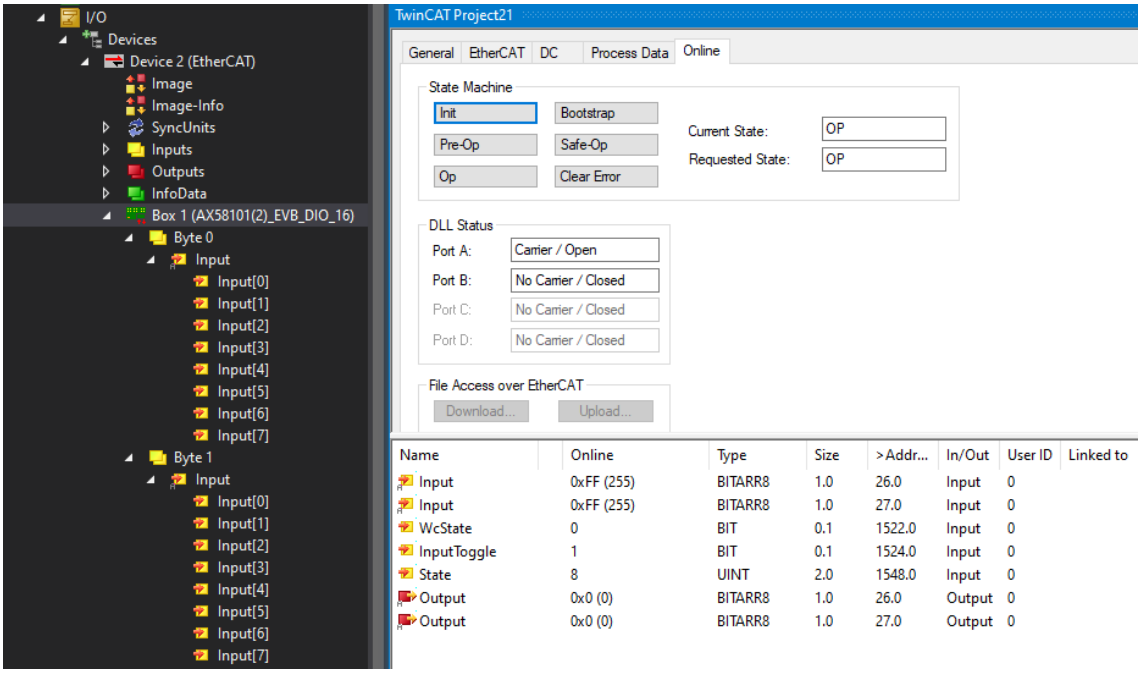

Figure-24. EtherCAT SubDevice GPIO input pin list.

- **Step 2:** Please connect to the input pin with GPIO output pin or pull-high(3.3V) / pull- low.
- Example as below: GPIO output [0] connect to GPIO input [0] on EVB board.

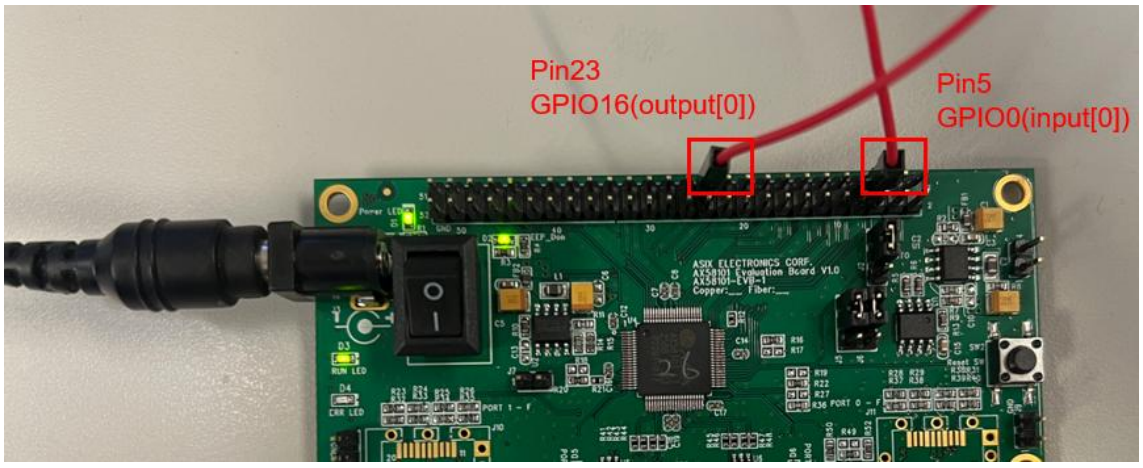

Figure-25. Connection of GPIO output pin connect to input pin.

- **Step 3:** Confirm the voltage change by multimeter or status value of input pin is correct or not.

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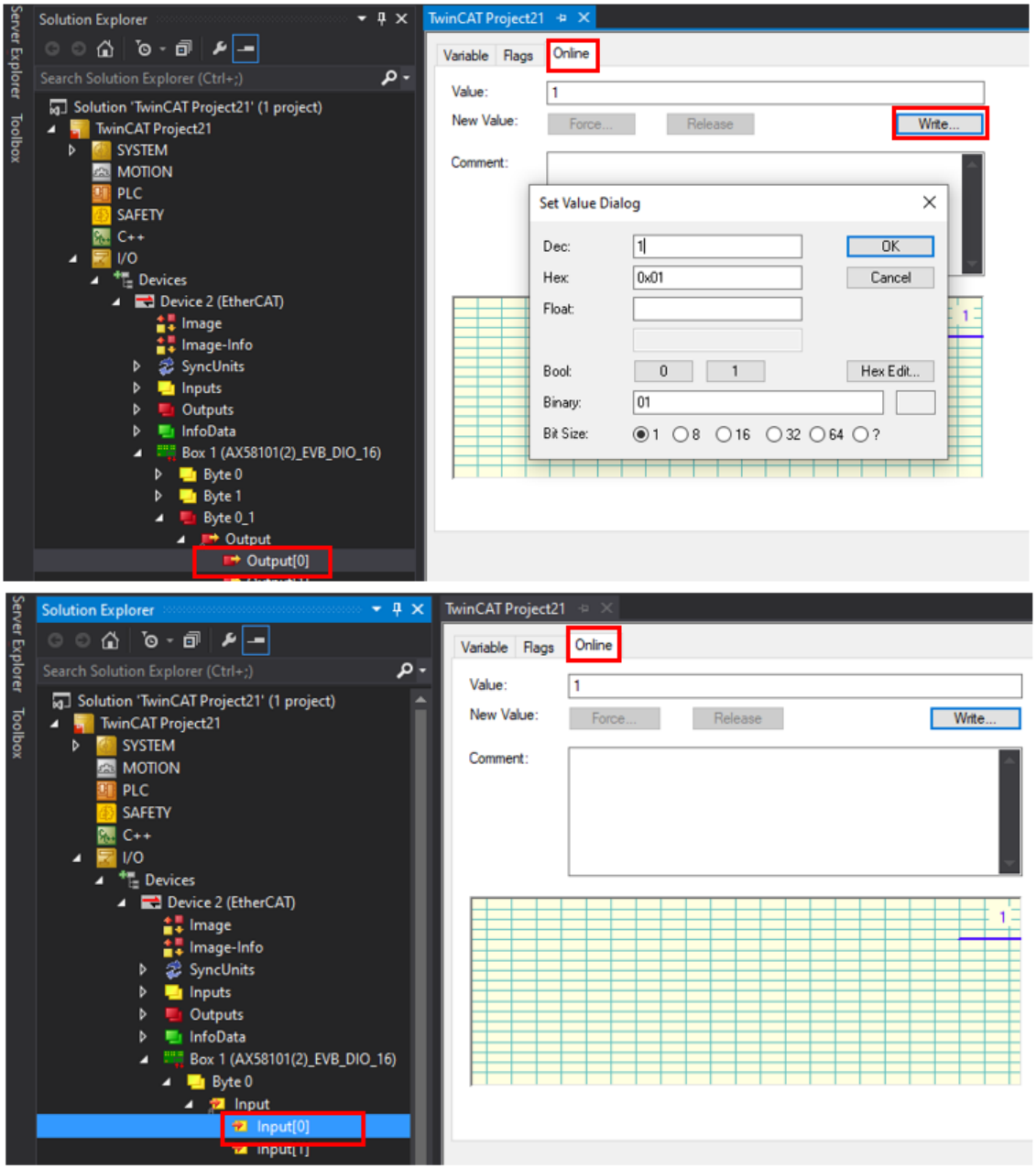

Figure-26. GPIO output select =1, GPIO input status value =1.

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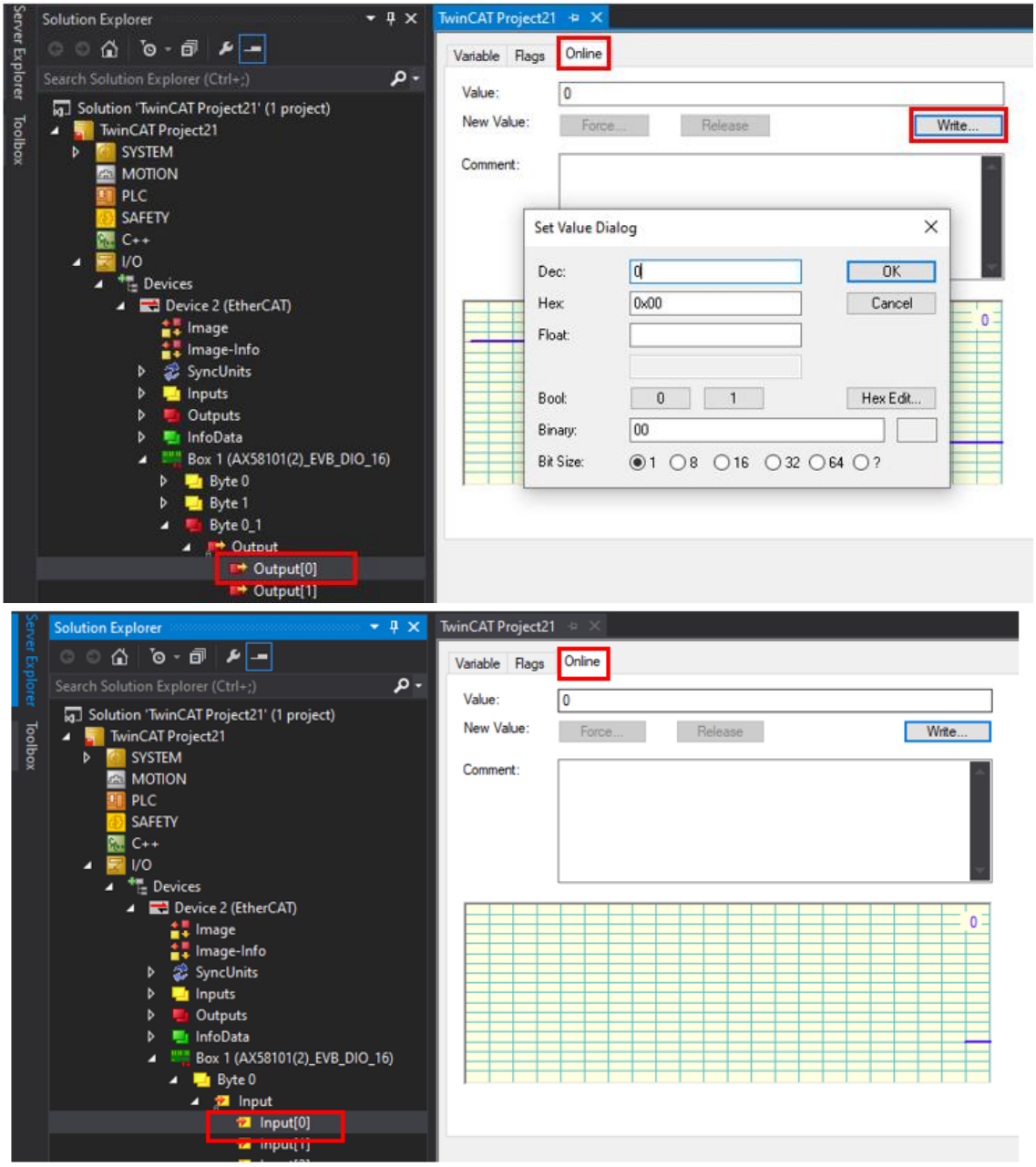

Figure-27. GPIO output select =0, GPIO input status value =0.

- **Step 4:** Repeat step1 – step 3.

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