docs

ATOM / Fieldbus / EtherCAT

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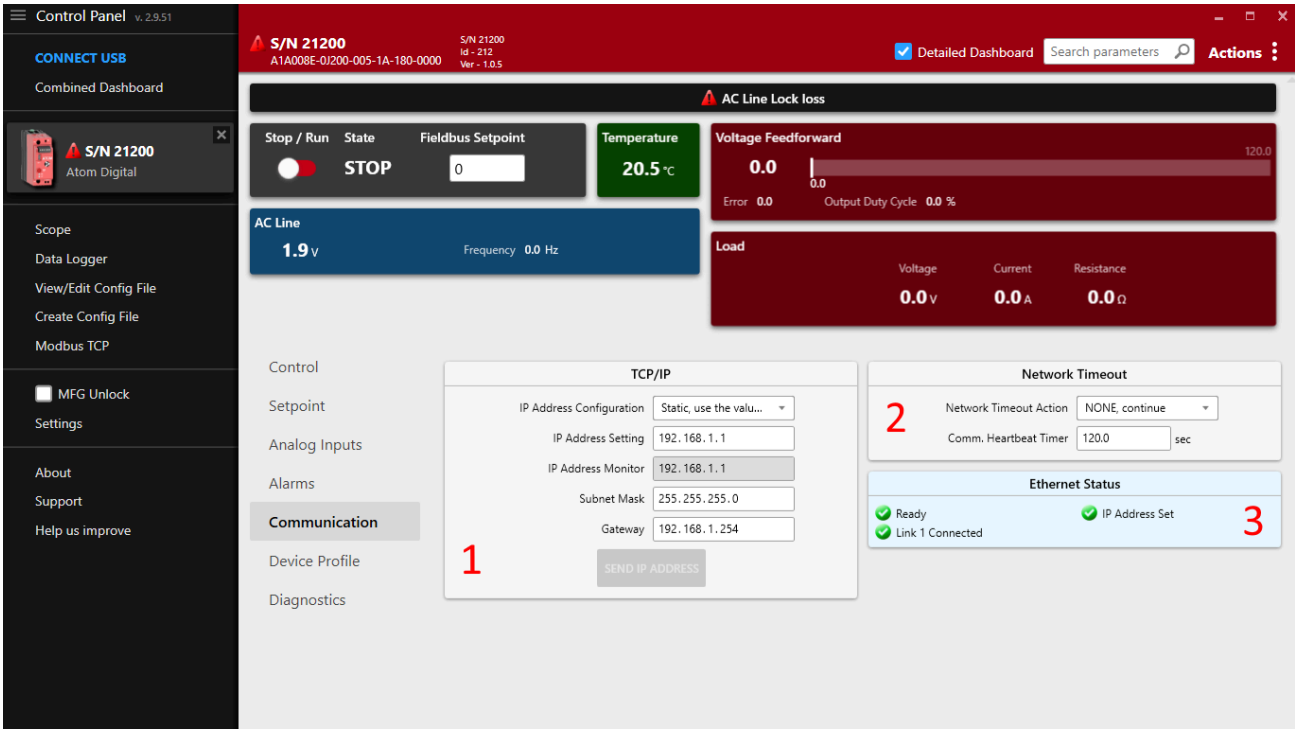
> **NOTE**
>
> Control Concepts has run the EtherCat Conformance Test Tool to verify that ATOM is fully compliant with the EtherCAT standard.

ESI file

> **INFO**
>
> Download ATOM's ESI file: Atom.xml.

Control Panel Communication Settings



Some communication settings can be configured in the **Communication** tab in Control Panel.

- Section `1`: TCP/IP settings
  - **IP Address Configuration**
    - `Static`: Use the IP address, subnet mask, and gateway specified below.
    - `DHCP`: Use DHCP to obtain an IP address.
  - **IP Address Setting**: The IP address of the ATOM controller.
  - **IP Address Monitor**: The current IP address of the ATOM controller.
  - **Subnet Mask**: The subnet mask of the ATOM controller.
  - **Gateway**: The gateway address for the ATOM controller.
- Section `2`: Network Timeout
  - The EtherNet/IP heartbeat timeout (Encapsulation Inactivity Timeout) in seconds.
  - You can configure a network timeout action to perform when the device loses communication with the PLC:
    - `None`: Do nothing

    - `STOP, fault shutdown`: STOP the controller, disabling output
    - `Use network timeout setpoint`: Configure an alternative setpoint to use when the controller loses communication with the PLC.
- Section `3`: Ethernet status
    - Indicates the status of both RJ45 ports, IP address configuration, conflict detection, and any other errors with the EtherNet/IP connection.

> **INFO**
>
> ## Control Panel and PLC software
>
> These settings are synchronized with your PLC environment. You do not have to use Control Panel to change these settings - you can stay in your PLC software. Control Panel merely provides them as an altnerative way to configure ATOM's EtherNet/IP settings.
>
> You can use Control Panel simultaneously with your PLC software without issues.

> **WARNING**
>
> ## IP Address Conflict Detection
>
> ATOM uses **IP Address Conflict Detection** to detect IP address conflicts on the network. If ATOM detects another device using the same IP address, it will disable all network communication until the conflict is resolved.
>
> Please ensure all devices on the network are assigned unique a IP address.

Hardware considerations

> **WARNING**
>
> ### Daisy chaining
>
> As ATOM has two RJ45 ports, it can be easily daisy-chained. When daisy-chaining ATOM, take care to avoid a loop in the network. In some loop configurations, ATOM is susceptible to network broadcast storms, which can cause the controller to become unresponsive. If you are daisy-chaining ATOM, ensure that the network is loop-free.
>
> ATOM works with both unmanaged and managed switches. We recommend a managed switch for larger networks to give you more control over the network topology.

Parameters

Overview

The following is an overview of the parameters available over EtherCAT. These parameters can be accessed and modified through TwinCAT or other EtherCAT master software.

Inputs (`DT6000`)

Index	Name	Type	Description
0x6000:01	Line Voltage	UINT	Input AC line voltage in tenths of a volt (i.e. `800` = `80.0 V`)
0x6000:02	Load Voltage	UINT	Load Voltage in tenths of a volt (i.e. `800` = `80.0 V`)

Index	Name	Type	Description
0x6000:03	Load Current	UINT	Load Current in tenths of an amp (i.e. `800` = `80.0 A`)
0x6000:04	Load Resistance	UINT	Load resistance in tenths of an Ohm (i.e. `800` = `80.0 Ohms`)
0x6000:05	Heatsink Temp	UINT	Heatsink temperature in tenths of a Celsius (i.e. `800` = `80.0 C`)
0x6000:06	AC Line Frequency	UINT	AC Line Frequency in tenths of a Hertz (i.e. `800` = `80.0 Hz`)
0x6000:07	Controller State	UINT	See controller state description
0x6000:08	Output Duty Cycle	UINT	Indicates the amount, in tenths of a percent (`800` = `80.0%`), that the output of the controller is ON
0x6000:09	Setpoint Reference	UINT	The command reference input to the control compensation loop in `V`, or `A` (per the feedback parameter)
0x6000:10	Feedback	UINT	The control output supplied to the load in units determined by the ?Feedback? selection
0x6000:11	Setpoint selected	UINT	Active setpoint. `1` = Analog setpoint, `2` = Digital setpoint, `3` = Fieldbus setpoint

Index	Name	Type	Description
0x6000:12	Inhibit Alarm Status	UINT	Indication of alarms that cause the controller to be shut OFF and not allowed to RUN. See inhibit alarm status description
0x6000:13	Controller Status	UINT	Indicates the operational status of the controller. See controller status description
0x6000:14	Warning Alarm	UINT	Indication of conditions that cause specific warning alarms. See warning alarm description

Inhibit Alarm Status

Inhibit alarm status is a 8-bit bitfield:

7	6	5	4	3	2	1
Reserved	Reserved	Reserved	Reserved	Feedback Loss	Over Temperature	Over Current Trip

If any bit is set to 1, the controller will *not* be allowed to run.

Warning Alarm Status

Warning alarm status is a 8-bit bitfield:

7	6	5	4	3	2	1	0
Reserved	Reserved	High Temperature	Shorted SCR	Open Load	Partial Load Fault	Current Limit	Voltage Limit

Warning alarms are not considered critical and will not prevent the controller from running.

Controller Status

Controller status is one of:

Value	Description
0	Disabled
1	Initialization
2	Normal, operating
3	Calibration
4	Diagnostic

Controller State

Controller state is one of:

Value	State	Description
0	STOP	The state the controller is in when AC Line voltage is not present.

Value	State	Description
1	RUN	The state the controller is in when AC Line voltage is present and the controller is synchronized to the AC line.
2	FAULT	A latching state of output shutdown caused by over current or over temperature alarms. A power cycle or processor reset is required to clear this state.
3	FAULT RESET	Used as a temporary state to transition from FAULT to RUN once again.

Outputs (`DT7000`)

Index	Name	Type	Description
0x7000:01	Fieldbus setpoint	UINT	A value between 0 and 10,000 indicating the desired output current. The value is scaled to the output range of ATOM. For example, if the output range is 0-100A, a value of 5000 would set the output to 50A. `0 = 0%`, `10,000 = 100%`
0x7000:02	Digital Run Enable	UINT	`0` = Disable output, `1` = Enable output. When disabled, the output current is set to 0A.

Configuration (`DT8000`)

Index	Name	Type	Description
0x8000:01	Feedback Type	UINT	Sets the signal type used for feedback by the control loop. `1` = Voltage Feedforward, `2` = Load Current.
0x8000:02	Firing mode	UINT	Selects the desired type of firing mode.
0x8000:03	Slew rate	UINT	`1-100`: Sets the control loop response for Phase Angle and Half-Cycle DC firing modes. Higher value = slower response, Lower value = faster response.
0x8000:04	Control Loop	UINT	Closed loop compares the feedback with the setpoint to achieve the correct output. Open loop adjusts the output duty cycle of the controller directly without adjusting for feedback.
0x8000:05	Full Scale Voltage	UINT	Set to the expected output voltage when the controller output is fully ON 100%. This equates to the voltage output command when feedback type is set to Voltage feedforward and the setpoint is at 100% (maximum)
0x8000:06	Full Scale Current	UINT	Set to the expected output current when the controller output is fully ON 100%. This equates to the current output command when feedback type is set to Load Current and the setpoint is at 100% (maximum)

Index	Name	Type	Description
0x8000:07	Voltage Limit	UINT	`10 - 700`: Sets the maximum output voltage allowed by the controller.
0x8000:08	Current Limit	UINT	`1.0 - 84.0`: Sets the maximum output current allowed by the controller.
0x8000:09	Partial Load Fault Enable	UINT	`0` = Disable partial load fault detection & alarm, `1` = Enable partial load fault detection & alarm.
0x8000:10	Partial Load Fault Tolerance	UINT	`0.0 - 100.0` Sets the maximum percent load resistance deviation from the ?Partial Load Fault Resistance? value. Deviations outside this band will trigger a Partial Load Fault alarm.
0x8000:11	Partial Load Fault Resistance	UINT	`0.10 - 655.35` - Sets the nominal resistance of the load. This is used for comparison in determination of a partial load fault alarm condition.
0x8000:12	Partial Load Fault Alarm Delay Time	UINT	Sets the delay time, in seconds, after detection of a partial load fault until the alarm is indicated.
0x8000:13	Relay Alarm Mask	UINT	See relay mask bitfield
0x8000:14	Shorted SCR Check Enable	UINT	Enables and disables shorted SCR detection and alarm indication. Shorted SCR detection is

Index	Name	Type	Description
			always performed when AC Line is ON and the controller?s output is OFF.
0x8000:15	Open Load Detect Enable	UINT	Enables and disables open load detection and alarm indication.

Relay mask

Relay mask is an 16-bit bitfield:

15-9	8	7	6	5	4	3	
Reserved	Over Current Trip	Over Temperature	Partial Load Fault/Open Load	Shorted SCR	Current Limit	Voltage Limit	A Li Lo

ATOM / Fieldbus / EtherCAT / TwinCAT 3

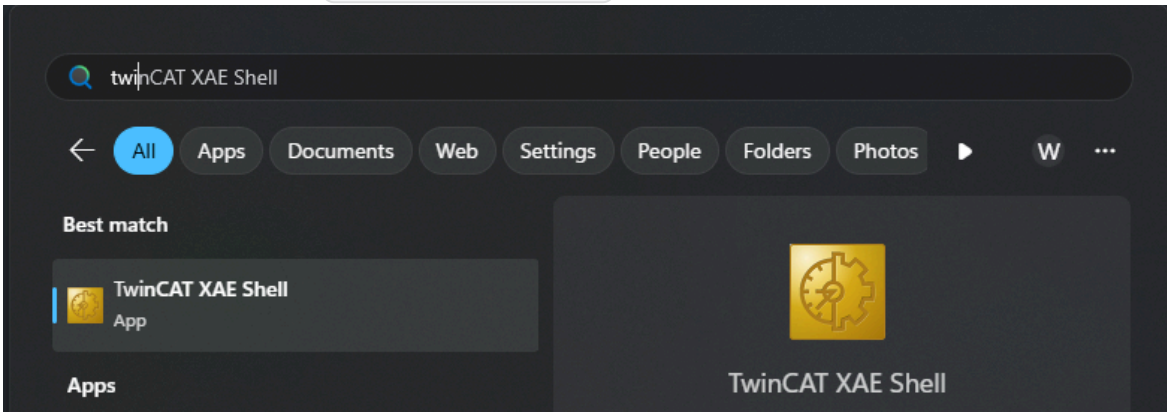
In this tutorial, you'll learn how to control ATOM over EtherCAT with TwinCAT 3.

> **NOTE**
>
> If you'd like to skip this tutorial, download the completed example project: AtomExampleTwinCat.zip.

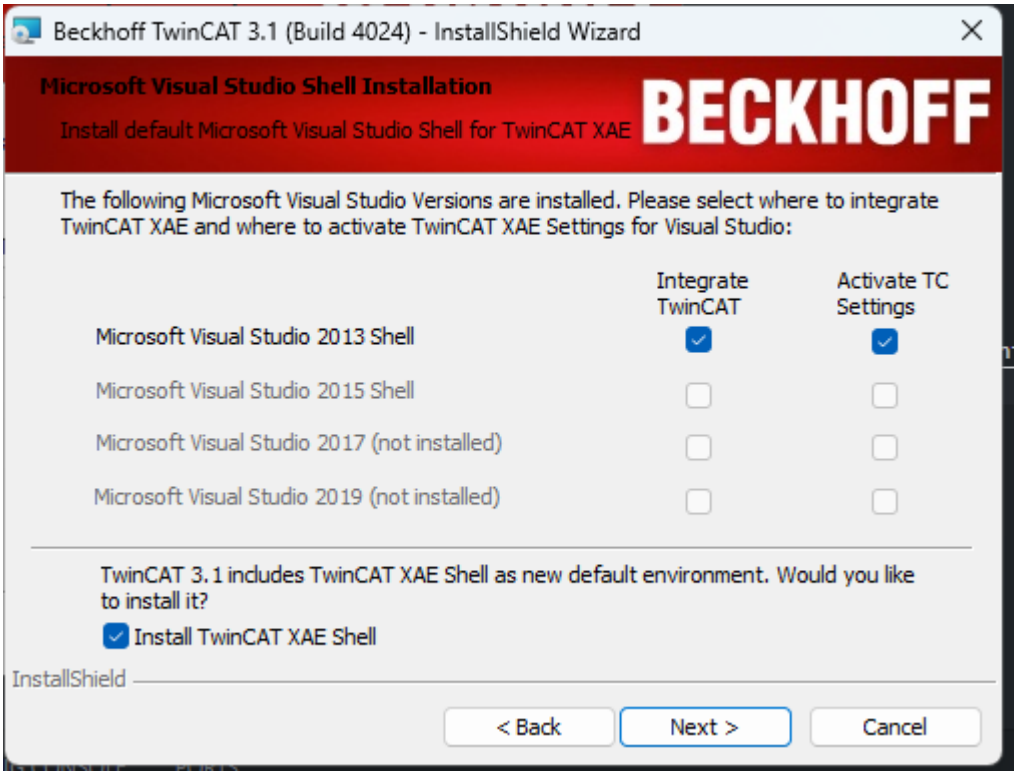
> **NOTE**
>
> If you are unfamiliar with TwinCAT 3, check out PLC programming using TwinCAT 3 video series by Jakob Sagatowski.

Prerequisites

1. A PC with TwinCAT 3 Engineering installed
   - We recommend using `TwinCat XAE Shell`:



- This can be installed during the installation process:



- An Intel-based network interface:

  TwinCAT 3 requires an Intel-based network adapter to work properly.

2. *(Optional)* A Beckhoff EtherCAT PLC (e.g., CX9020, CX5130)
   - TwinCAT 3 includes a built-in soft PLC simulator that you can follow along with. This tutorial will cover both options - using a PLC and using the soft PLC simulator.
3. Download ATOM's ESI file: Atom.xml

Hardware setup

INFO

To simplify this tutorial, we skip connecting a load to ATOM. The fieldbus configuration remains the same regardless of whether you connect a load or not.

INFO

EtherCAT ID switches

ATOM has two rotary switches that together set the EtherCAT ID. The EtherCAT ID is a two byte ID that unqiuely identifies ATOM on an EtherCAT network.

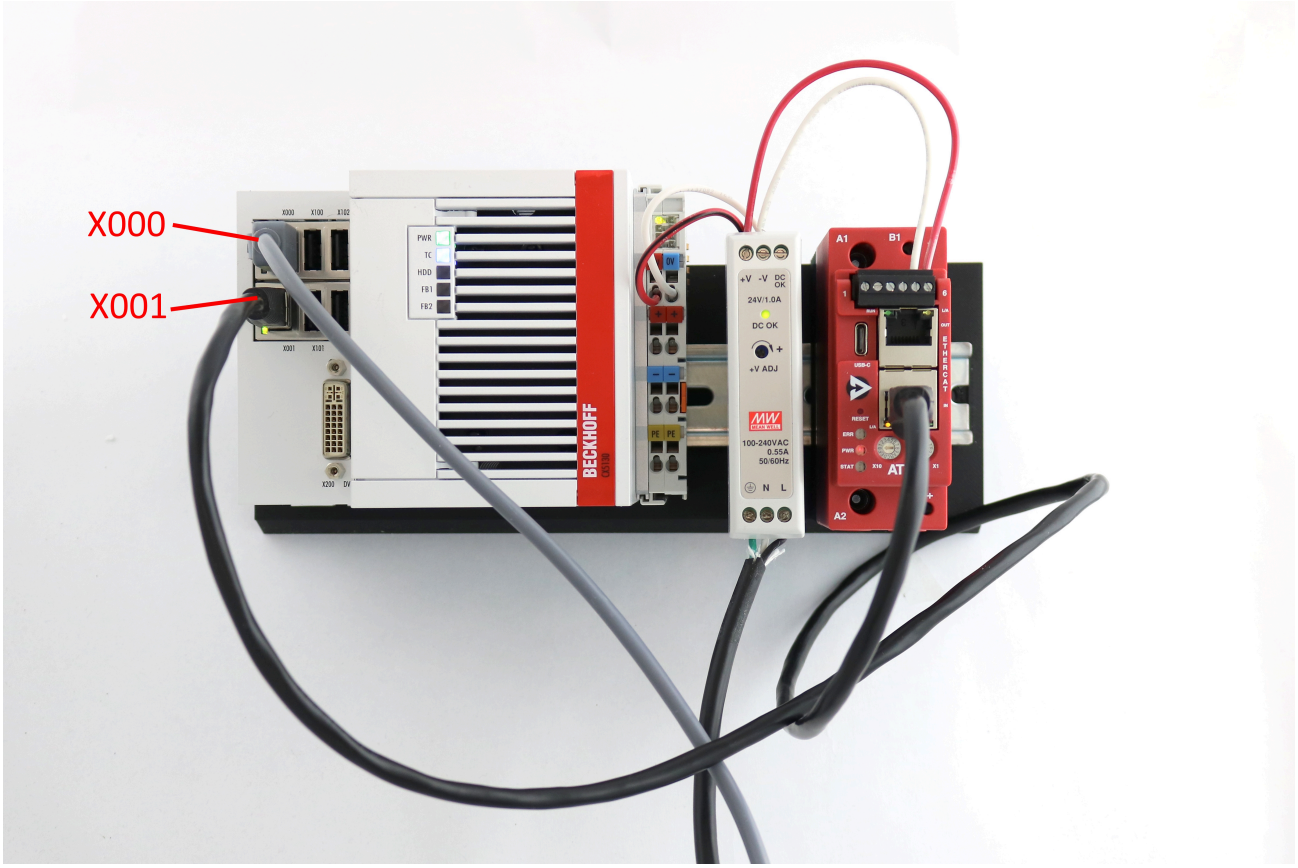
The `X1` rotary switch sets the low byte of the EtherCAT ID, and the `X10` rotary switch sets the high byte of the EtherCAT ID.

For example, when `X1` is set to `1` and `X10` is set to `2`, the EtherCAT ID is `0x21` (33 in decimal).

The EtherCAT ID is used for manual addressing of EtherCAT devices which is useful for seamless device replacement and consistent identification across restarts. In this example, we use TwinCAT's built in automatic addressing, so the EtherCAT ID switch positions don't matter.

Connections:

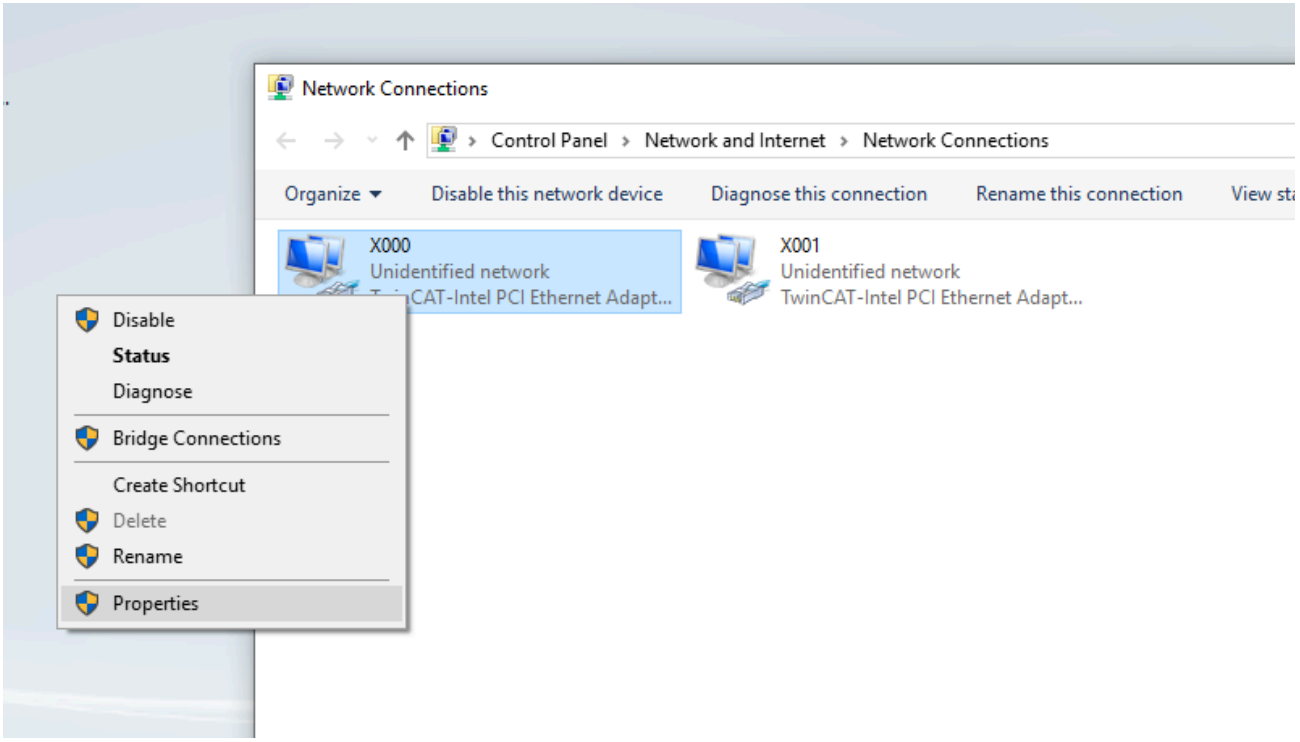
- Connect port `X000` on your PLC to your PC with an Ethernet cable.
- Connect port `X001` on your PLC to the `IN` port on ATOM with an Ethernet cable.
- Connect 24V DC power to ATOM and your PLC.



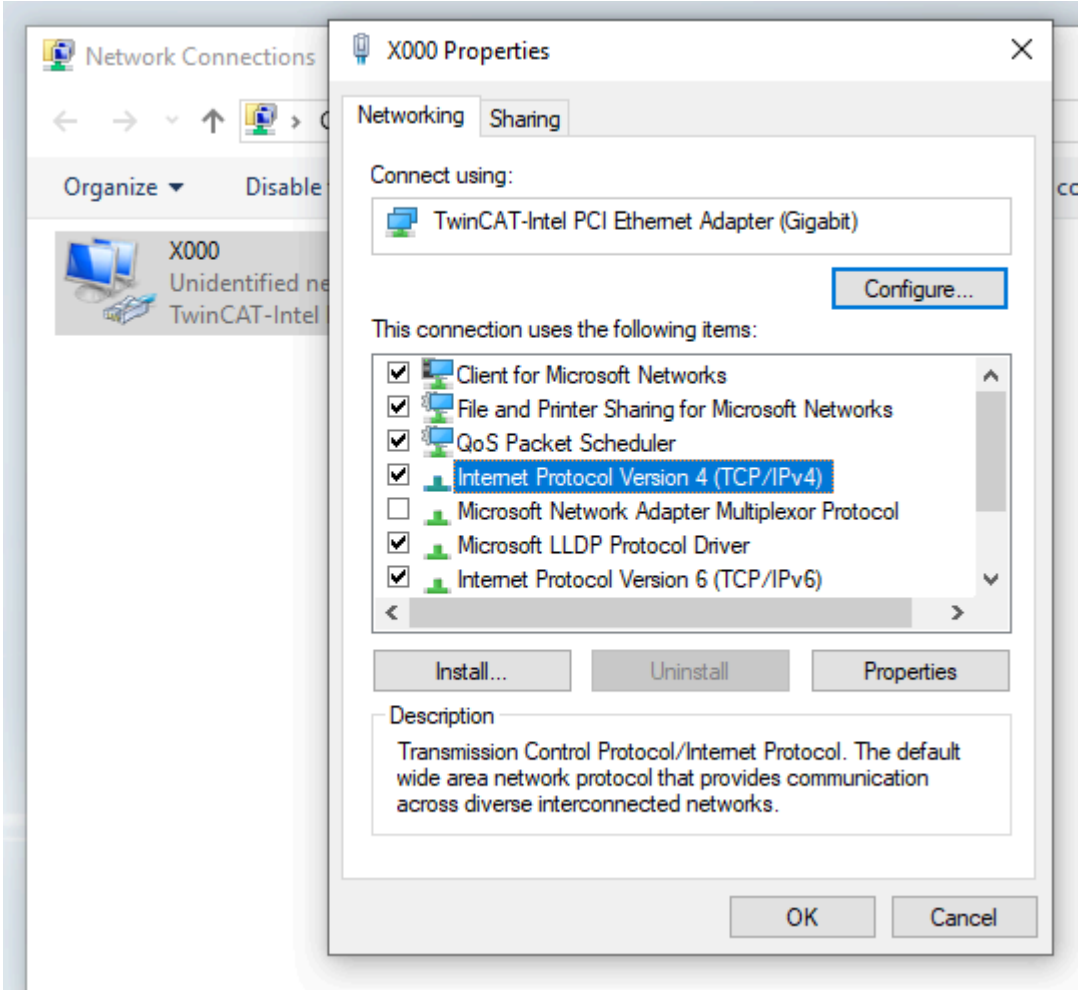
PLC configuration

> **NOTE**
>
> You can skip this section if you are using the TwinCAT soft PLC simulator.

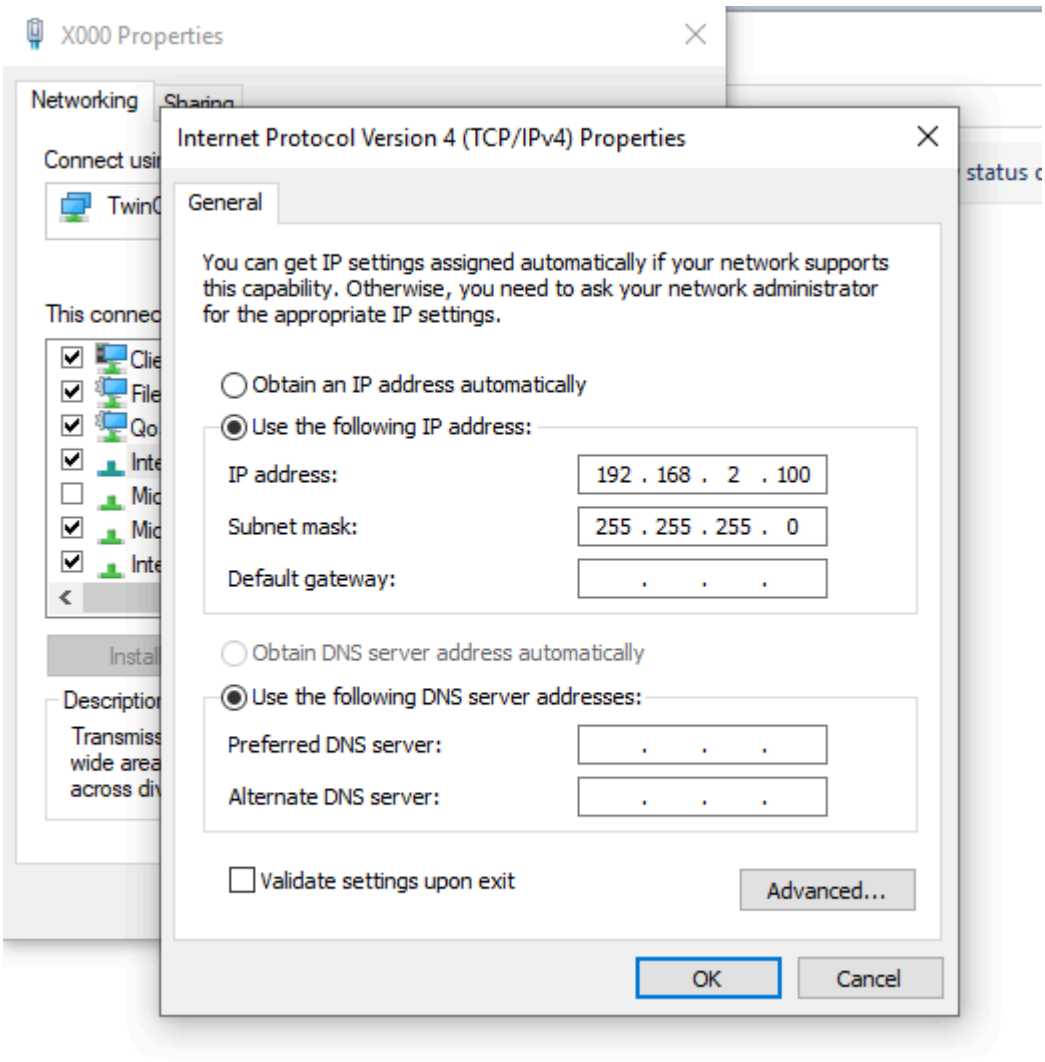
1. If you are using a PLC, connect a monitor and keyboard to it and power it on.
2. Open Network Connection Manager, right-click the `X000` network interface, and select **Properties**:



3. In the **X000 Properties** dialog, select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**:



4. In the **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog, select **Use the following IP address** and enter the following values. Then click **OK**:
   - IP address: `192.168.2.100`
   - Subnet mask: `255.255.255.0`

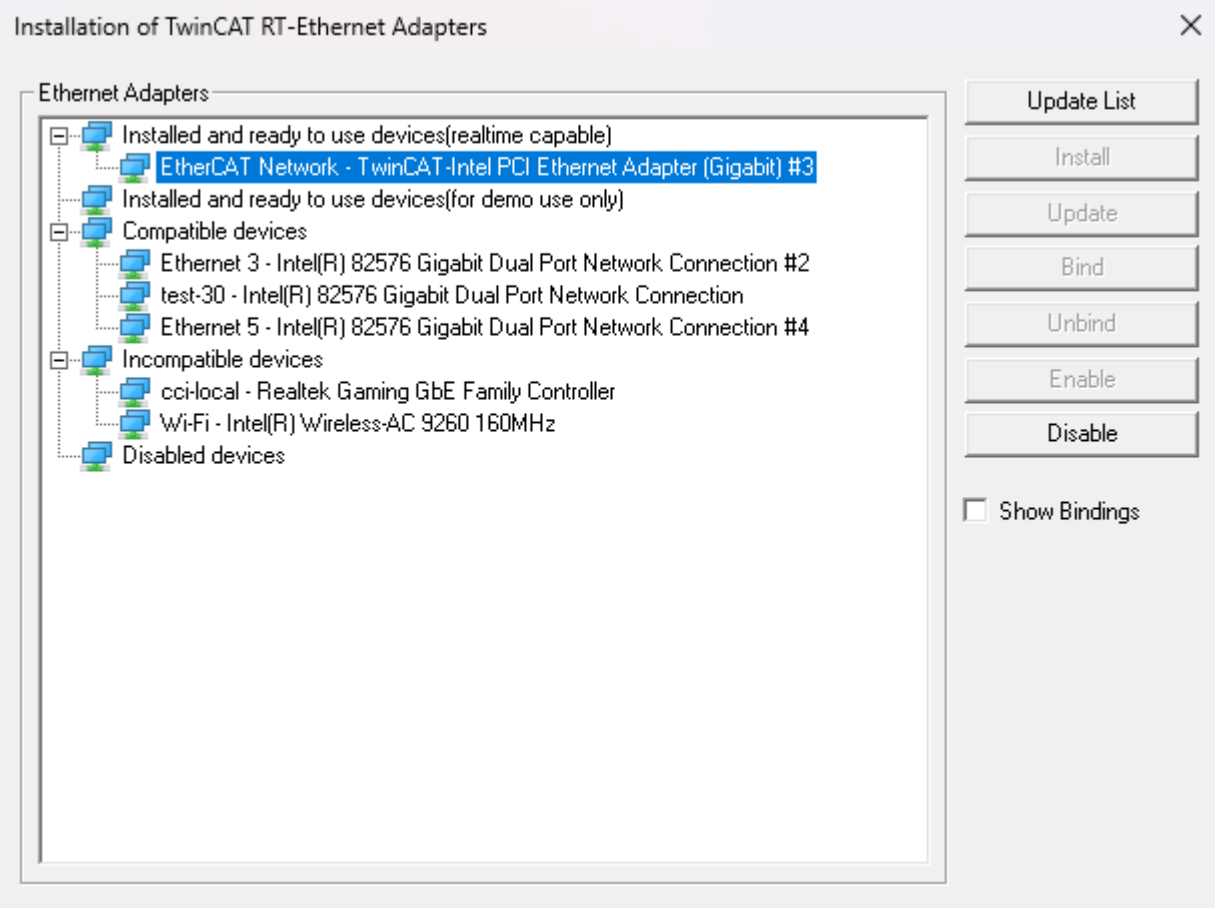


PC configuration

Back on your PC, follow these steps:

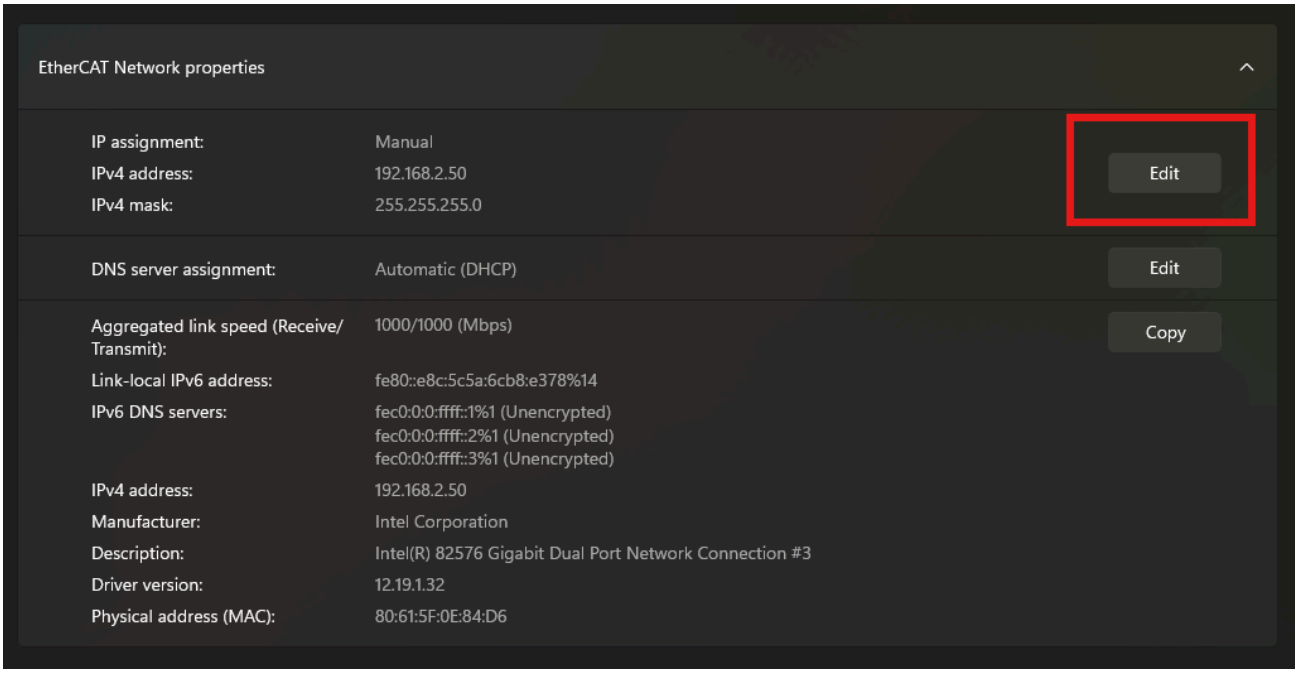
> **INFO**
>
> This uses a network adapter named `EtherCAT Network` to make it easy to remember and follow along. If your network adapter has a different name, use that instead.

1. Navigate to your TwinCAT 3 installation directory (typically `C:\TwinCAT\3.1\System`) and execute `TcRteInstall.exe`. Ensure that the network adapter you intend to use appears under the **Installed and ready to use devices(realtime capable)** category. If it does not, select the network adapter and click **Install**:

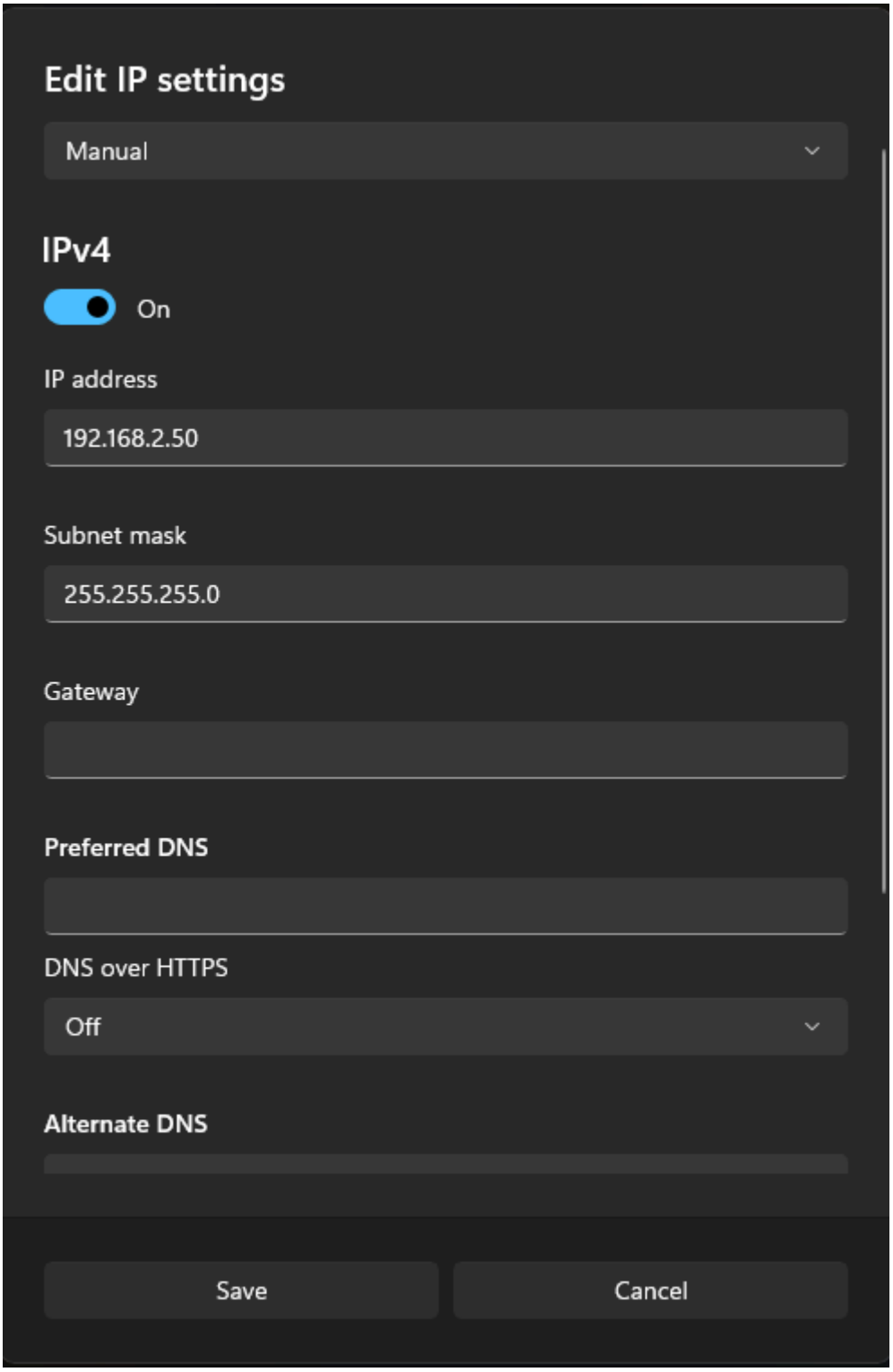


2. Place `Atom.xml` (from the requirements section) in the `C:\TwinCAT\3.1\Config\Io\EtherCAT` directory. This is where TwinCAT looks for ESI files.

3. Navigate to your Settings app and locate your `EtherCAT Network` adapter. Right-click it and select **Edit**:

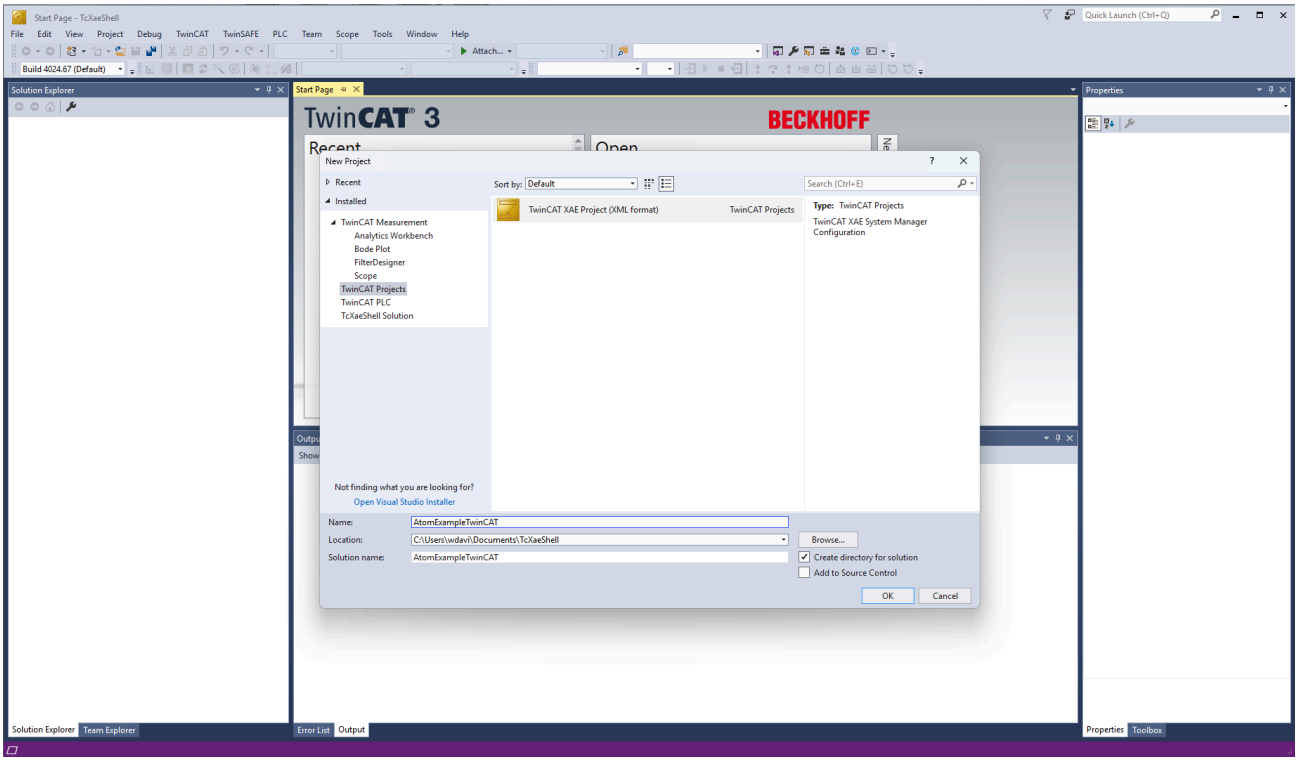


4. In the **EtherCAT Network Properties** dialog, set the `IP address` and `Subnet mask` to the following values. Then, hit **Save**.
   - IP address: `192.168.2.50`
   - Subnet mask: `255.255.255.0`



Creating a TwinCAT 3 project

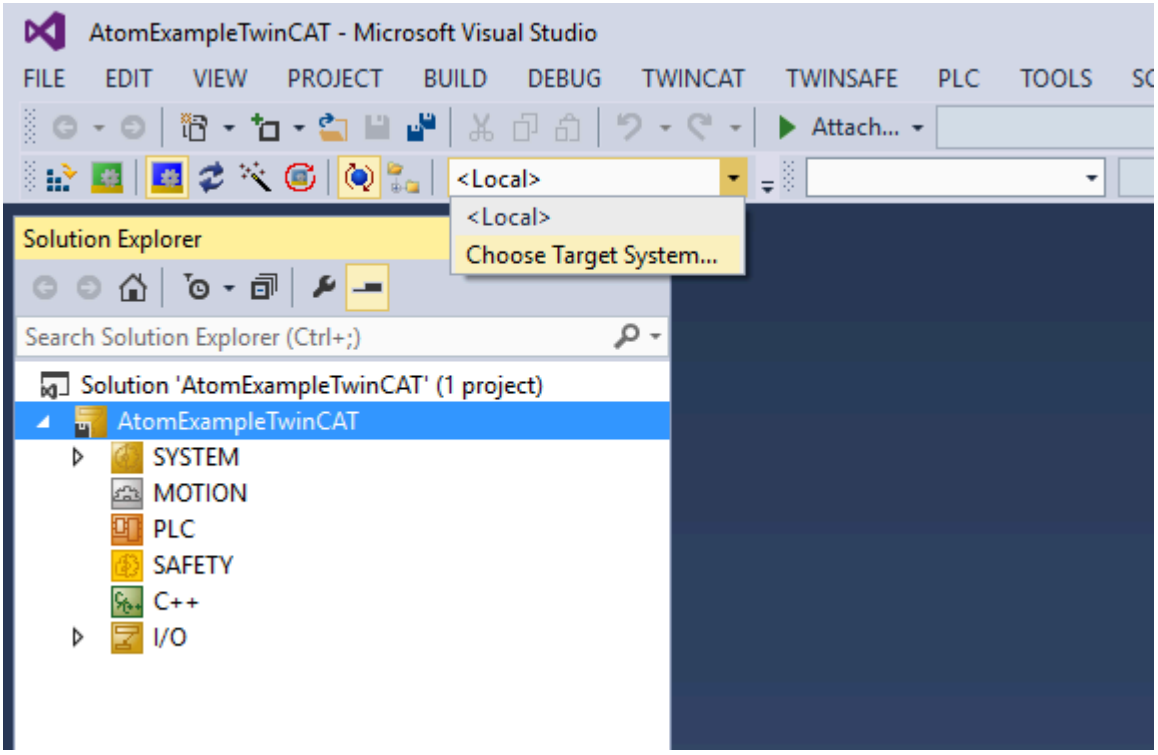
1. Open TwinCAT 3 and select **File** > **New Project**. Name it `AtomExampleTwinCAT` and click **OK**:



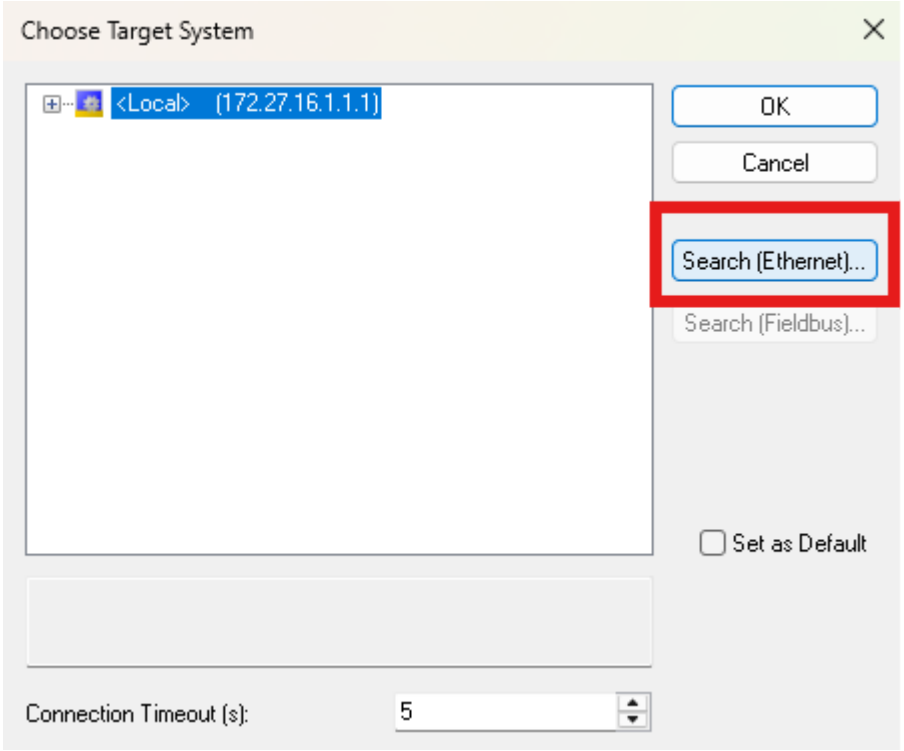
Connecting to your PLC

> **NOTE**
>
> If you are using the TwinCAT soft PLC simulator, you can skip this section.

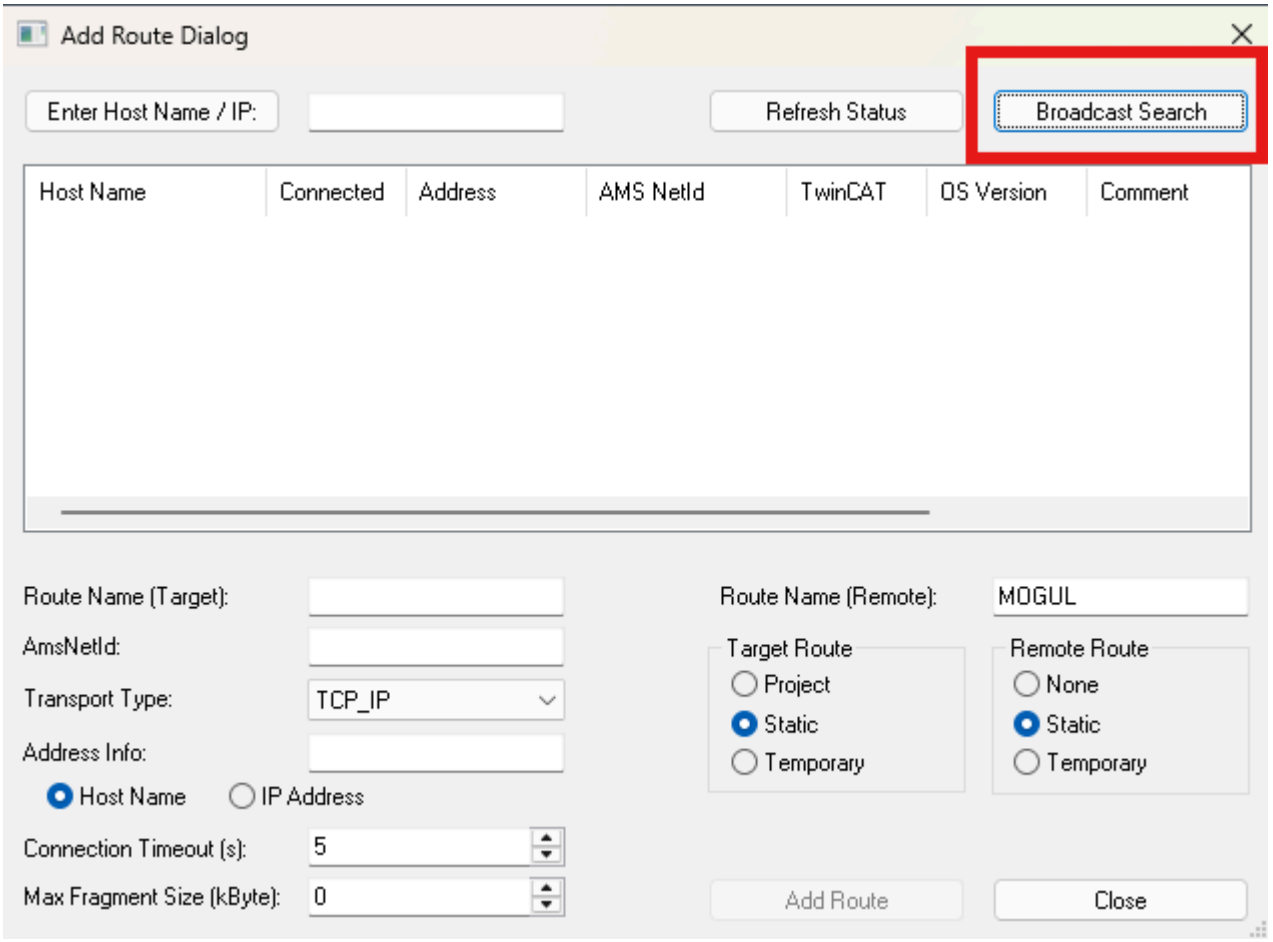
1. Select the target dropdown and click **Choose Target System...**:



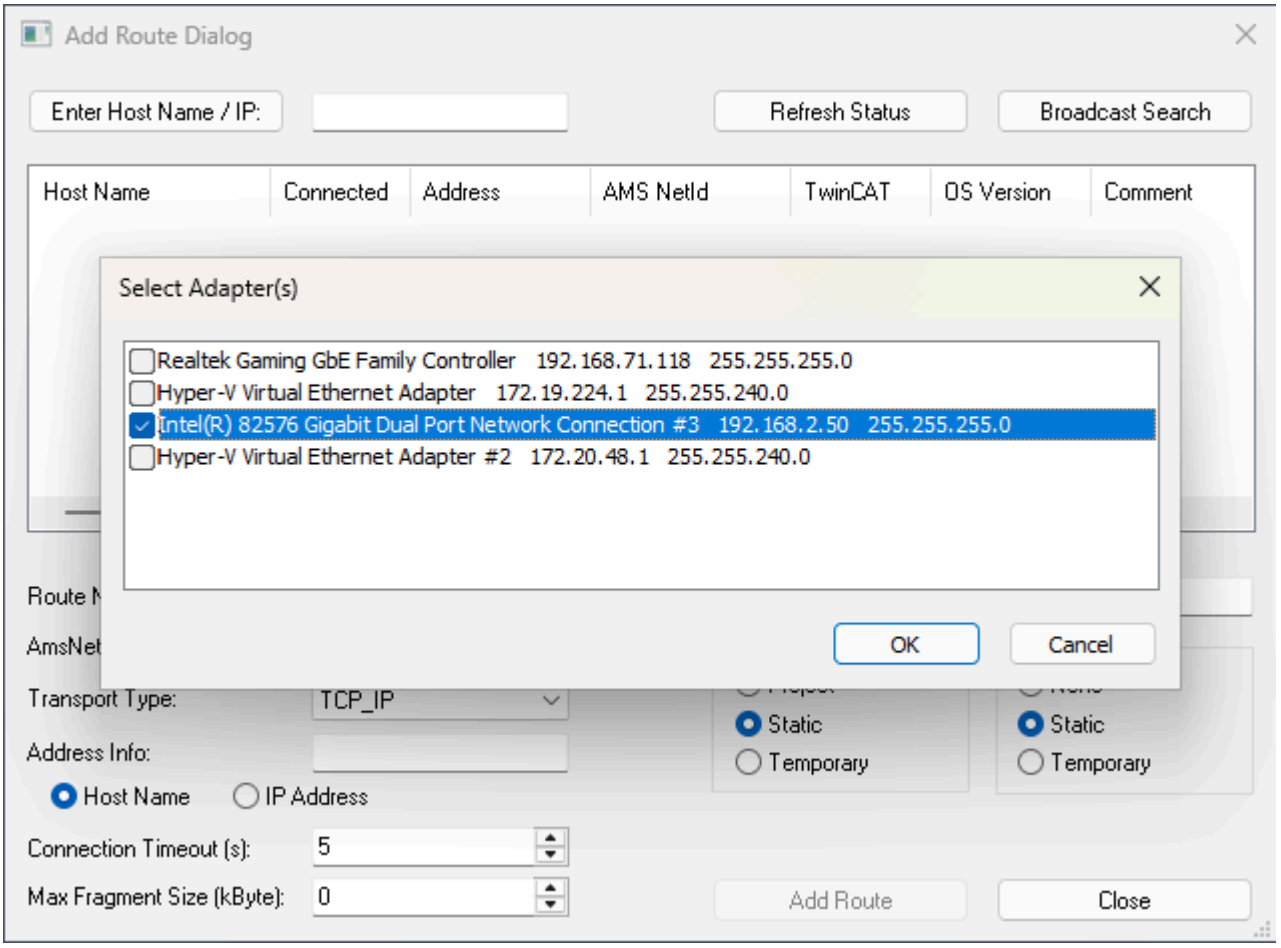
2. Click **Search (Ethernet)**:



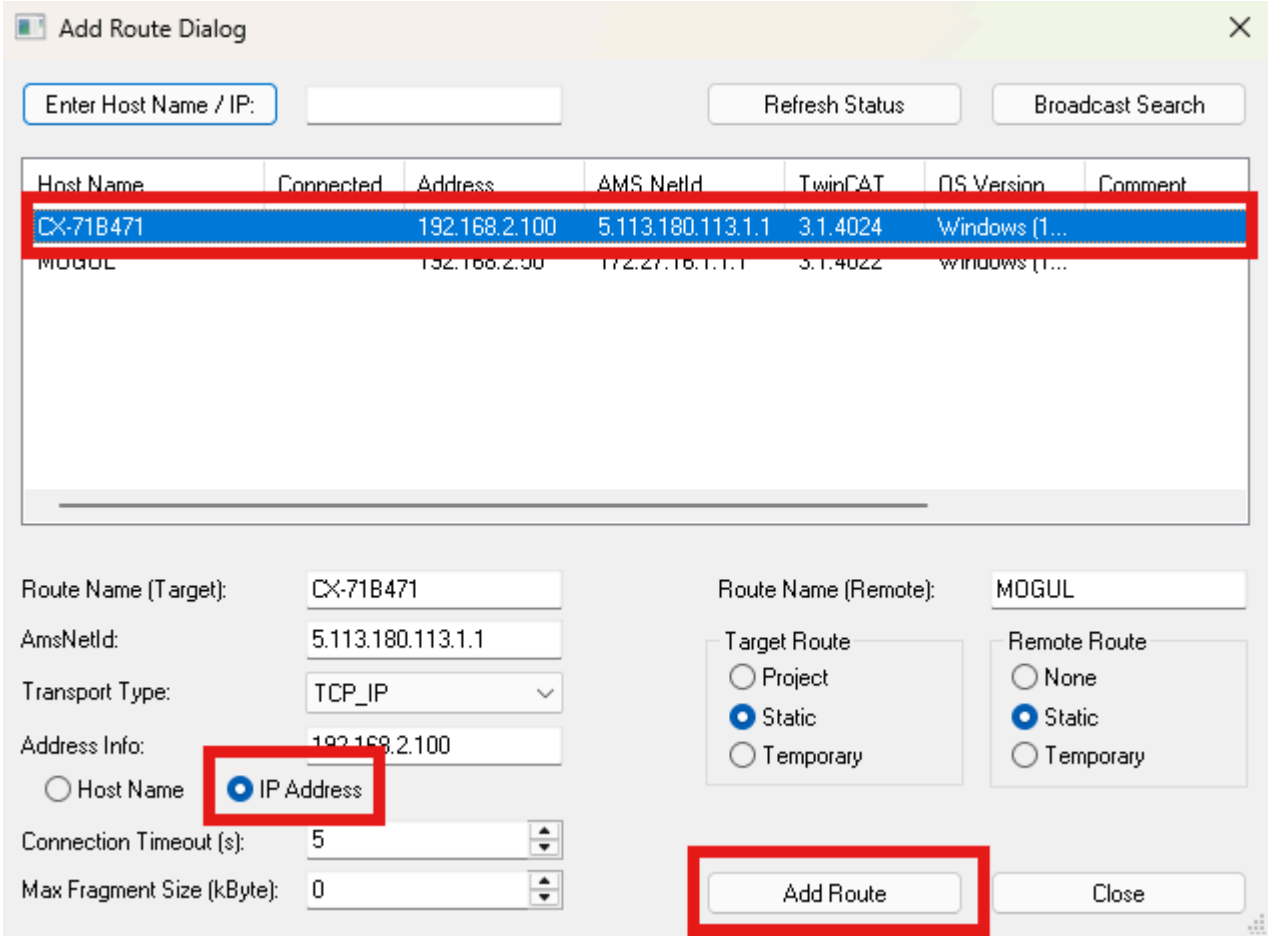
3. Select **Broadcast Search**:



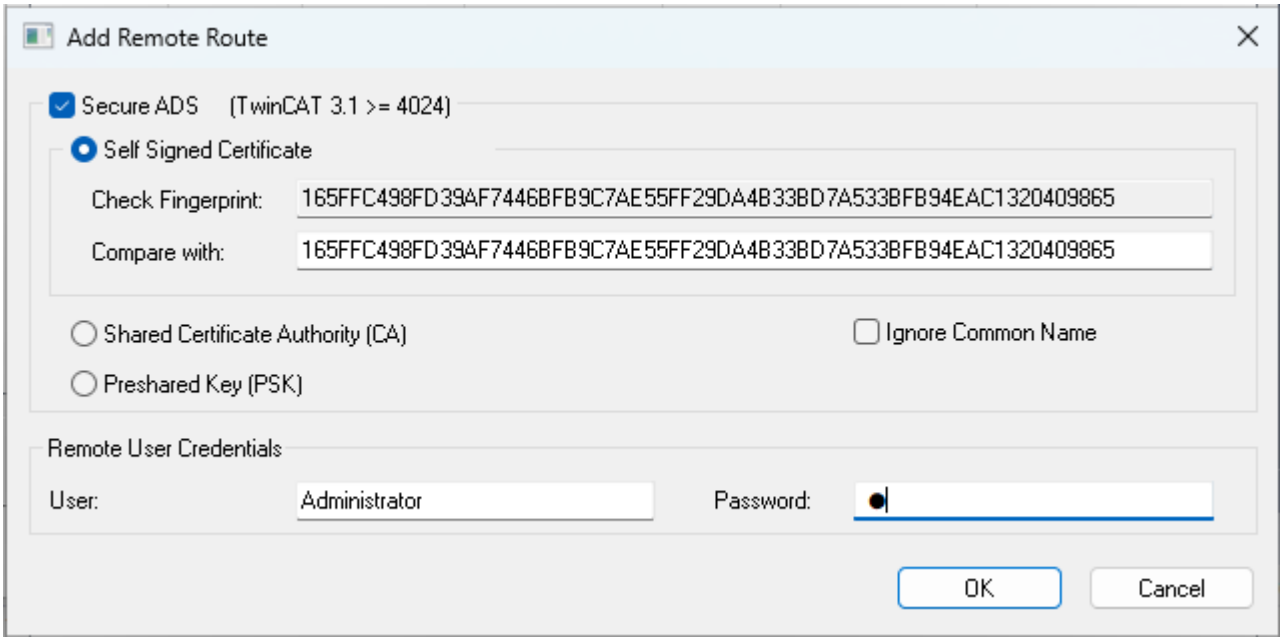
4. Select the network adapter to search - pick the one labeled `192.168.2.50`:



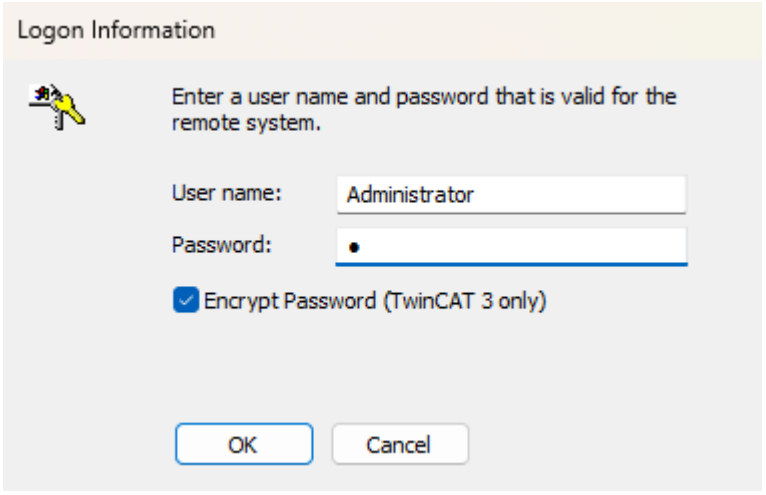
5. Select your `PLC` from the list (it should have the IP address you configured above: `192.168.2.100`). Under **Address Info** select **IP Address**, then click **Add Route**:



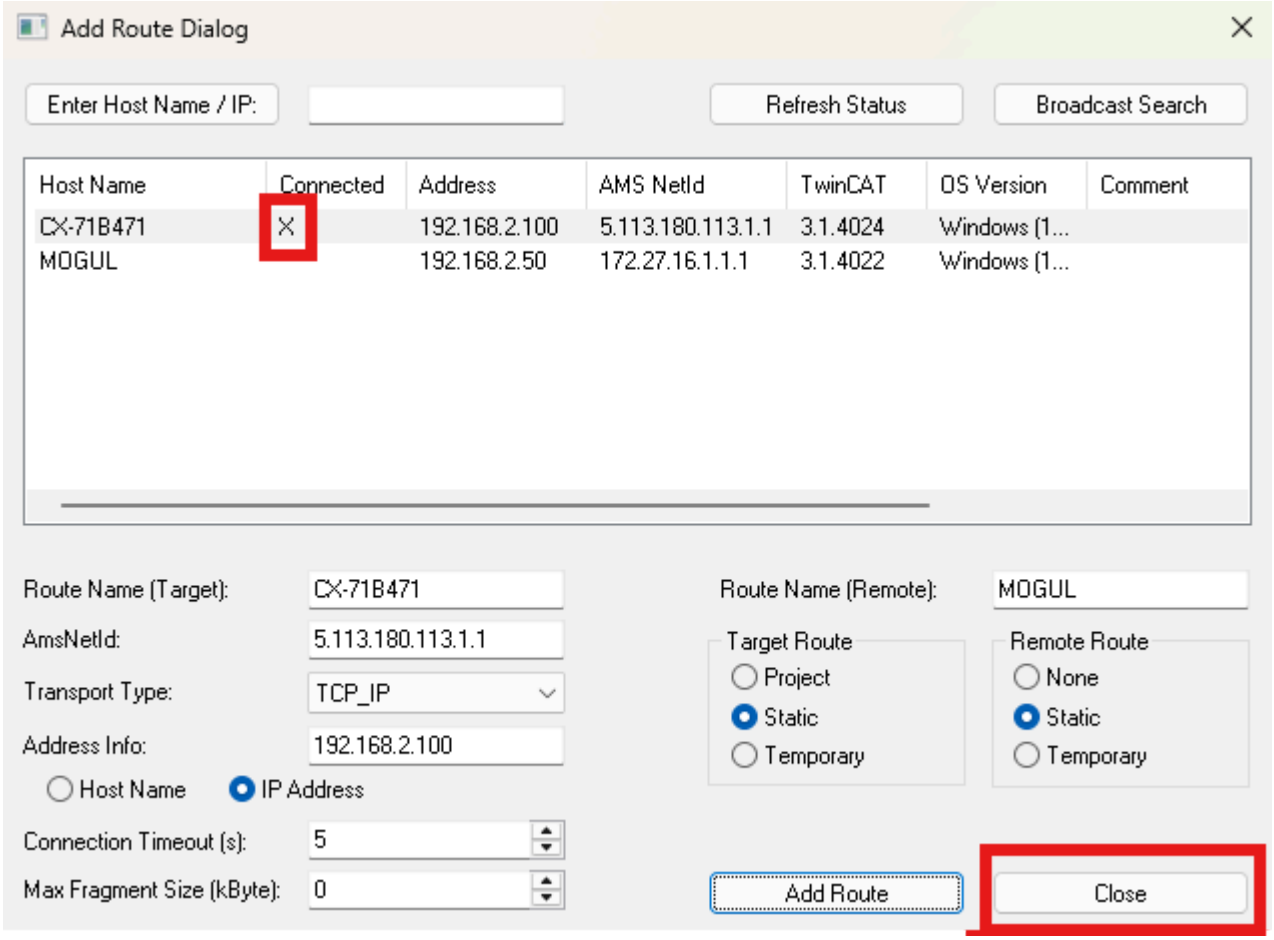
6. If you want to use `Secure ADS`, check `Secure ADS` and copy the `Check Fingerprint` value to the `Compare with` box. In **Remote User Credentials**, enter the username and password for your PLC, then click **OK**. If you haven't changed it, the default Beckhoff credentials are:
   - Username: `Administrator`
   - Password: `1`



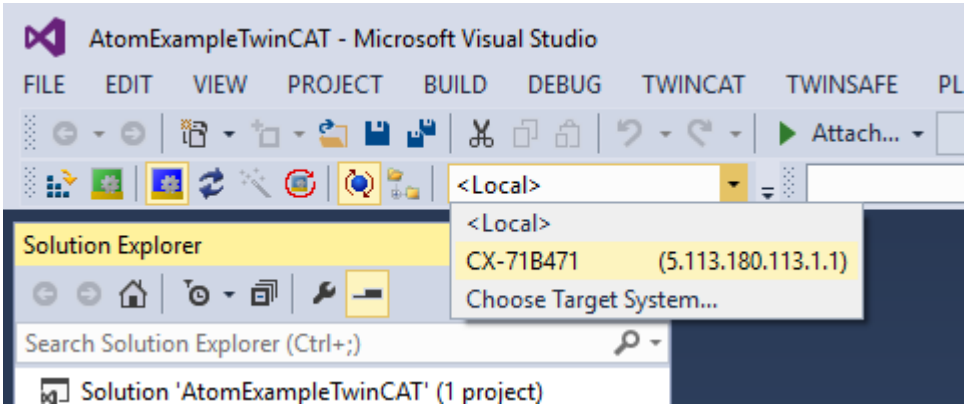
7. If a password prompt appears, enter the same username & password for your PLC as in step 6. then click **OK**:



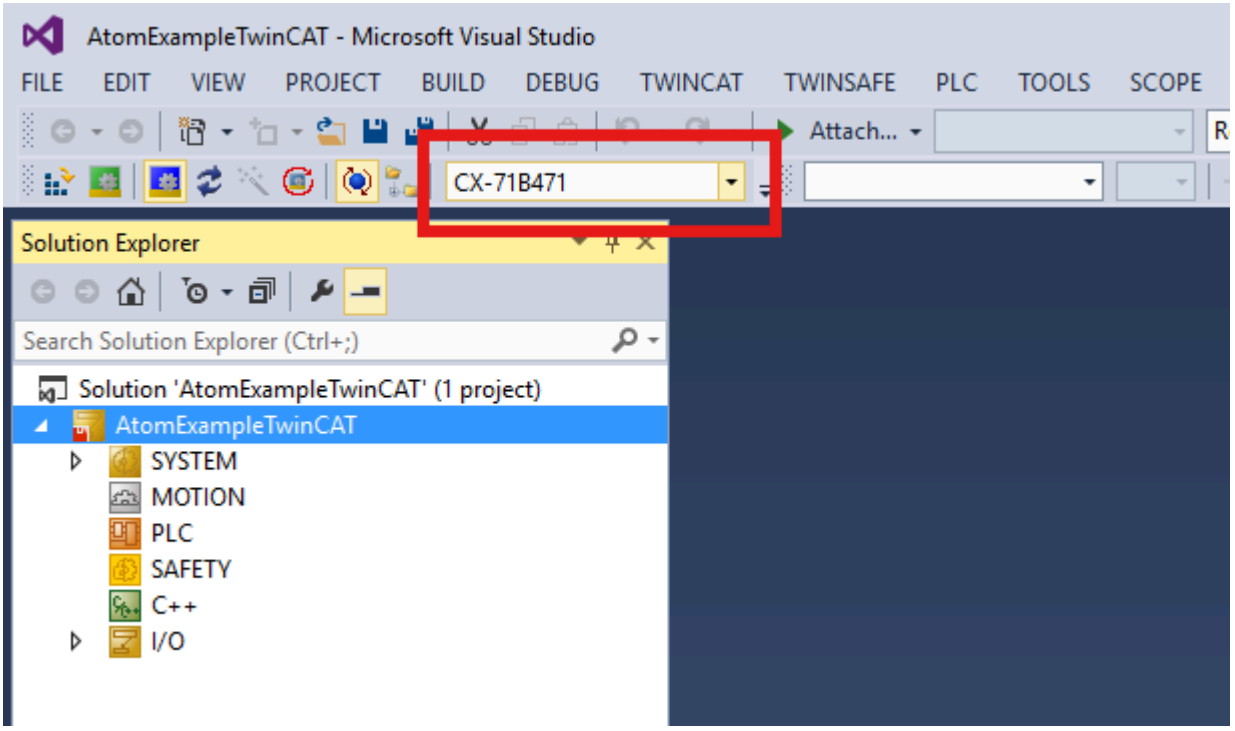
8. If everything worked correctly, you should see a check or X under the `Connected` column next to your PLC. If it does, hit **Close**:



9. Select the target dropdown and select your PLC (in our case, `CX-71B471`):

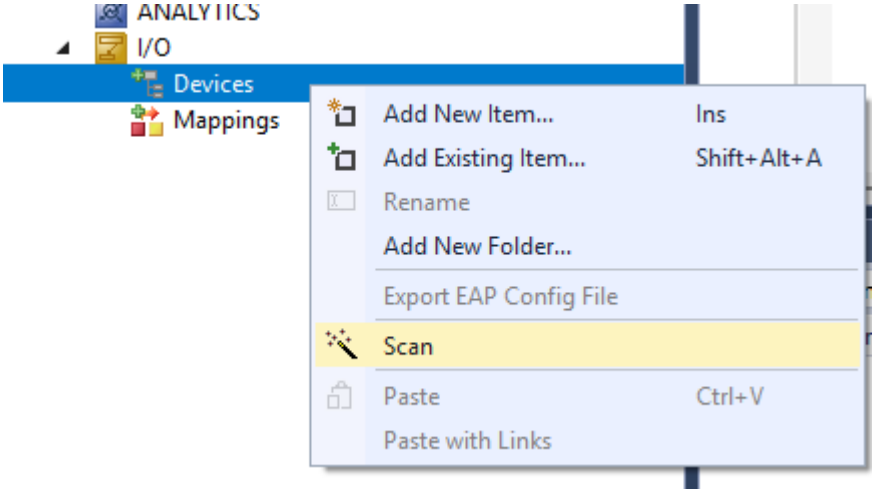


10. If everything worked correctly, you should see `CX-71B471` become the value in the dropdown with *no* `(ERROR)` suffix:

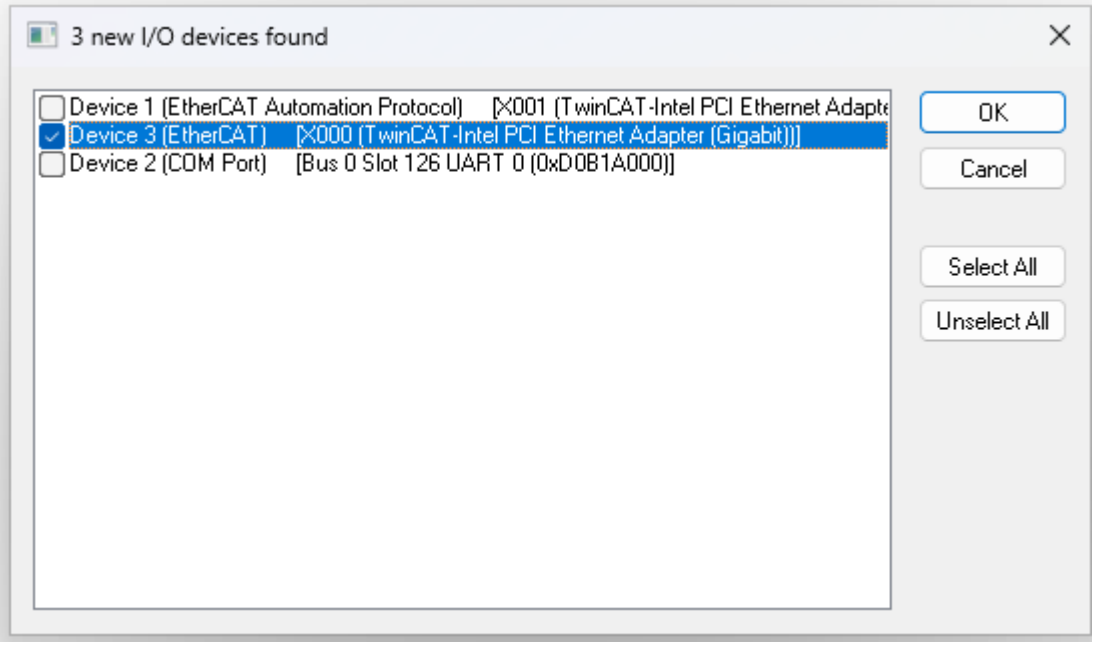


Adding and configuring Atom

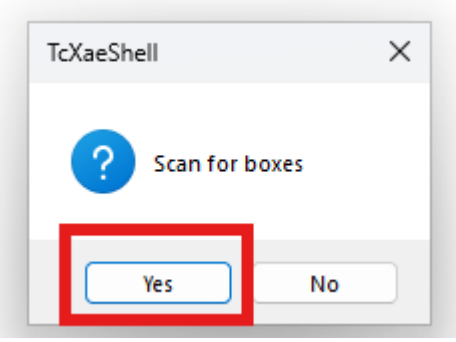
1. Right-click **I/O** > **Devices** and select **Scan**:



2. Select the entry that reads `Device 3 (EtherCAT)` and click **OK** (this might be slightly different for you):

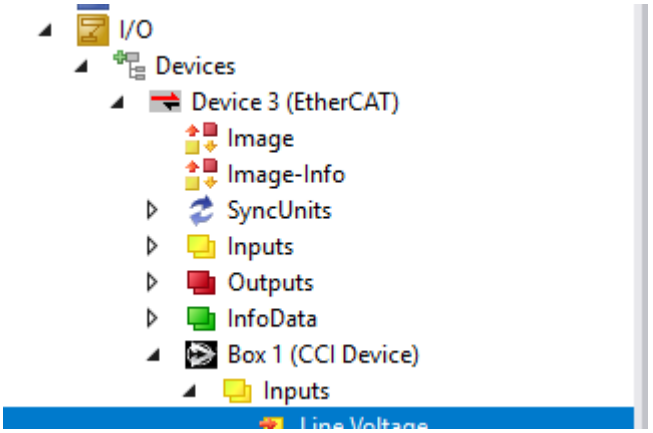


3. When prompted to **Scan for boxes**, select **Yes**:



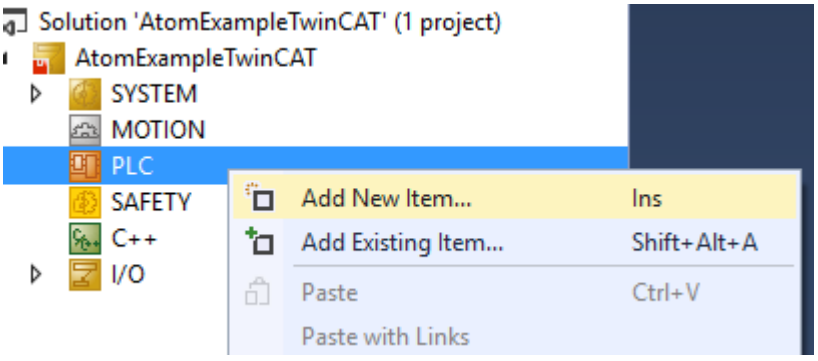
4. If everything worked correctly, you should see `Device 3 (EtherCAT)` (your PLC) and `Box 1 (CCI Device)` (ATOM) in the **I/O Devices** tree. If you do not, see troubleshooting.

> **INFO**
>
> If you are using the TwinCAT soft PLC simulator, you should only see `Box 1 (CCI Device)` in the **I/O Devices** tree.

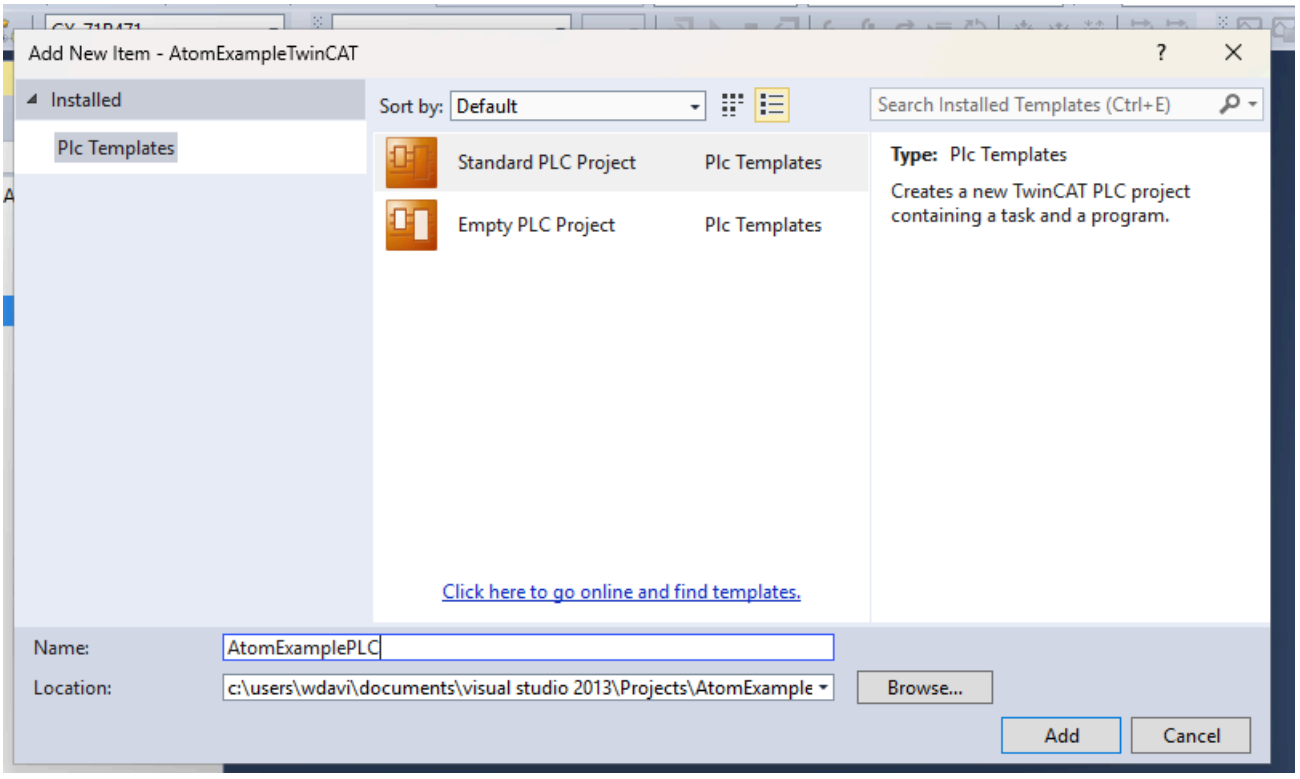


Configuring your TwinCAT 3 project

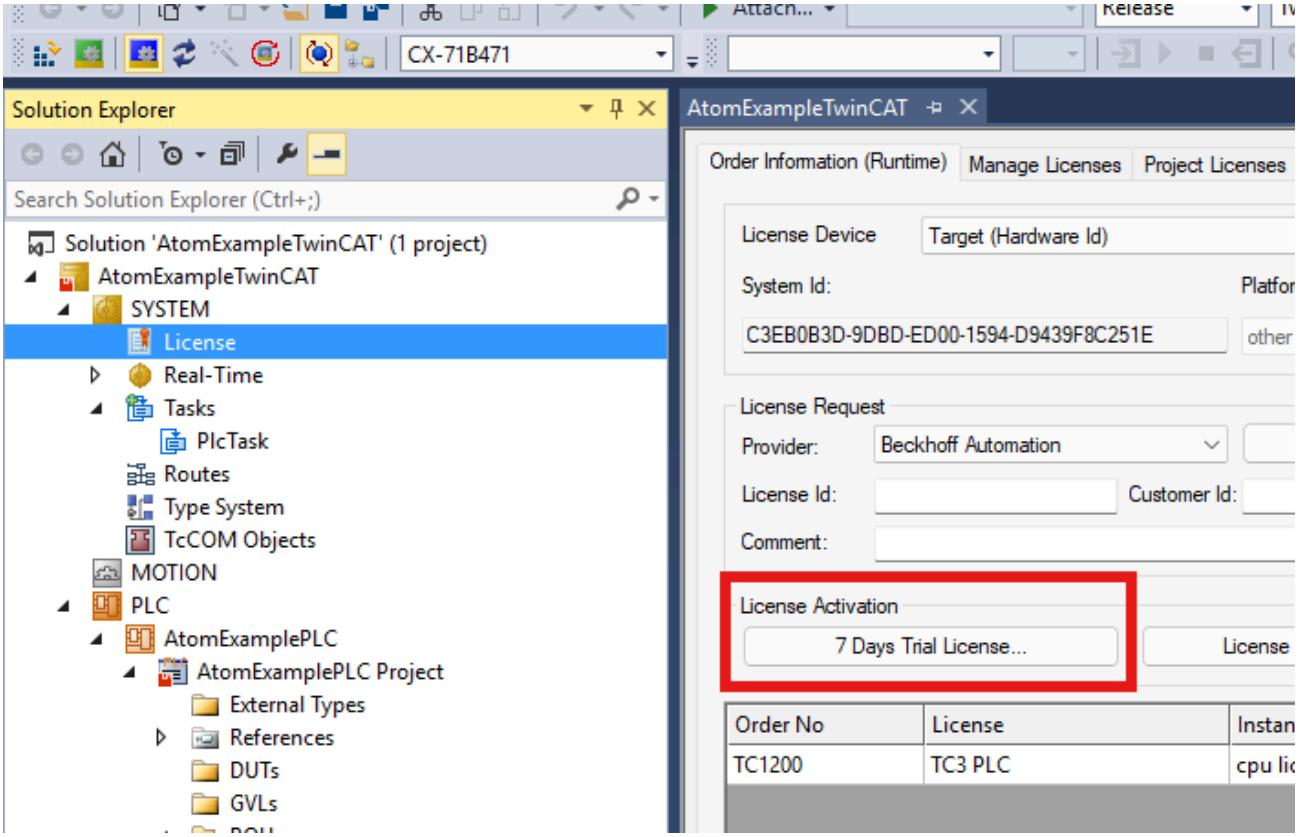
1. Right-click **PLC** and select **Add New Item...**:

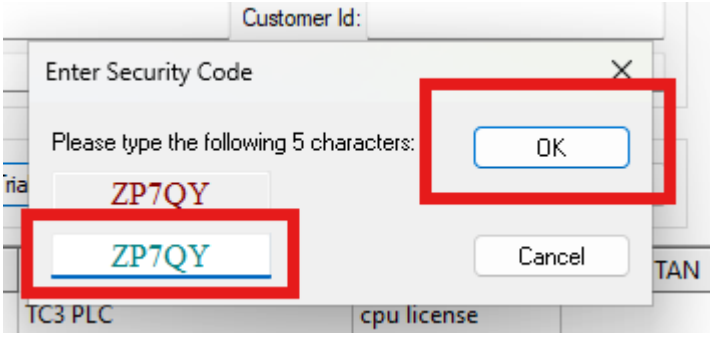


2. Select **Standard PLC Project**, name it `AtomExamplePLC`. Click **Add**:

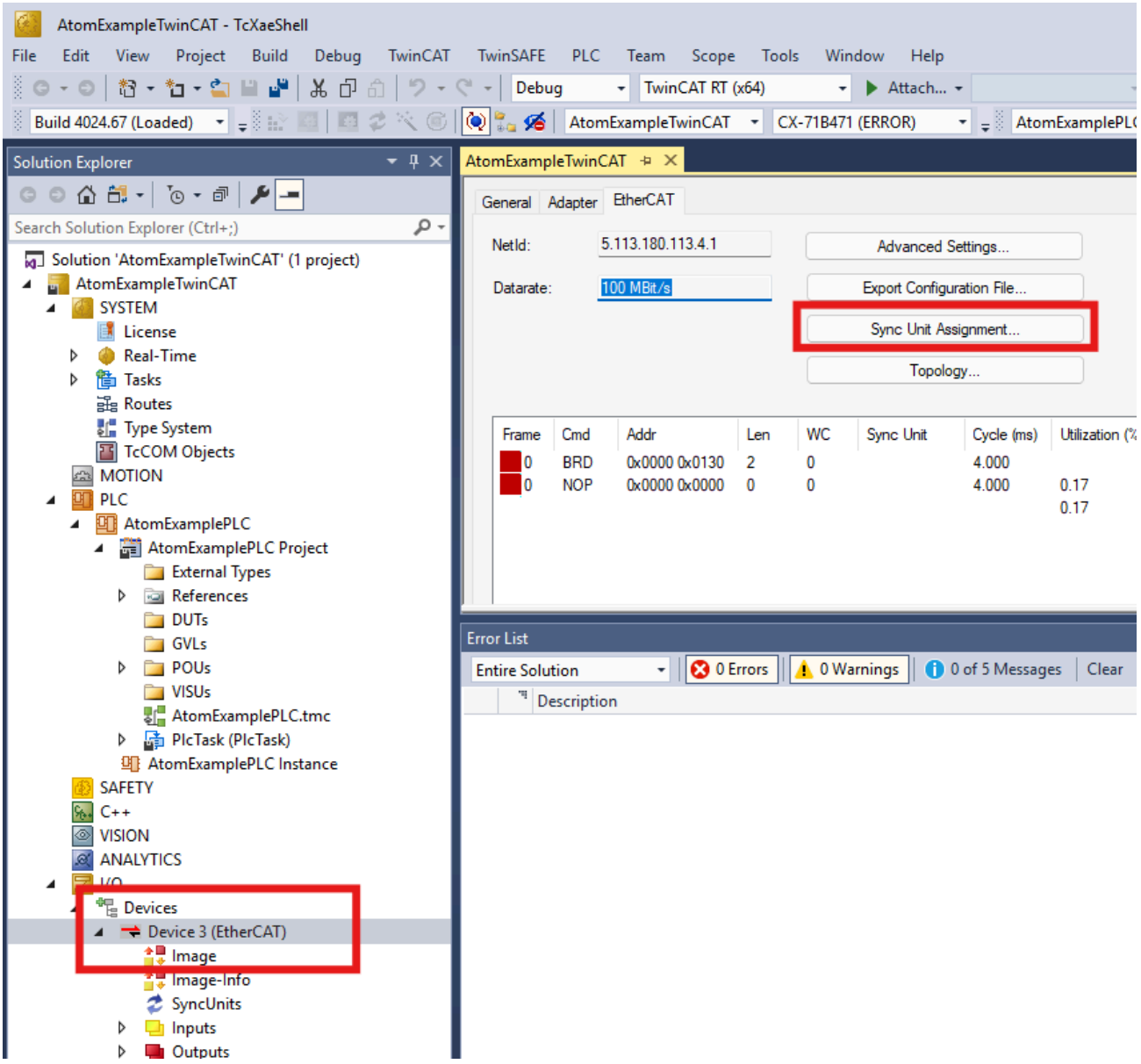


3. Select **License** and click **7 Days Trial License...*. Then complete the CAPTCHA:

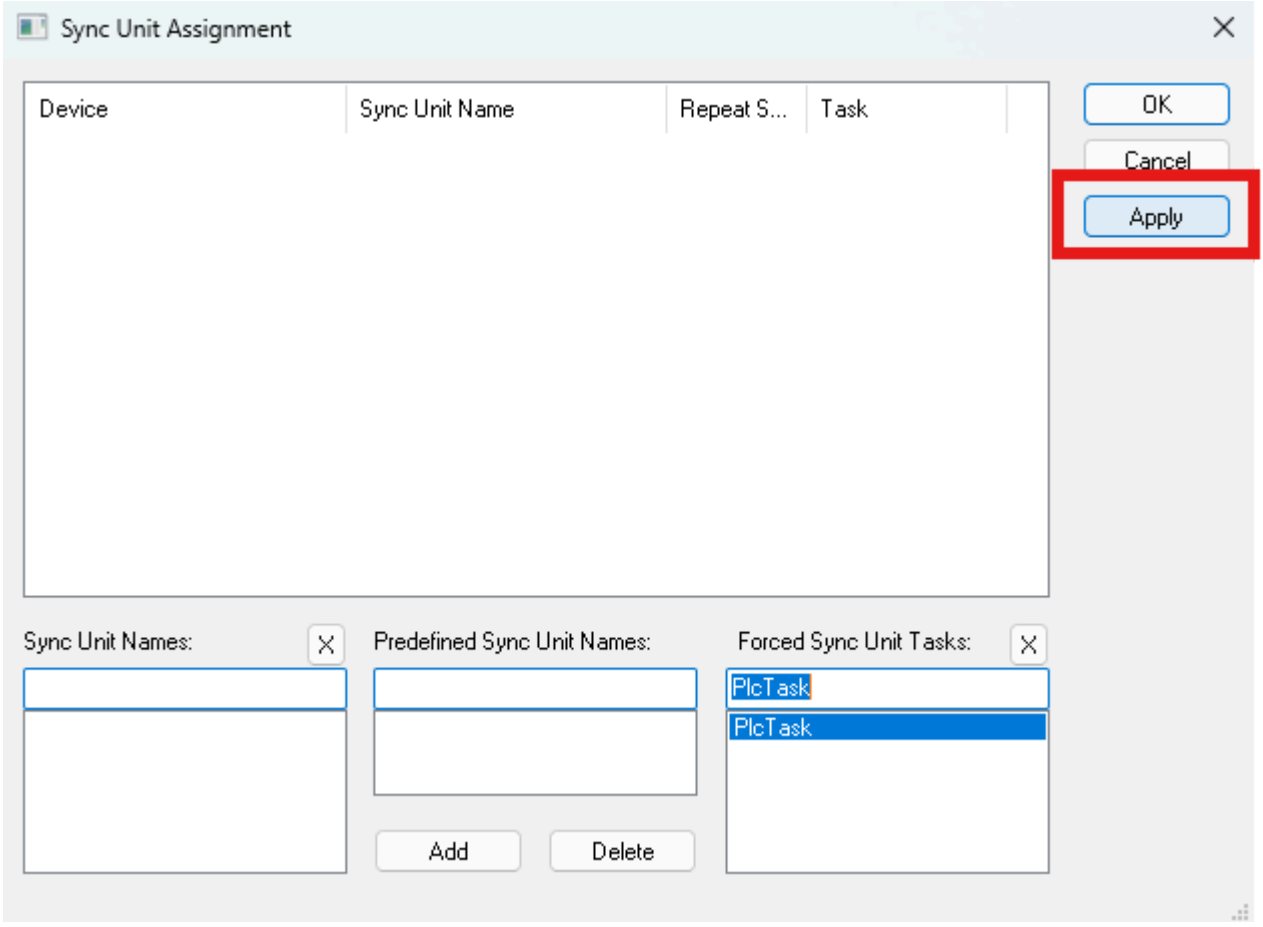




4. Select **Device 3 (EtherCAT)** and click **Sync Unit Assignment**:

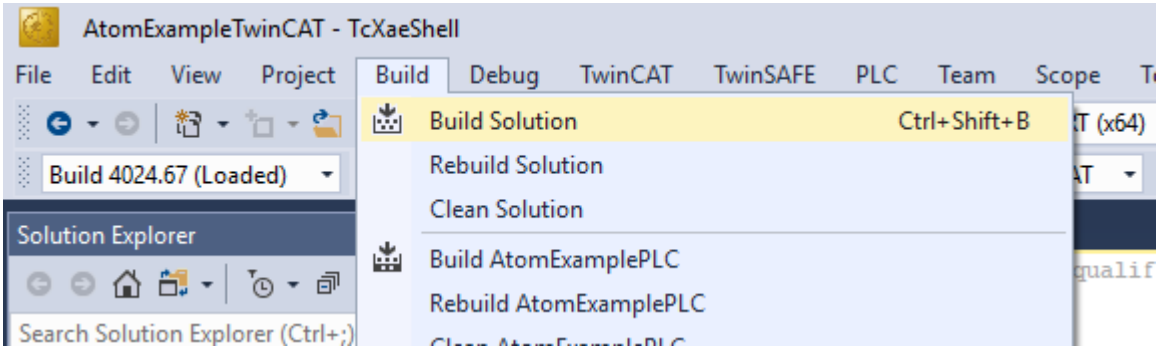


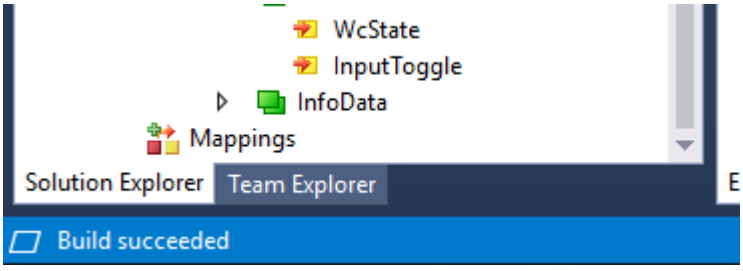
5. Select **PlcTask** and hit **Apply**:



> **NOTE**
>
> If you get an error message like "needs sync master (at least one variable linked to a task variable)", redo this step.

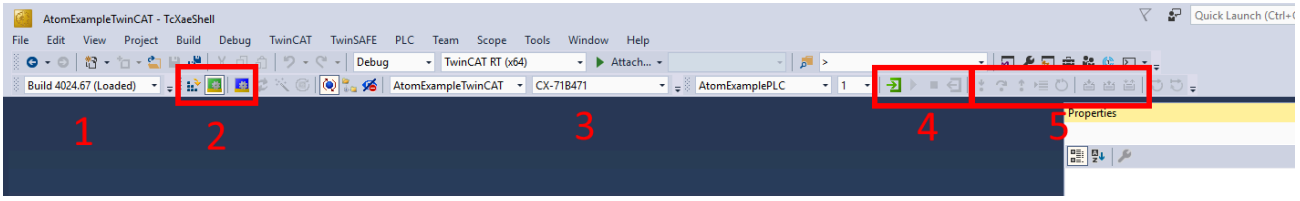
6. Select **Build** > **Build Solution**. If you configured everything correctly, you should see a message like `Build succeeded` in the lower left and no error messages should pop up:





Crash course in TwinCAT 3

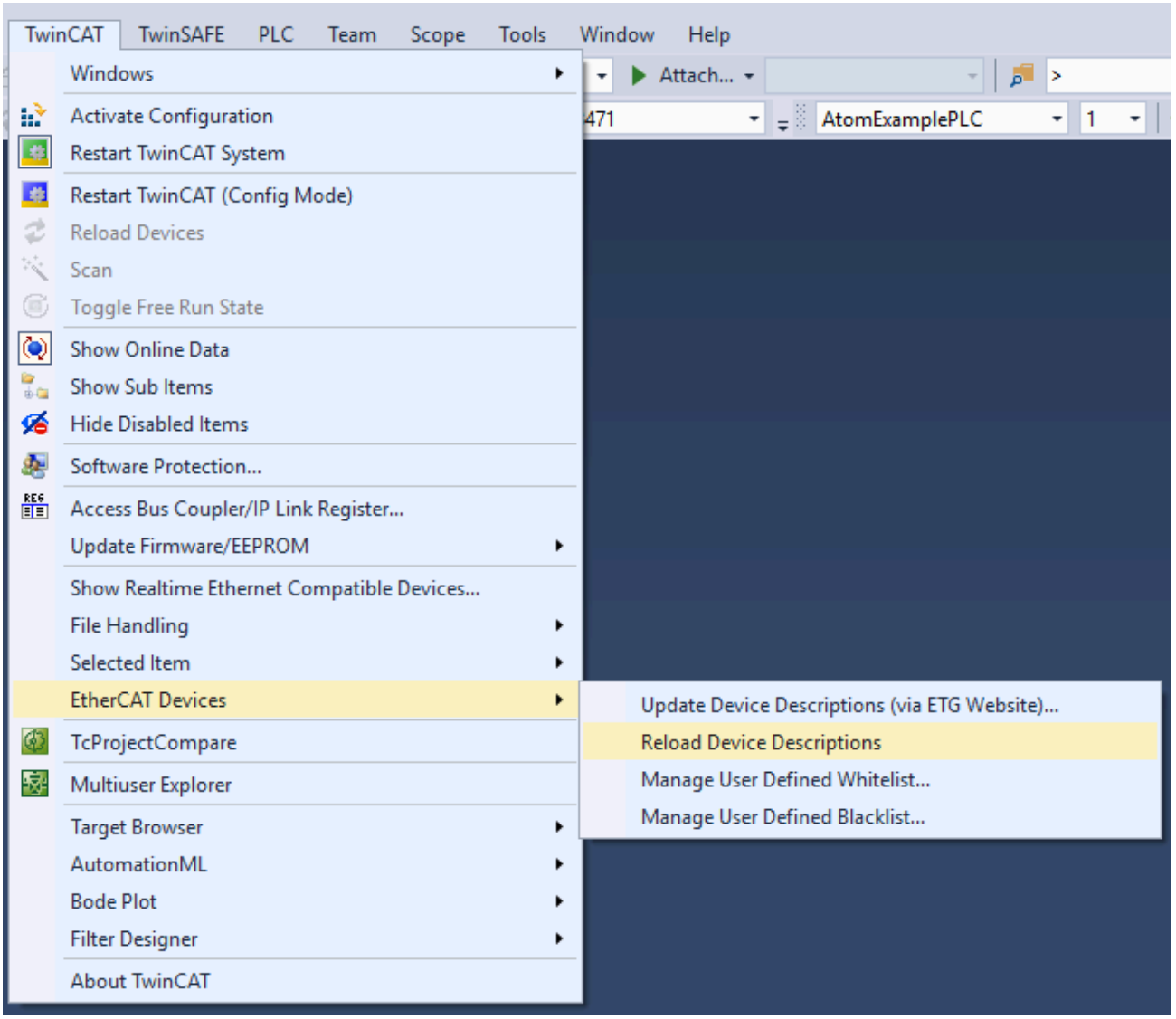
Most actions can be performed from the **TwinCAT** menu in the top bar. Here are some of the most common actions:



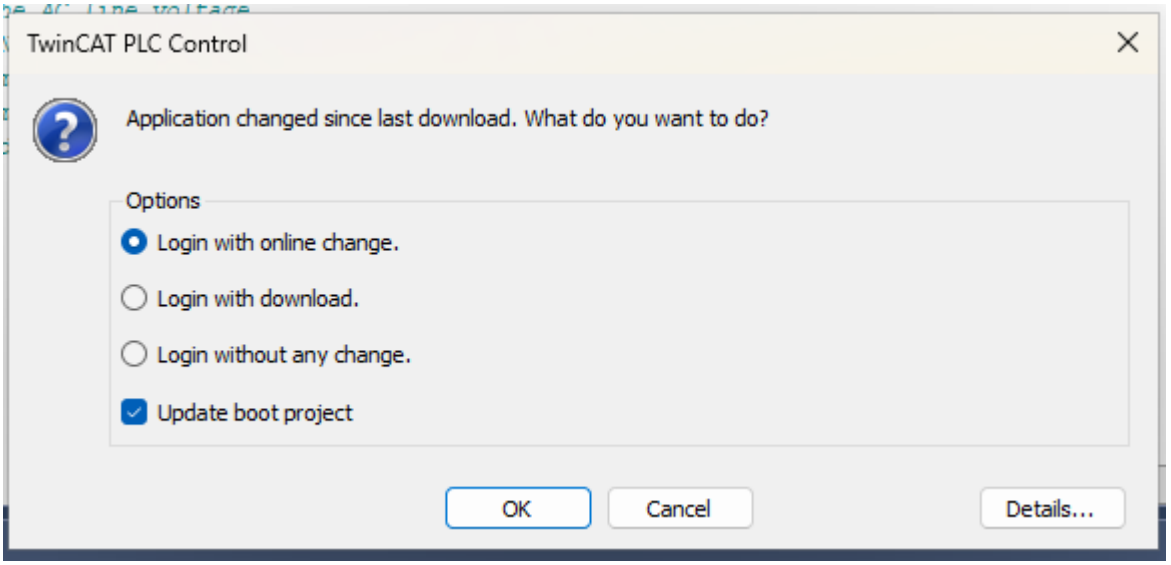
- `1` - The TwinCAT build version to use. This should match the version of TwinCAT on your PLC.
- `2` - From left to right:
  - `Activate the configuration`: Loads the PLC project onto the PLC as the boot project (the project the PLC will auto-start when it boots)
  - `Run`: Puts the TwinCAT system into run mode, allowing the PLC to execute the project

    - `Config`: Puts the TwinCAT system into configuration mode, allowing you to modify the PLC project.
        - You may occasionally get a prompt reading `Activate free run?` - free run is a special PLC mode that allows you to edit EtherCAT variables on your I/O devices manually without having to put the PLC into run mode.
        - When adding new devices or installing new ESI files, you may need to click activate config mode even if config mode is already active. Clicking **Config** mode will restart the PLC in config mode.
- `3` - This is the PLC you want to program. `<Local>` is the built in soft PLC for testing & development.
- `4`: From left to right:
    - `Login` - Log in to download changes to the PLC and debug in real-time.
    - `Start` - Start PLC program execution.
    - `Stop` - Pause PLC program execution.
    - `Logout` - Log out of the PLC to make changes/modify the PLC program.
- `5`: Debugging tools. You can set breakpoints, step through code, force variables, and more.

If you install a new ESI file in `C:\TwinCAT\3.1\Config\Io\EtherCAT`, you may need to **Reload Device Descriptions** and restart the PLC in config mode:



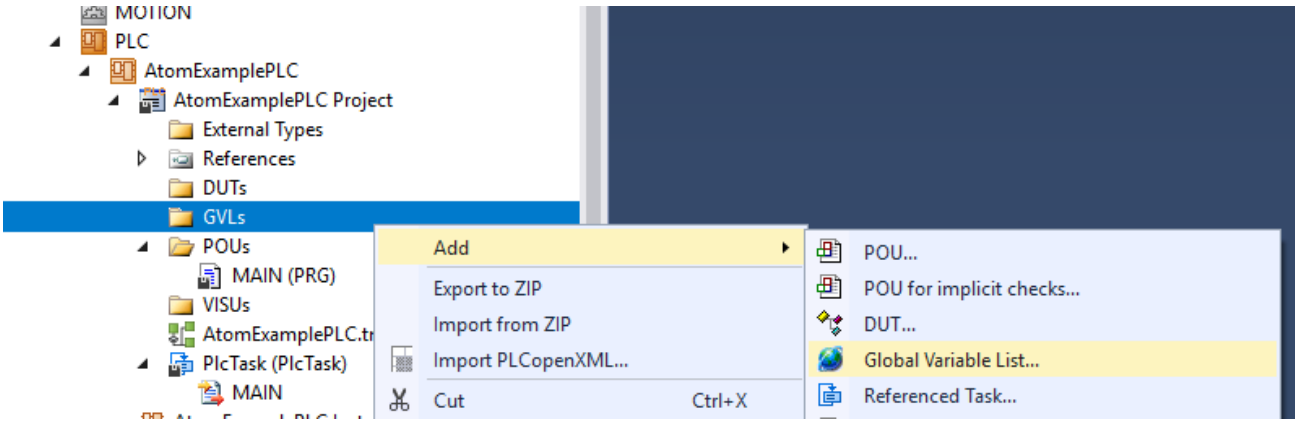
When you login to the PLC, you may be prompted with this dialog:

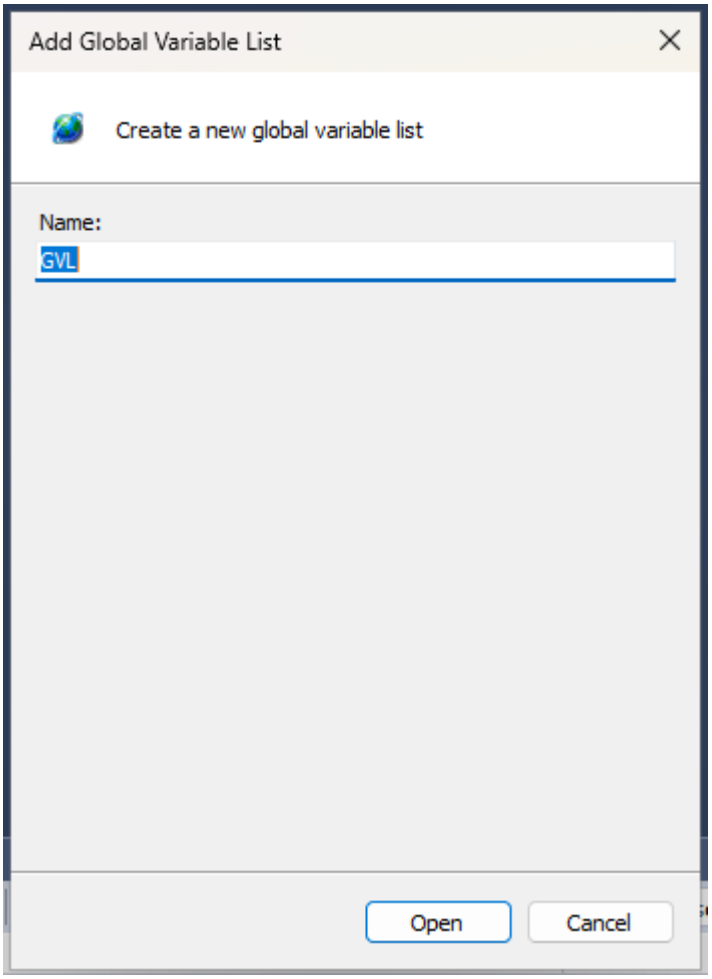


- `Login with online change` - Changes you made to the project with be pushed in real-time to the PLC without restarting the current program. Essentially, this pushes the "delta-updates".
- `Login with download` - The entire project is re-downloaded to the PLC, overwriting & restarting whatever program was running.
- `Login without any change` - Do not download any changes you made to the PLC.
- `Update boot project` - Update the default boot project to the one you are downloading.

A basic example program

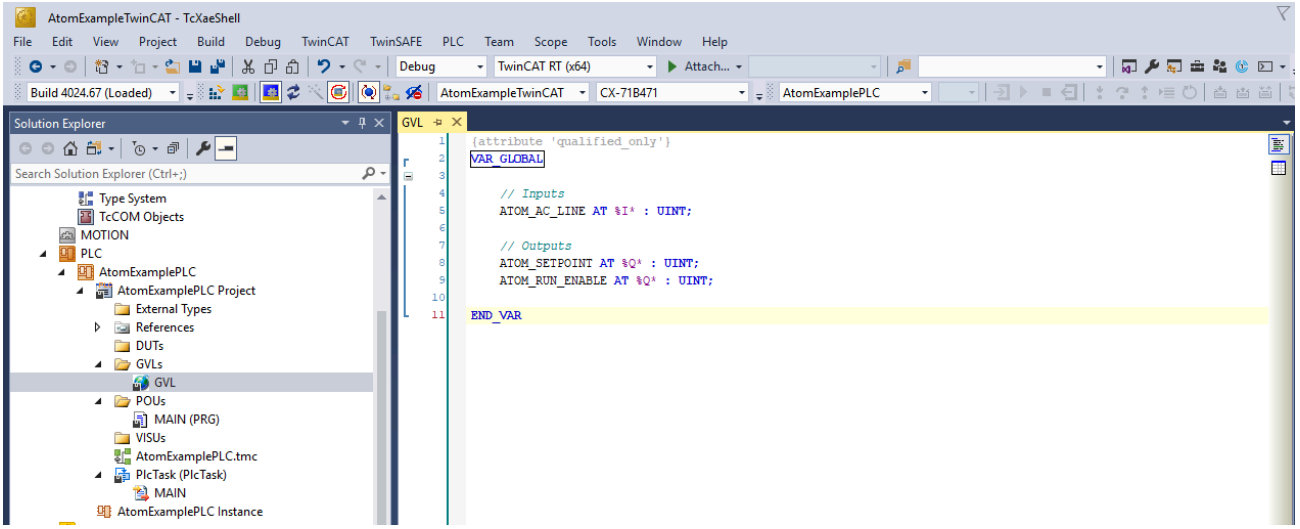
1. Right-click **GVLs** and select **Add** > **Global Variable List**. Name it `GVL` and click **Add**:





2. Create three variables:

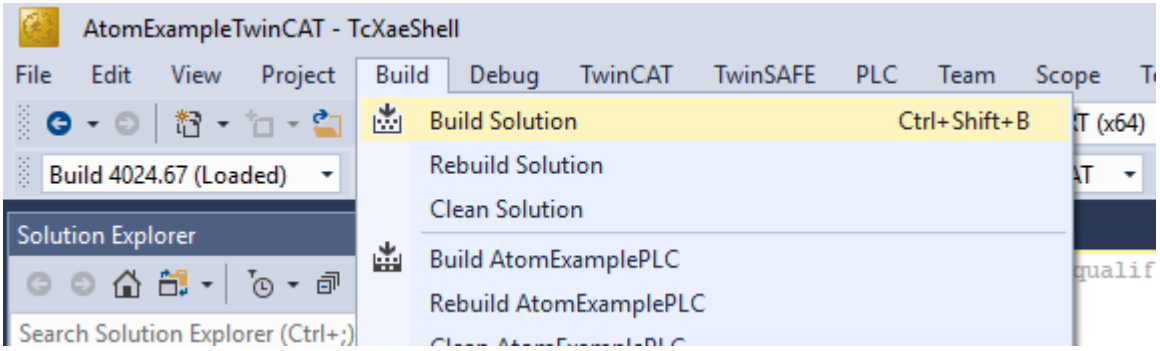
```
  // Inputs
  ATOM_AC_LINE AT %I* : UINT; // AC Line Voltage in Volts as reported by
ATOM

  // Outputs
  ATOM_SETPOINT AT %Q* : UINT; // The setpoint/output command to ATOM
  ATOM_RUN_ENABLE AT %Q* : UINT; // Put ATOM in RUN/STOP
```



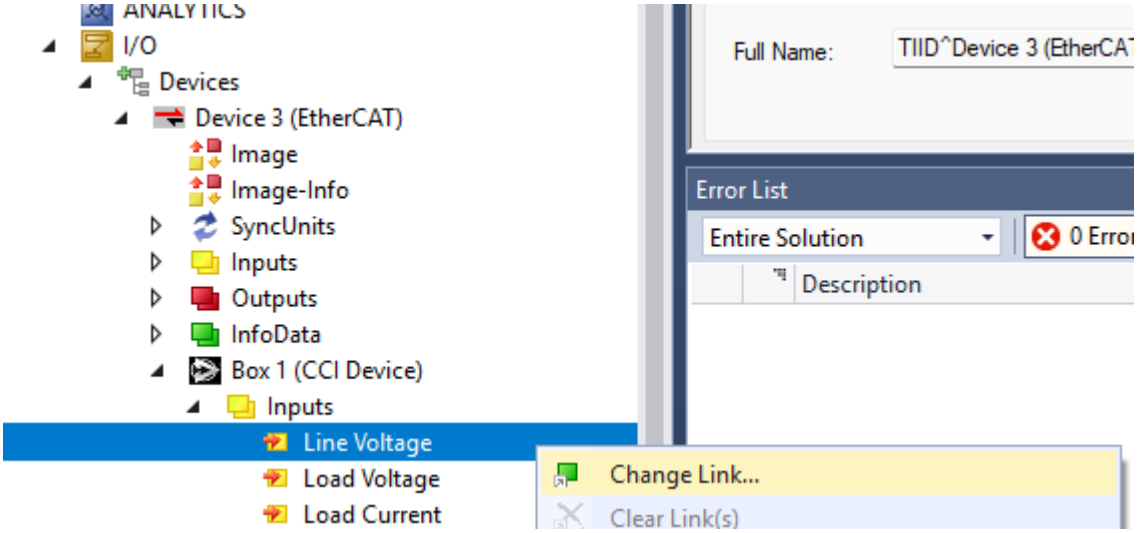
INFO

Global variables take the format: `<NAME> AT %<I/Q>* : <DATA-TYPE>;`. Use `%I*` for inputs and `%Q*` for outputs. All ATOM EtherCAT variables are `UINT` (unsigned integers).

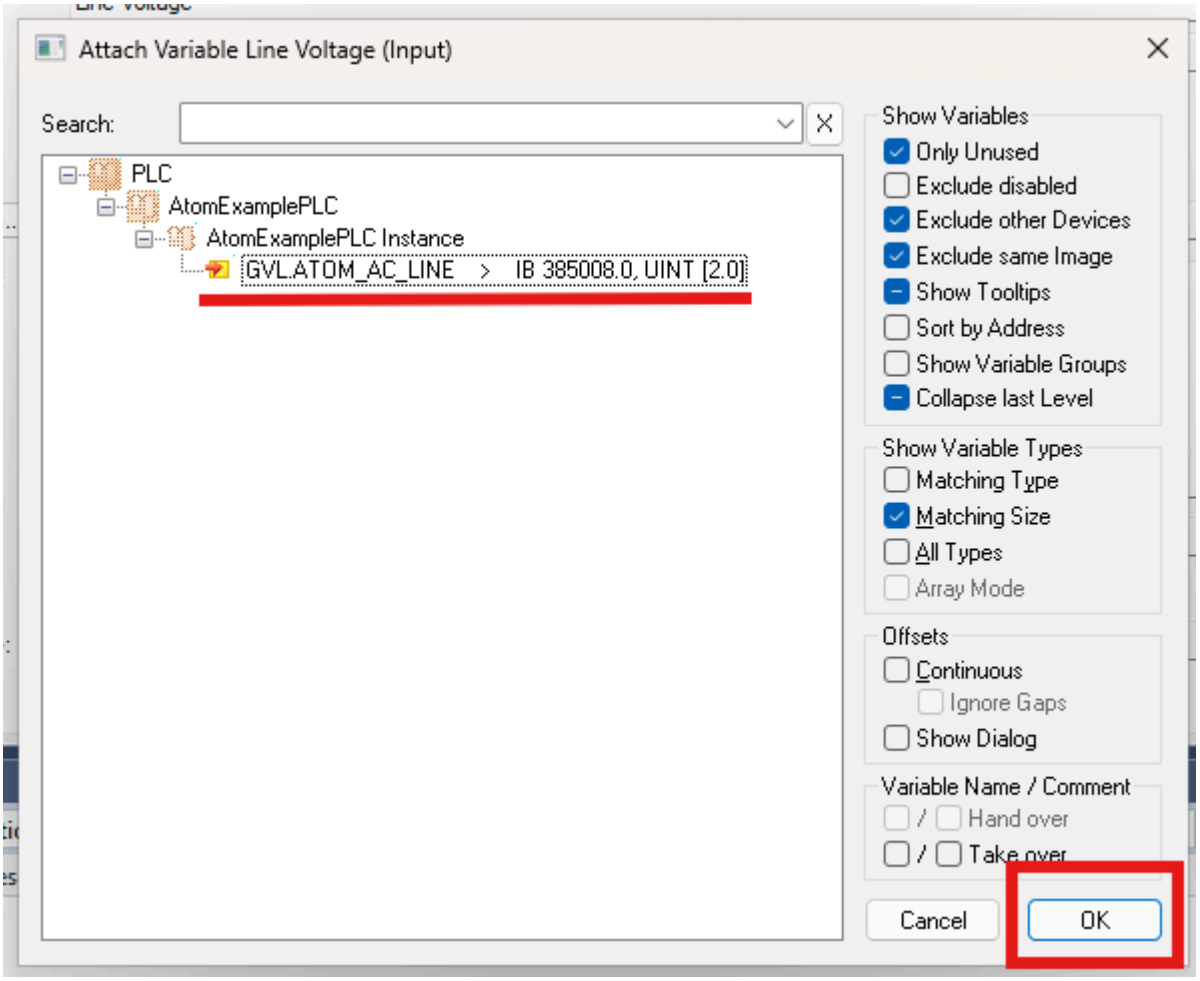
3. You must build the project to register the global variables. Select **Build** > **Build Solution**. If you configured everything correctly, you should see a message like `Build succeeded` in the lower left and no error messages should pop up:



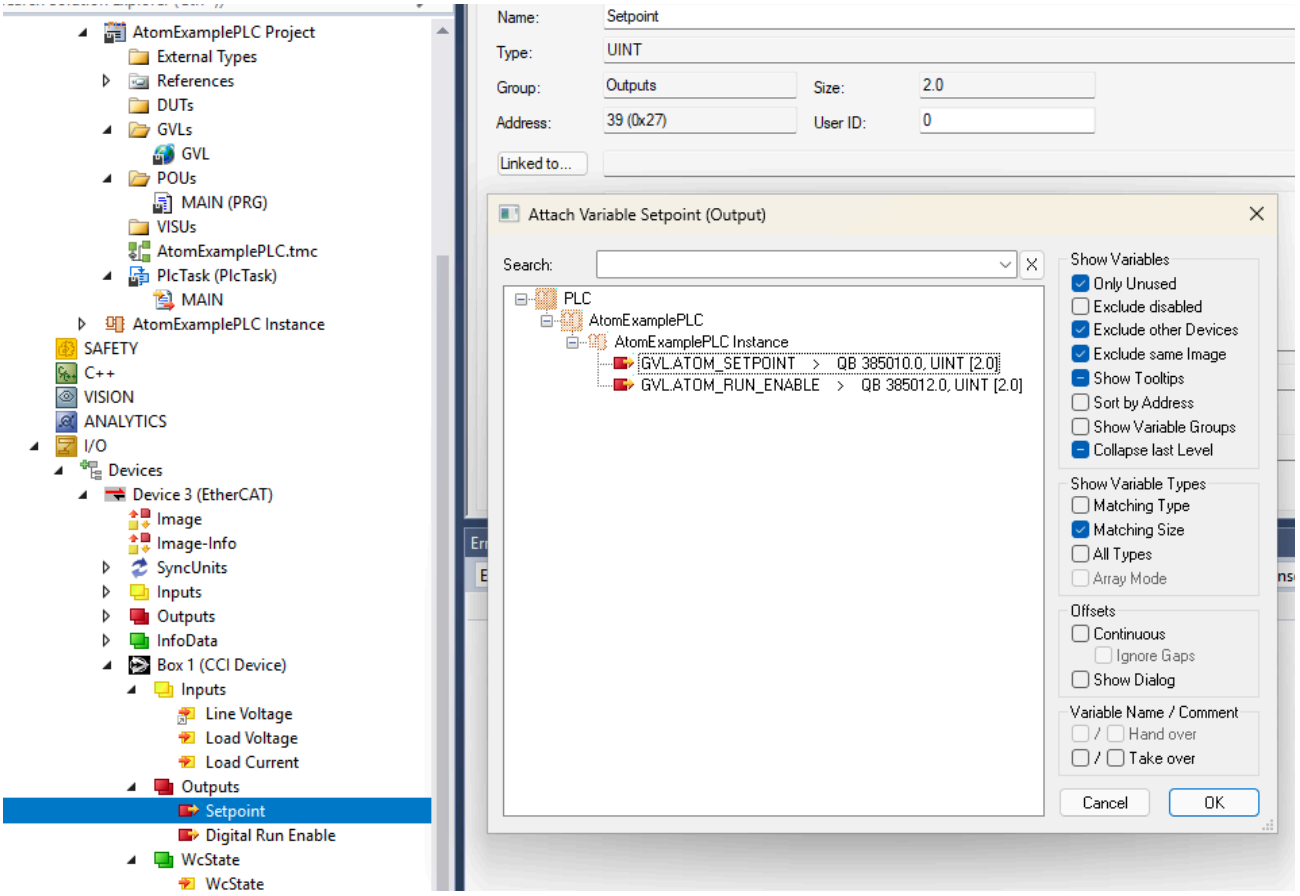
4. Right-click `Box 1 (CCI Device)` > `Inputs` > `Line Voltage` and select **Change Link...*:



5. Select the corresponding global variable `GVL.ATOM_AC_LINE` and click **OK**:

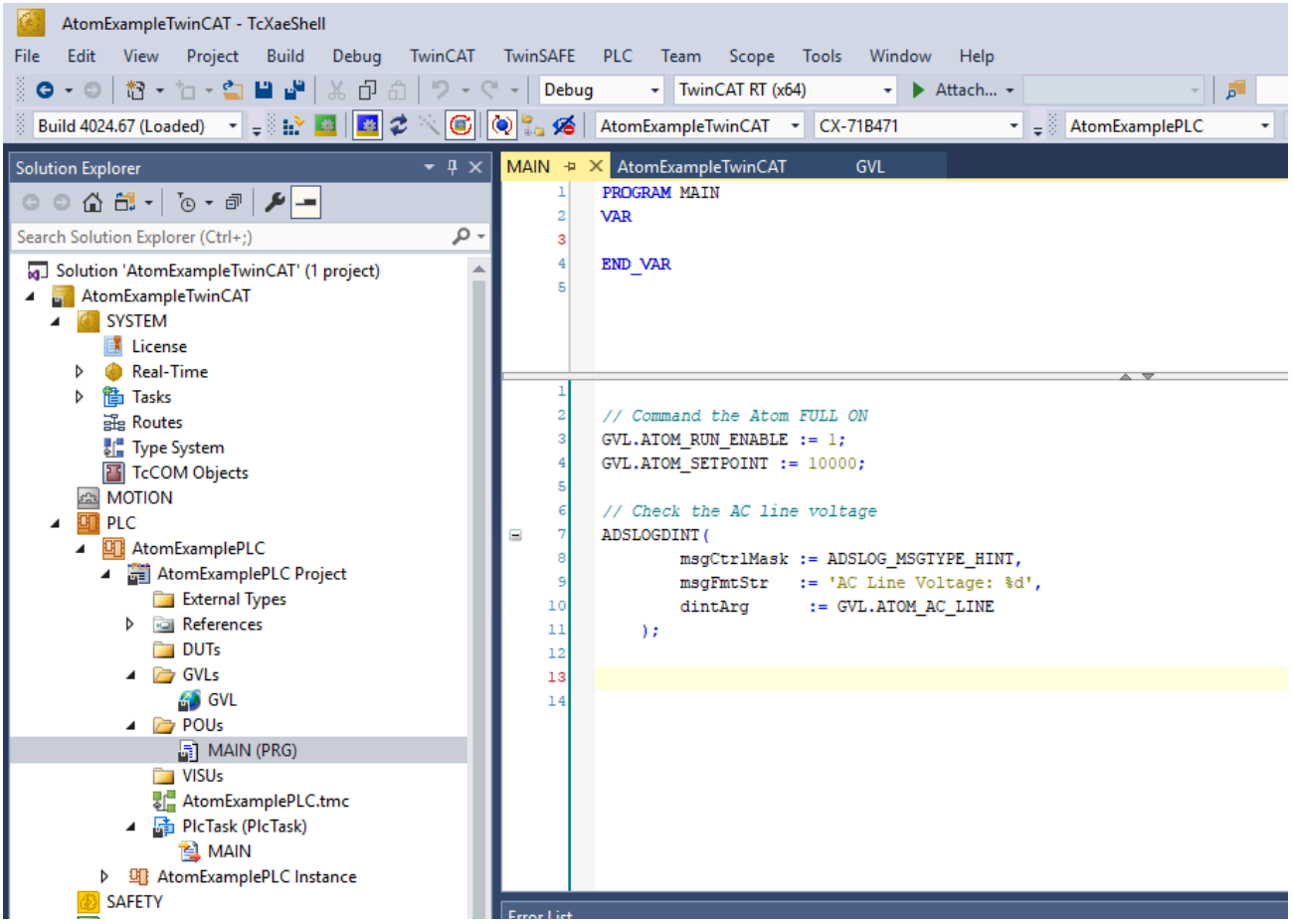


6. Repeat the process for `Outputs` > `Setpoint` and `Outputs` > `Digital Run Enable`:

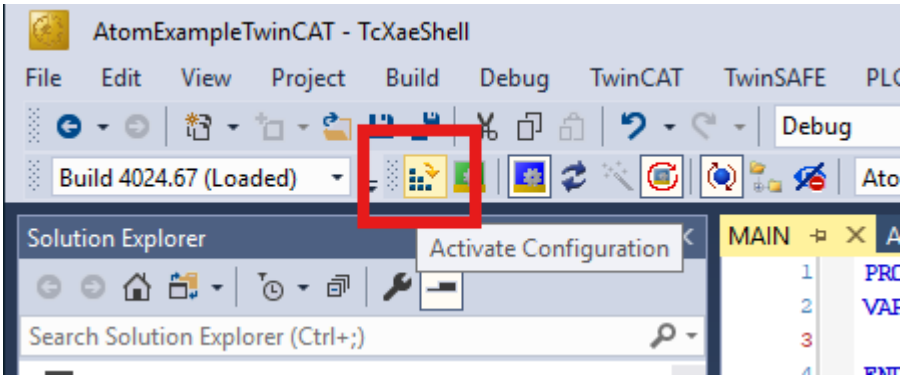


7. Select the main program `MAIN (PRG)` and add the following code:

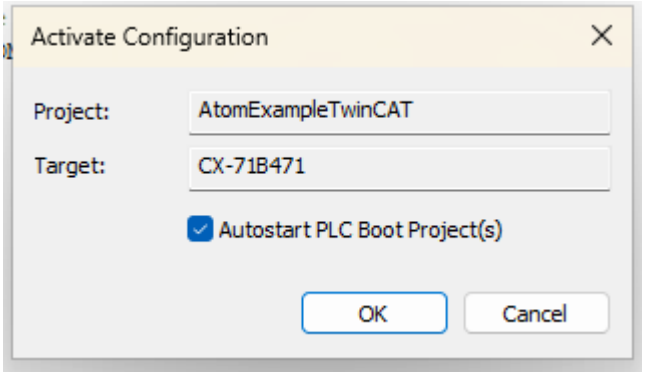
```
// Command the Atom FULL ON
GVL.ATOM_RUN_ENABLE := 1;
GVL.ATOM_SETPOINT := 10000;

// Print the AC line voltage:

ADSLOGDINT(
  msgCtrlMask := ADSLOG_MSGTYPE_HINT,
  msgFmtStr := 'AC Line Voltage: %d V',
  msgArgs := GVL.ATOM_AC_LINE
);
```



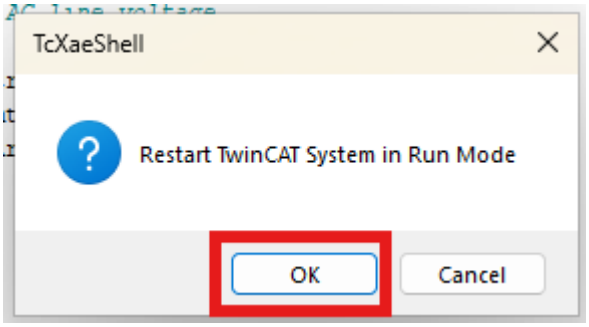
8. Activate the configuration:



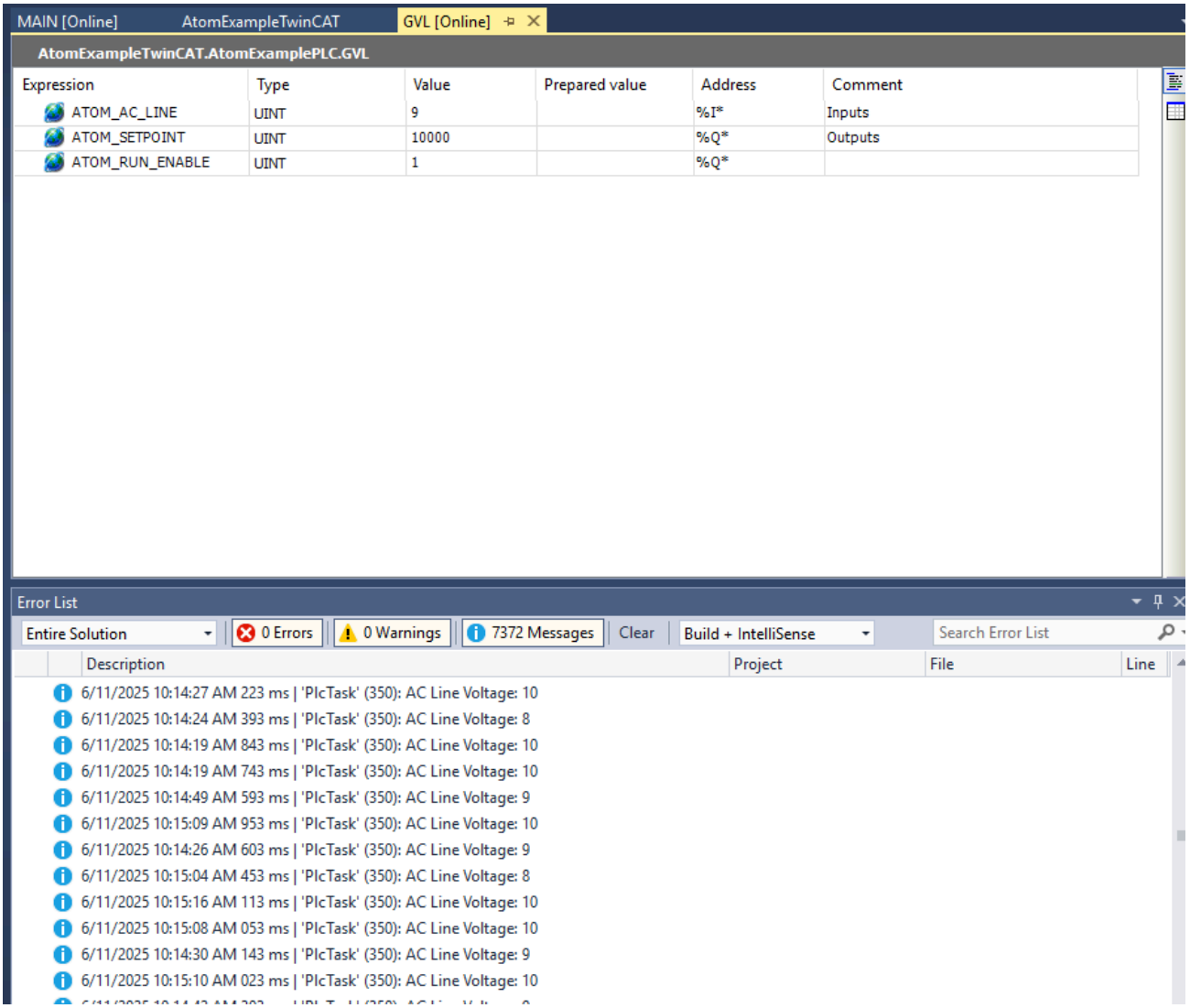
9. Check **Autostart PLC Boot Project(s)** and click **OK**:



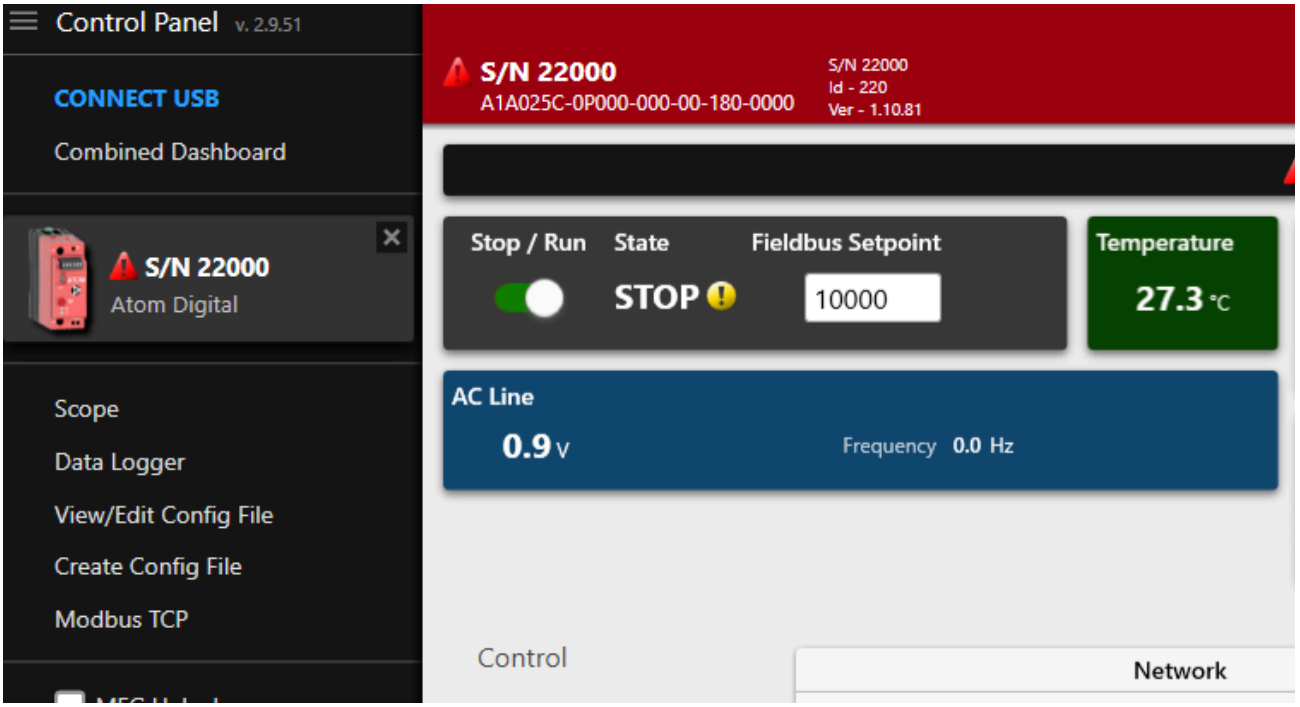
10. When prompted to **Restart TwinCAT System in Run Mode**, click **Yes**:



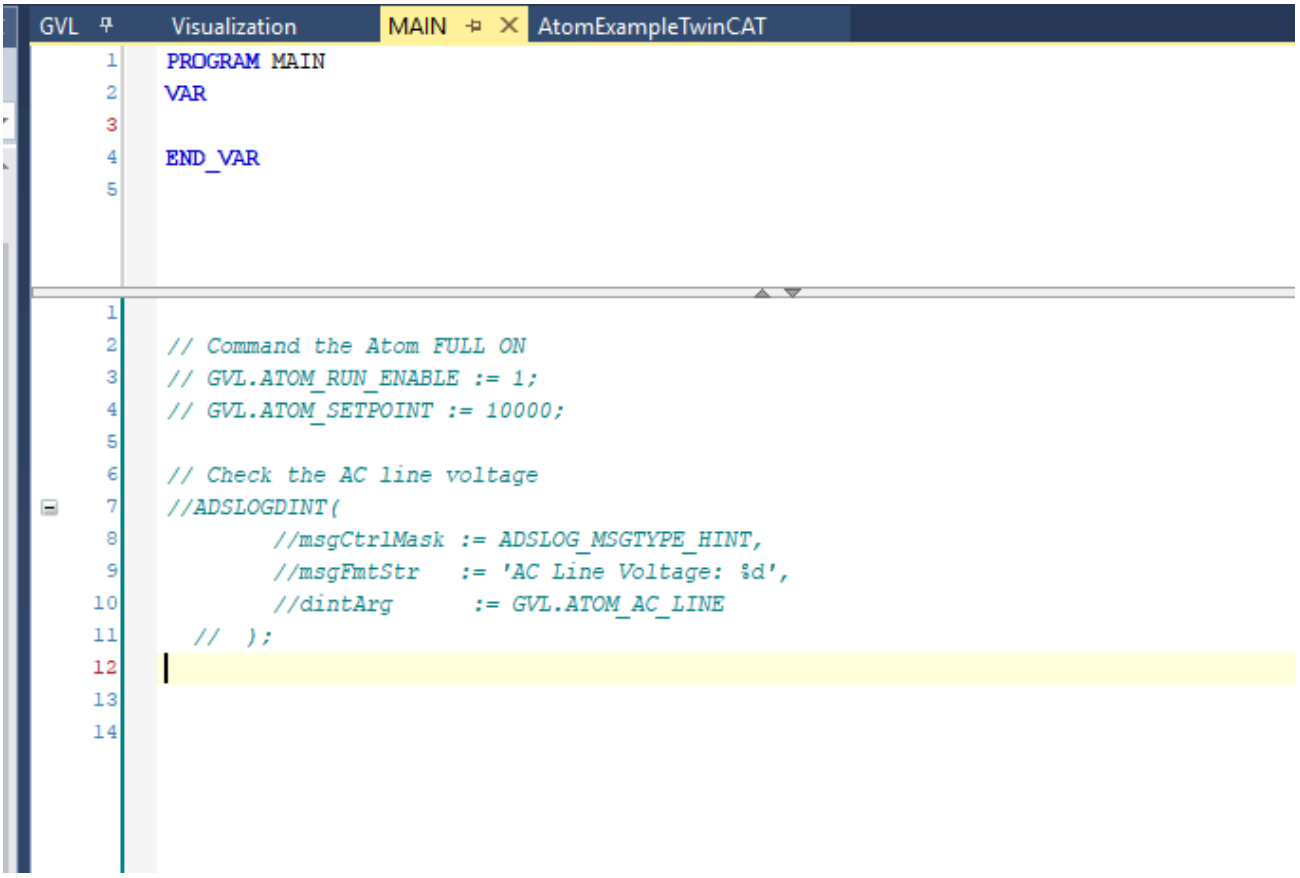
11. Login to the PLC by clicking the **Login** button in the top bar. You should see the AC Line Voltage updated in the debug window and printed to the console:



Additionally, if you connect to ATOM with Control Panel over USB, you can see the ATOM went into RUN mode and the output setpoint was set to `10000` (which is `100.0%` of the output):



Once you've verified that ATOM is working, you can comment out the code in `MAIN (PRG)`:



Next, we'll create a simple user interface to control ATOM. You can follow along with either the Structured Text or Ladder Logic examples below.

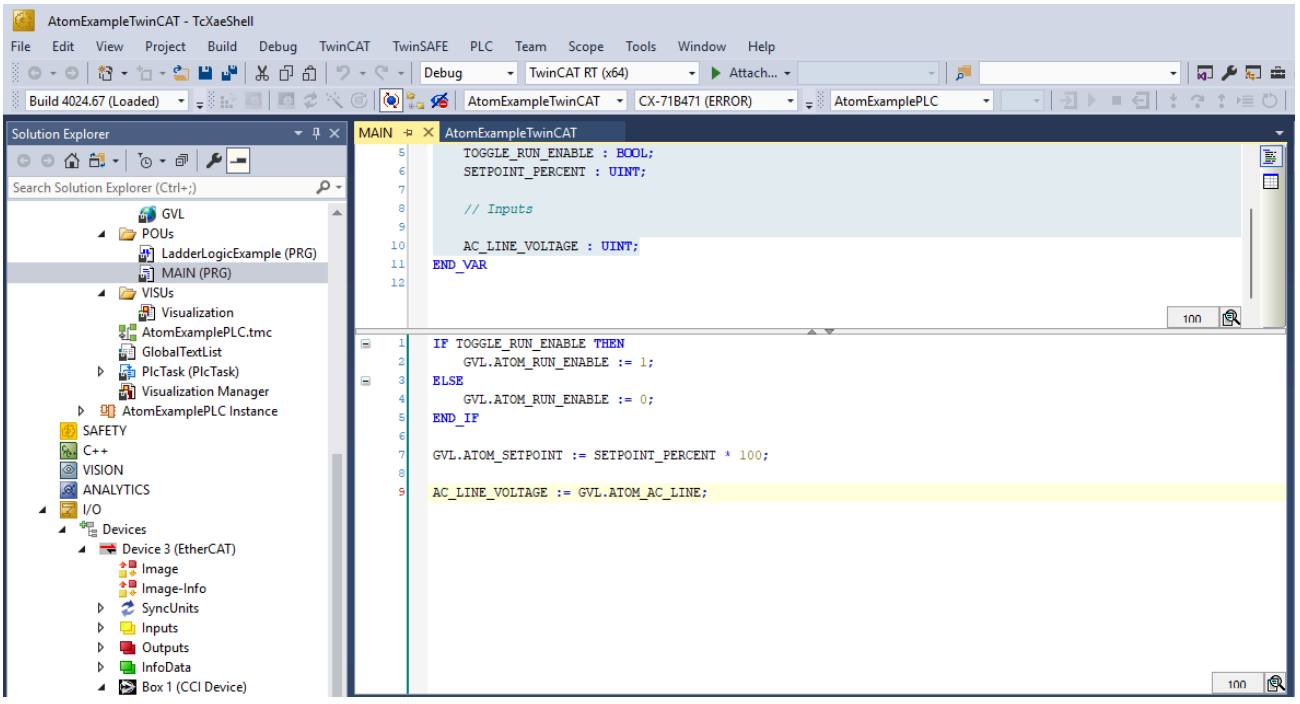
Structured Text

1. Define the variables:

```
// Outputs

TOGGLE_RUN_ENABLE : BOOL;
SETPOINT_PERCENT : UINT;

// Inputs

AC_LINE_VOLTAGE : UINT;
```

Add the following code:

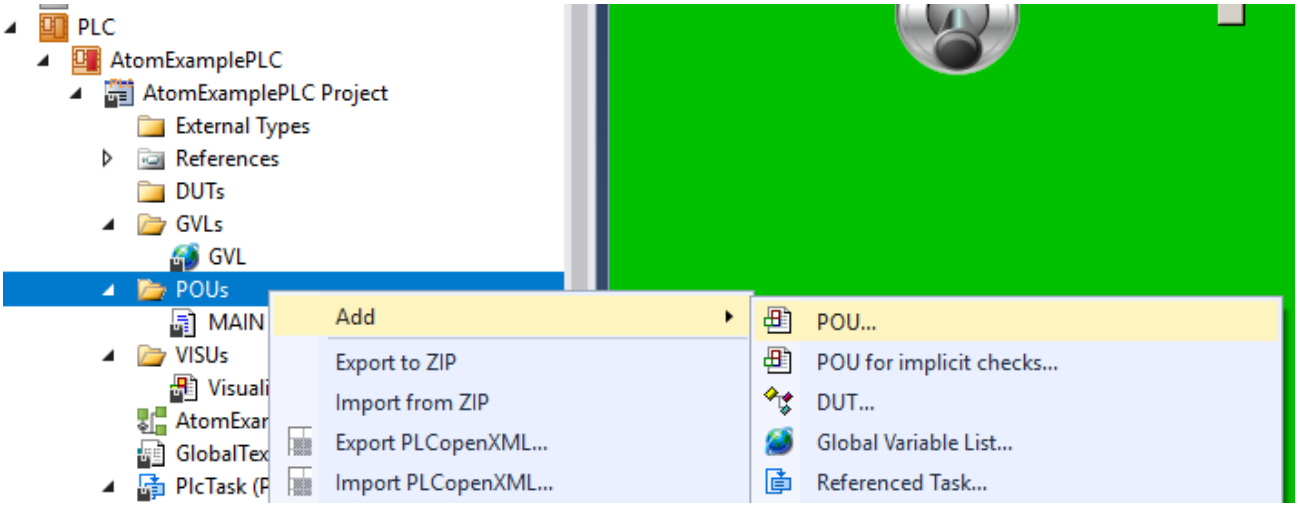
```
IF TOGGLE_RUN_ENABLE THEN
        GVL.ATOM_RUN_ENABLE := 1;
ELSE
        GVL.ATOM_RUN_ENABLE := 0;
END_IF

GVL.ATOM_SETPOINT := SETPOINT_PERCENT * 100;

AC_LINE_VOLTAGE := GVL.ATOM_AC_LINE;
```



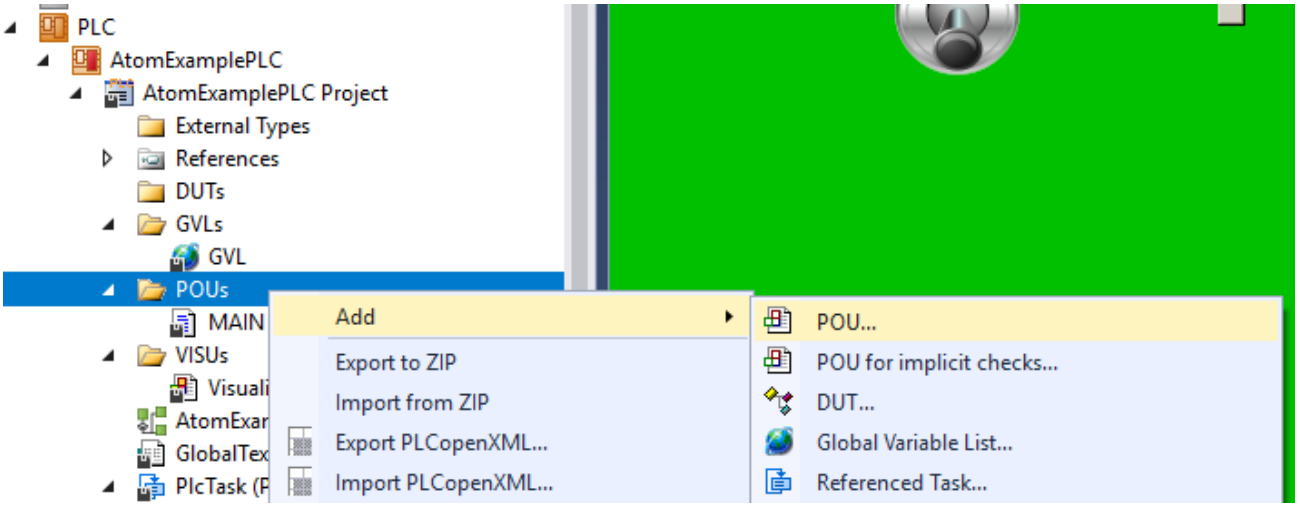
Next, head to the interface section to create a simple user interface to control ATOM.

Ladder logic

Right click **POUs** and select **Add > POU...**



Set the name to `LadderLogicExample`, set type to `Program` and select **Ladder Logic Diagram (LD)** as the Implementation language:

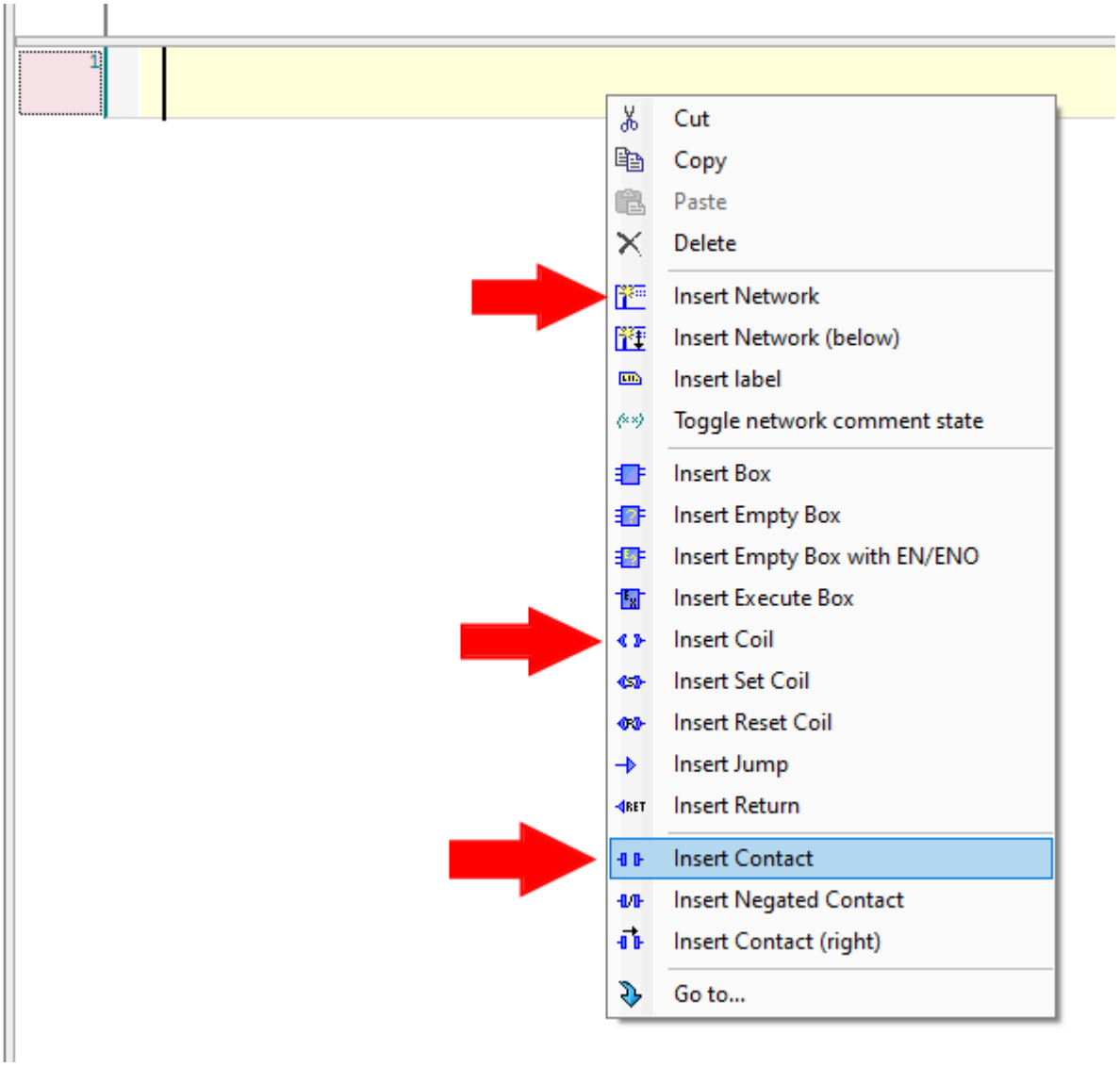


Copy the following code into the top panel of the **LadderLogicExample** editor:

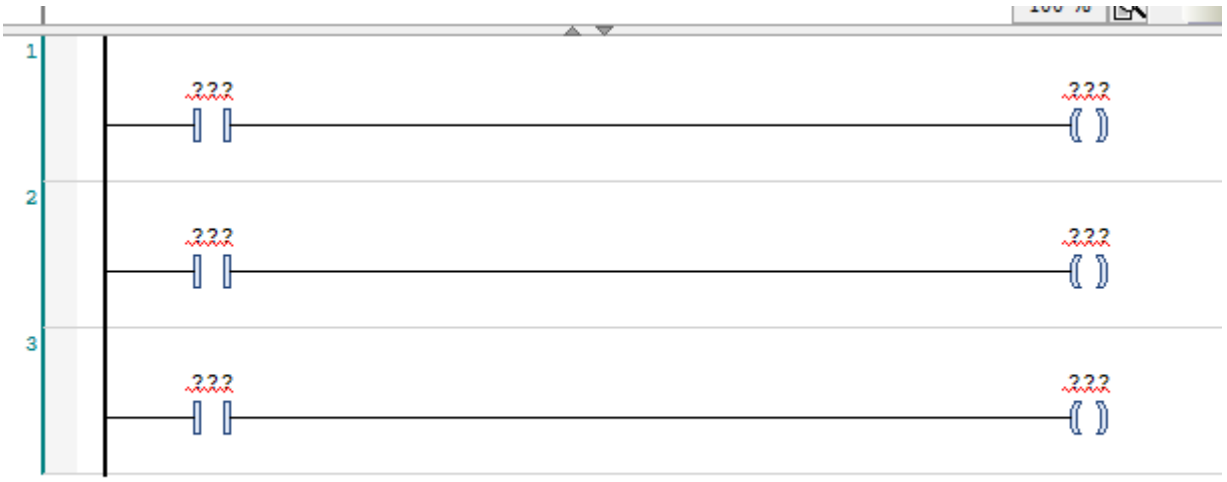
```
// ...
VAR_OUTPUT
        TOGGLE_RUN_ENABLE: BOOL;
  SETPOINT_PERCENT : UINT;
END_VAR

VAR_INPUT
        AC_LINE_VOLTAGE : UINT;
END_VAR
```

In the bottom panel of the editor, we'll create a simple ladder logic program using the variables we just added above.

1. Create **3** networks total by right-clicking and selecting **Insert Network**
2. For each network, right click and insert **one** contact and **one** coil



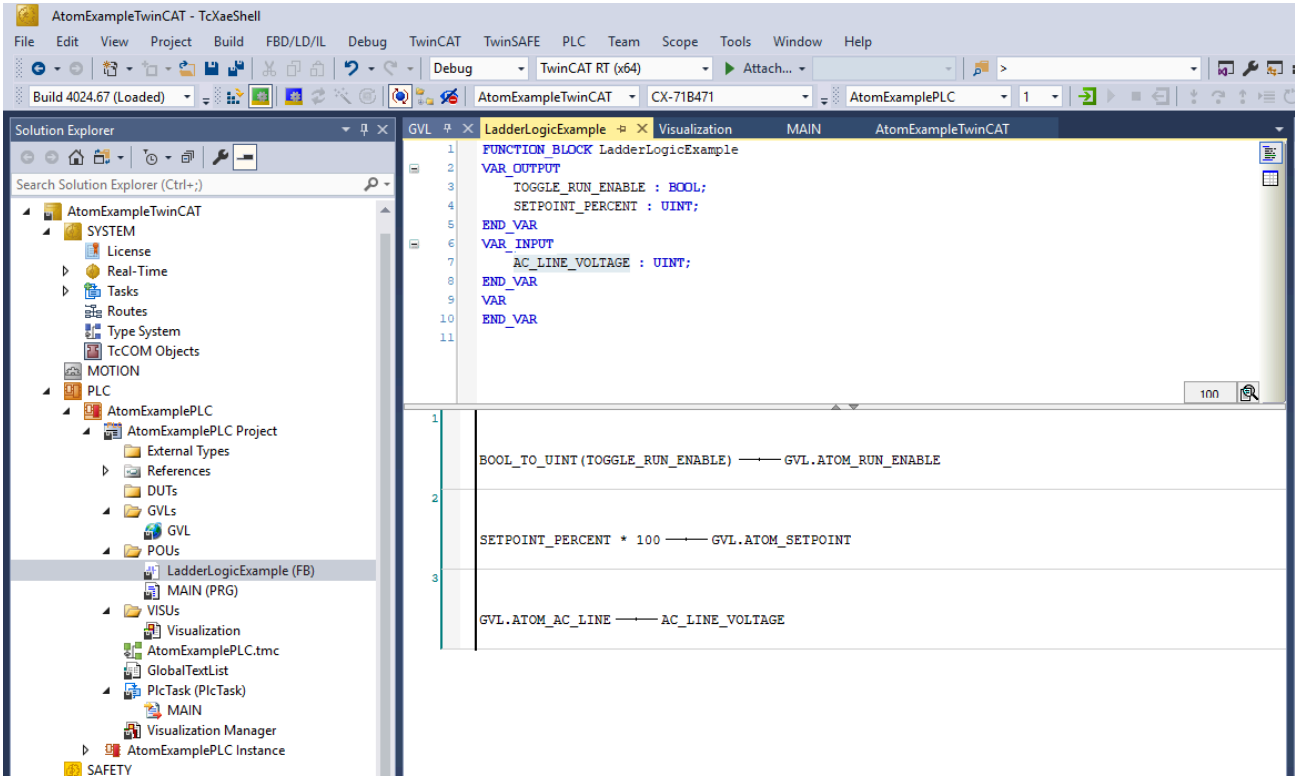
After you're finished, your ladder logic program should look like:



For each rung, replace the `???` with the corresponding variables:

1. **Rung #1** - `BOOL_TO_UINT(TOGGLE_RUN_ENABLE)` and `GVL.ATOM_RUN_ENABLE`
2. **Rung #2** - `SETPOINT_PERCENT * 100` and `GVL.ATOM_SETPOINT`
3. **Rung #3** - `GVL.ATOM_AC_LINE` and `AC_LINE_VOLTAGE`

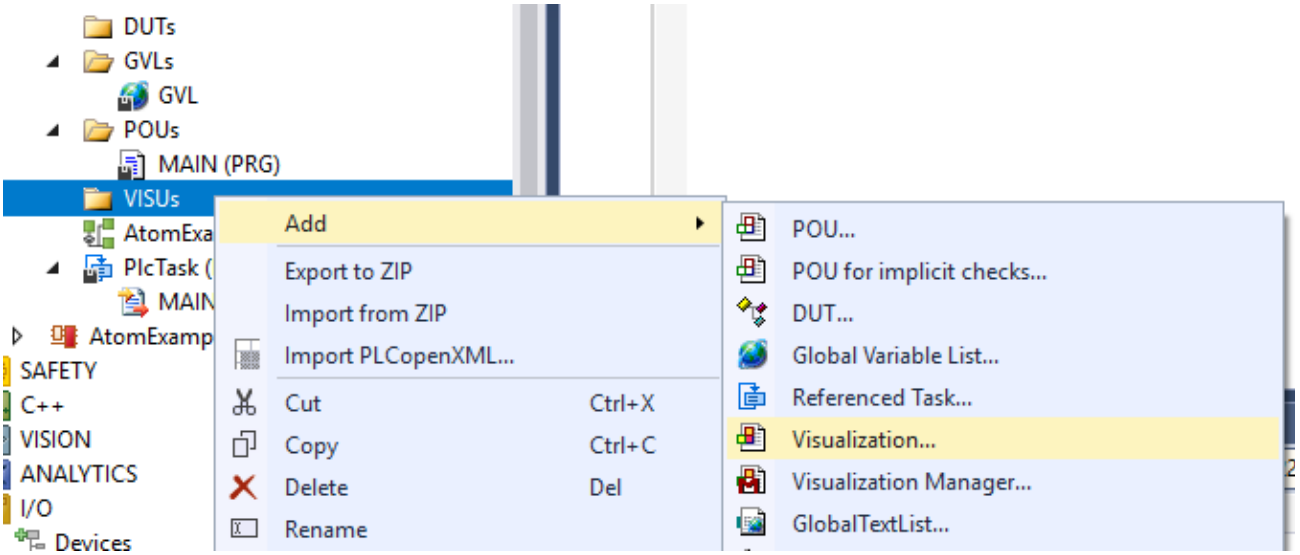
After you're finished, your ladder logic program should look like:



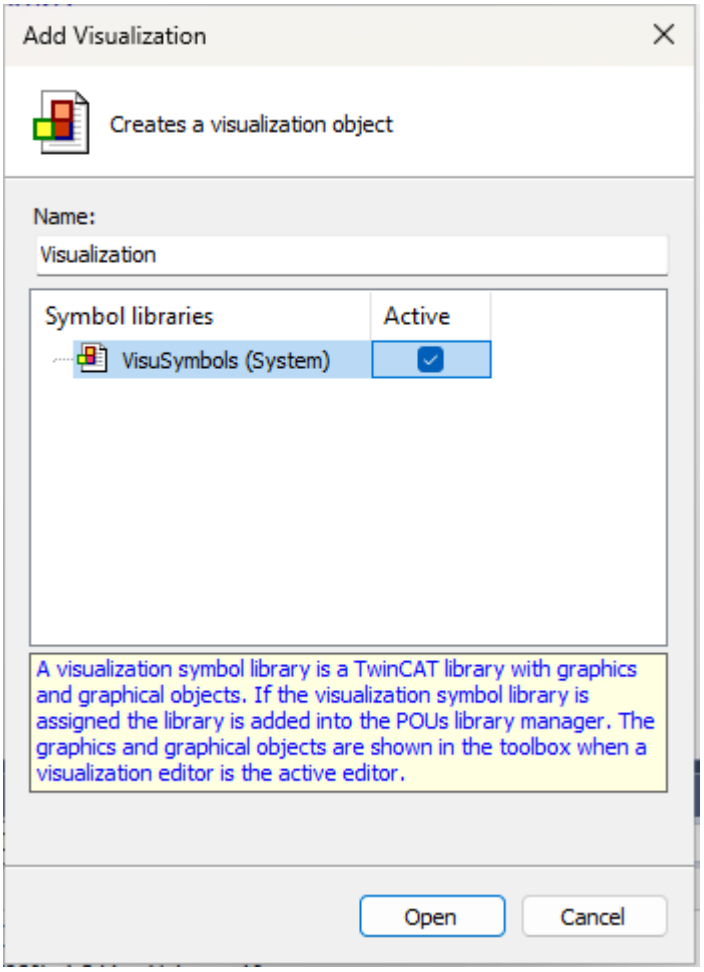
Next, head to the interface section to create a simple user interface to control ATOM.

Creating a user interface

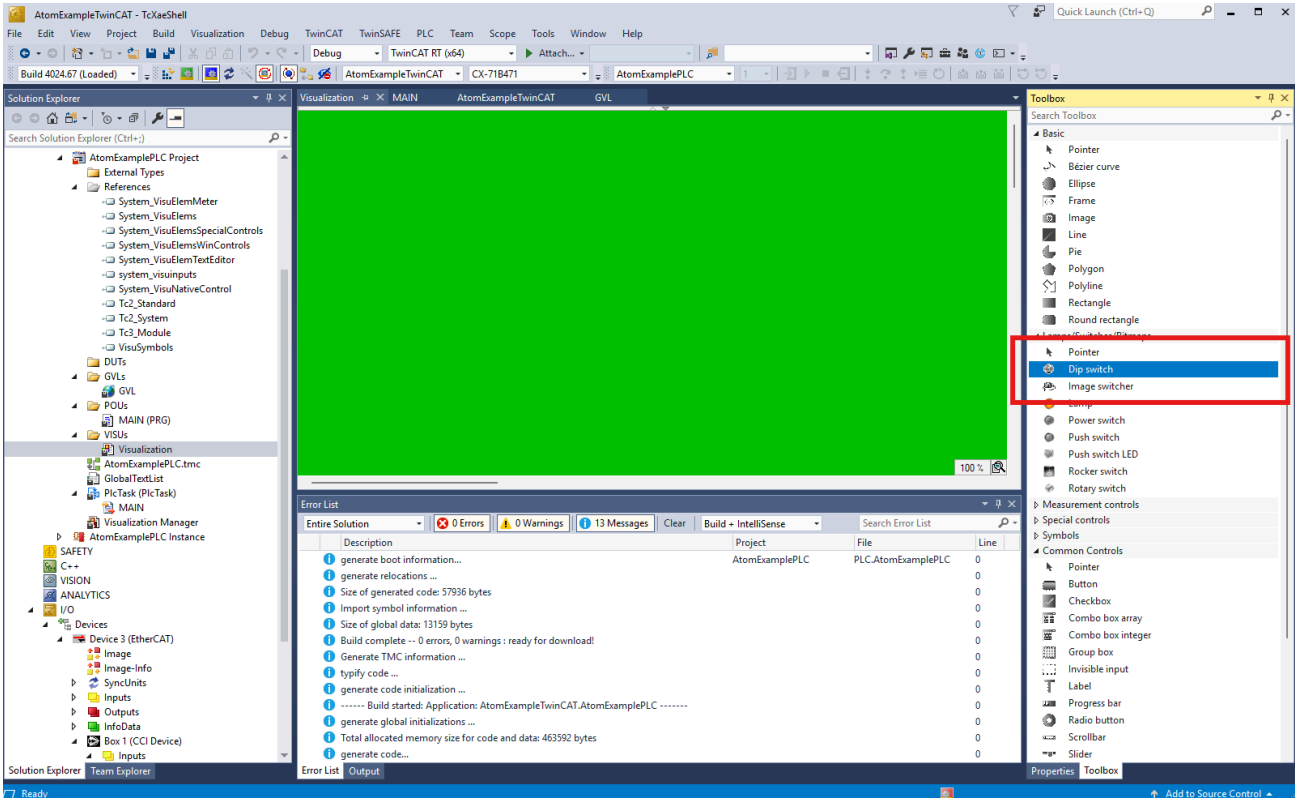
1. Right click **VISUs** and select **Add > Visualization...**:



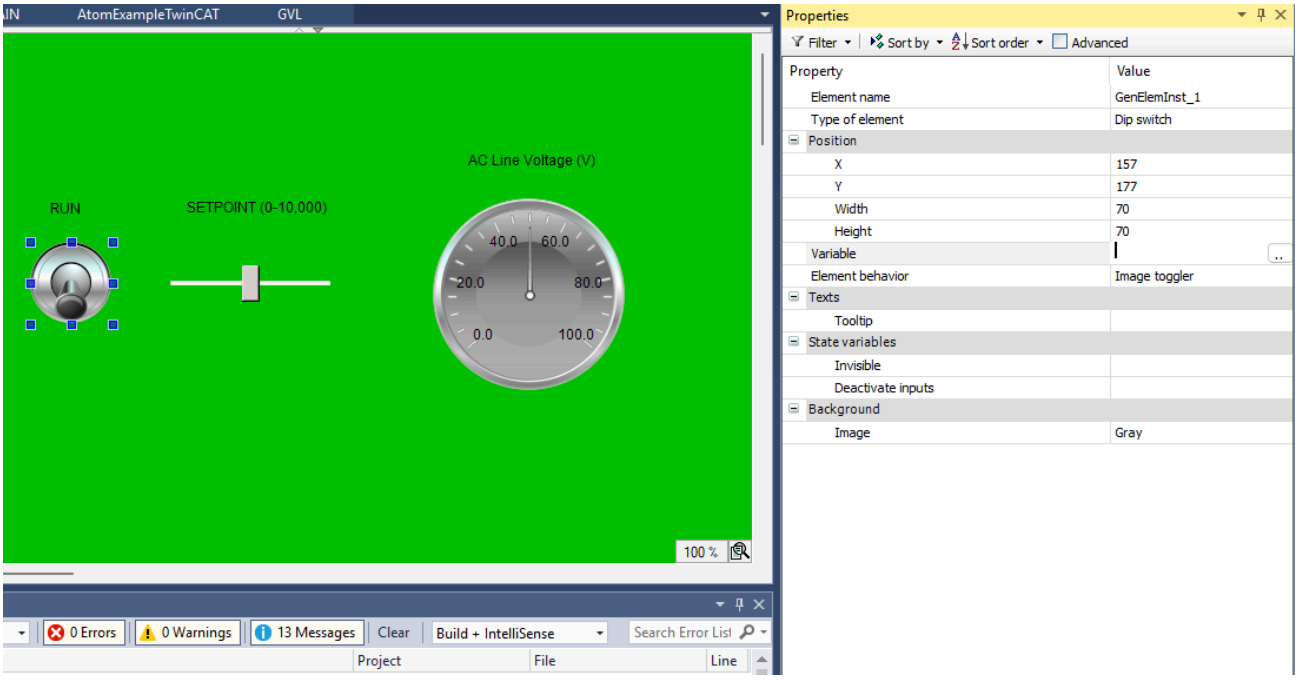
2. Name it `Visualization` and check **Active** on `VisuSymbols (System)`, then hit `Open`:



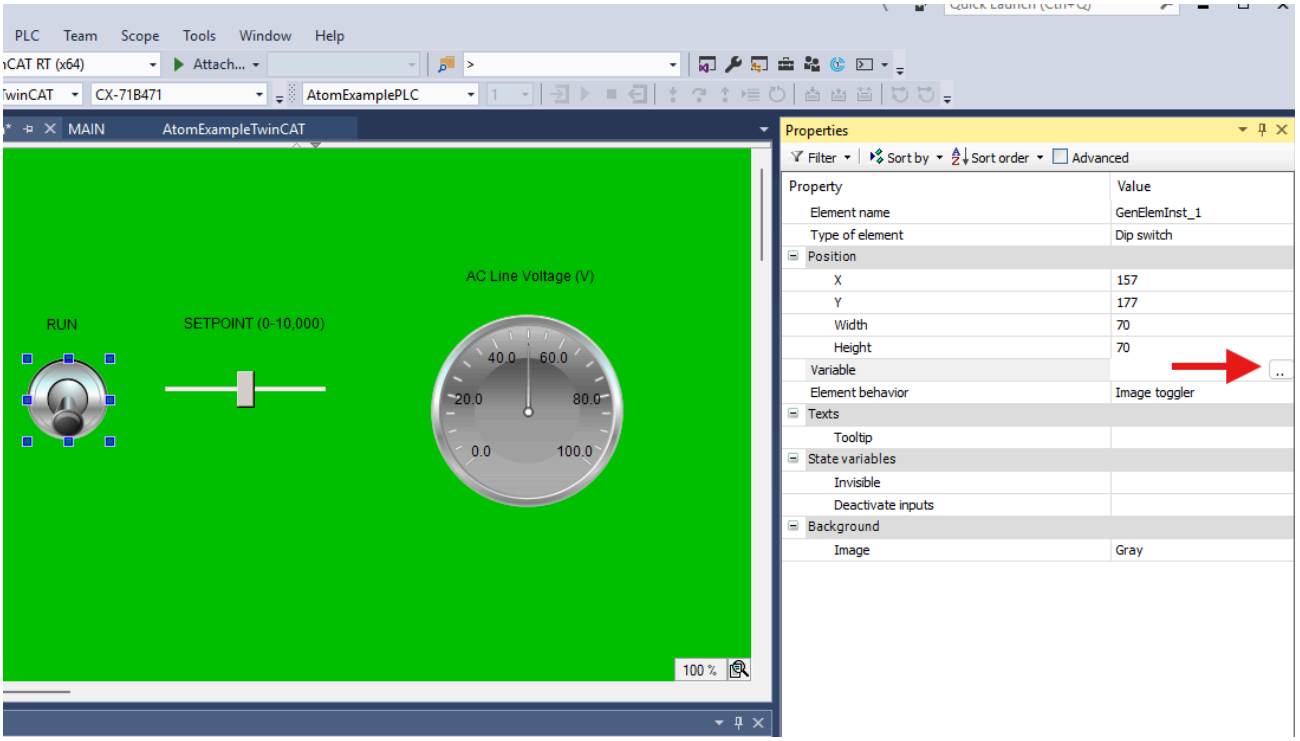
3. Select components in to the toolbox on the right and drag them onto the canvas:

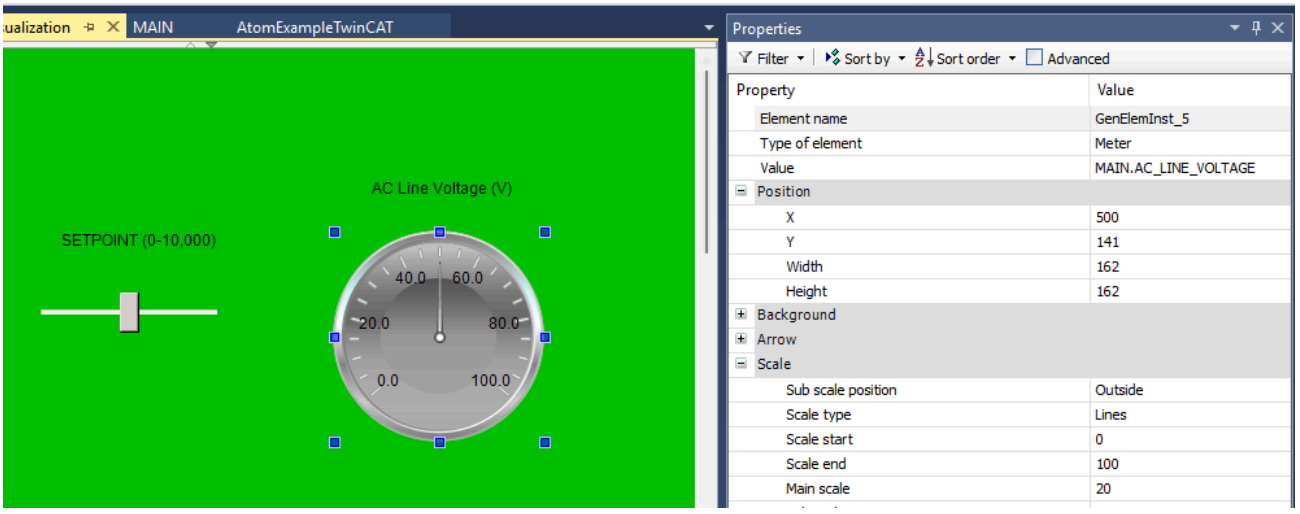


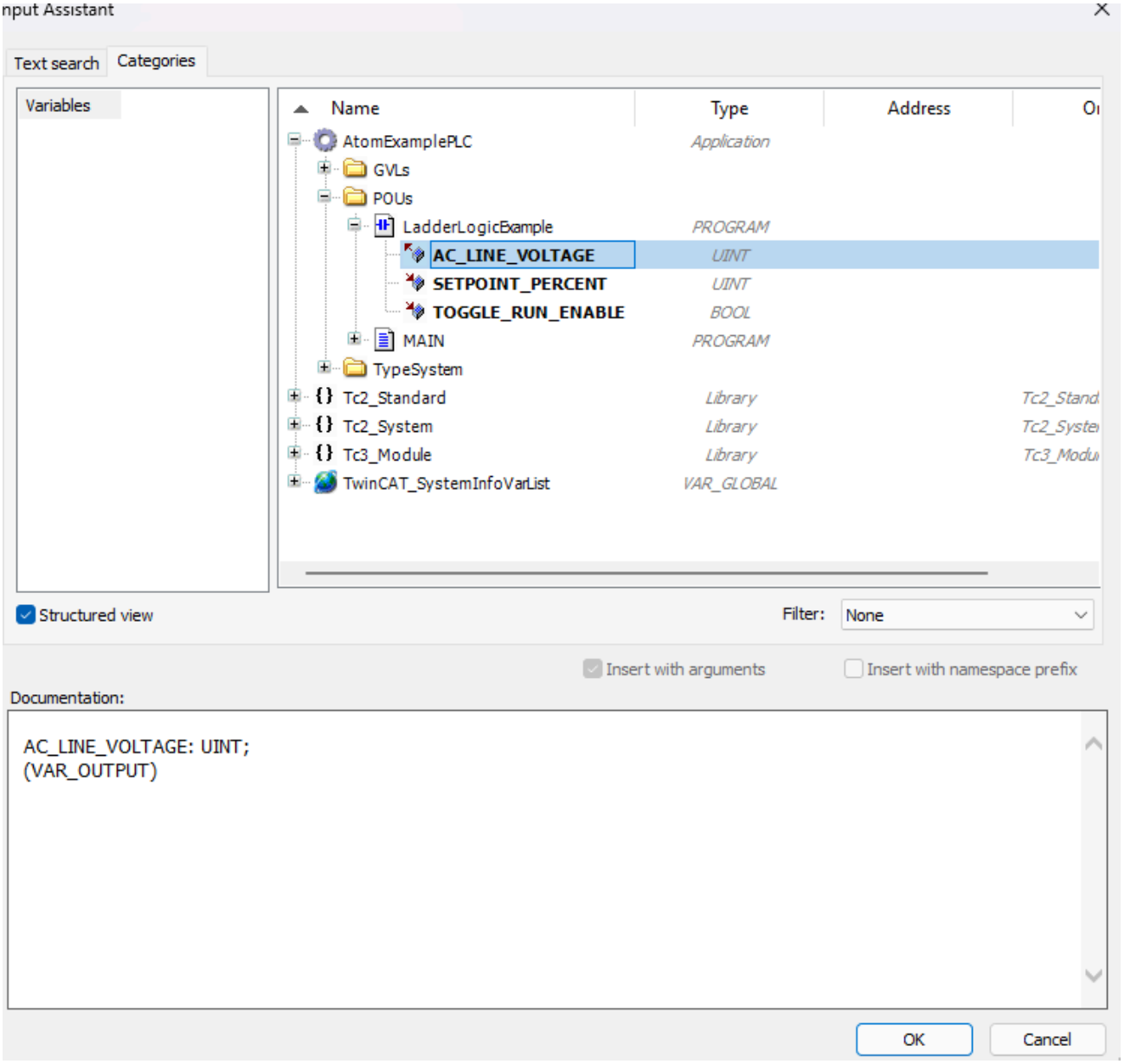
4. In this example, we will add:
    - A **Dip switch** to toggle the `Run Enable` state
    - A **Slider** to set the output setpoint percentage
    - A **Meter** to display the AC line voltage



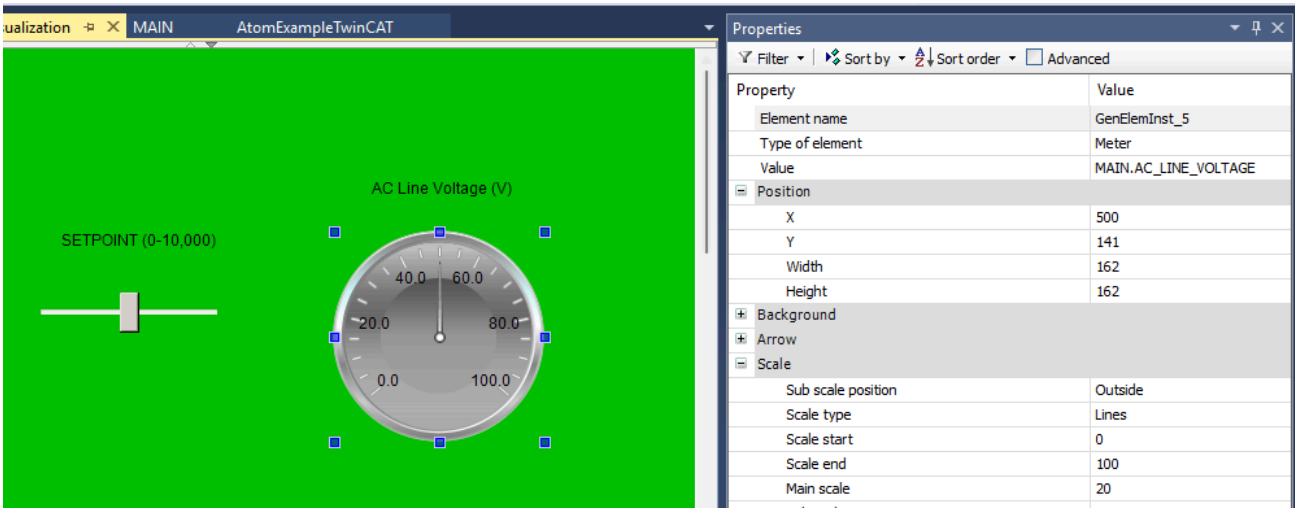
5. Connect the components to the variables we defined earlier:
    - For the **Dip switch**, set the `Variable` property to `MAIN.TOGGLE_RUN_ENABLE`, if using structured text, or `LadderLogicExample.TOGGLE_RUN_ENABLE` if using ladder logic.
    - For the **Slider**, set the `Variable` property to `MAIN.SETPOINT_PERCENT`, if using structured text, or `LadderLogicExample.SETPOINT_PERCENT` if using ladder logic.
    - For the **Meter**, set the `Value` property to `MAIN.AC_LINE_VOLTAGE` if using structured text, or `LadderLogicExample.AC_LINE_VOLTAGE` if using ladder logic.

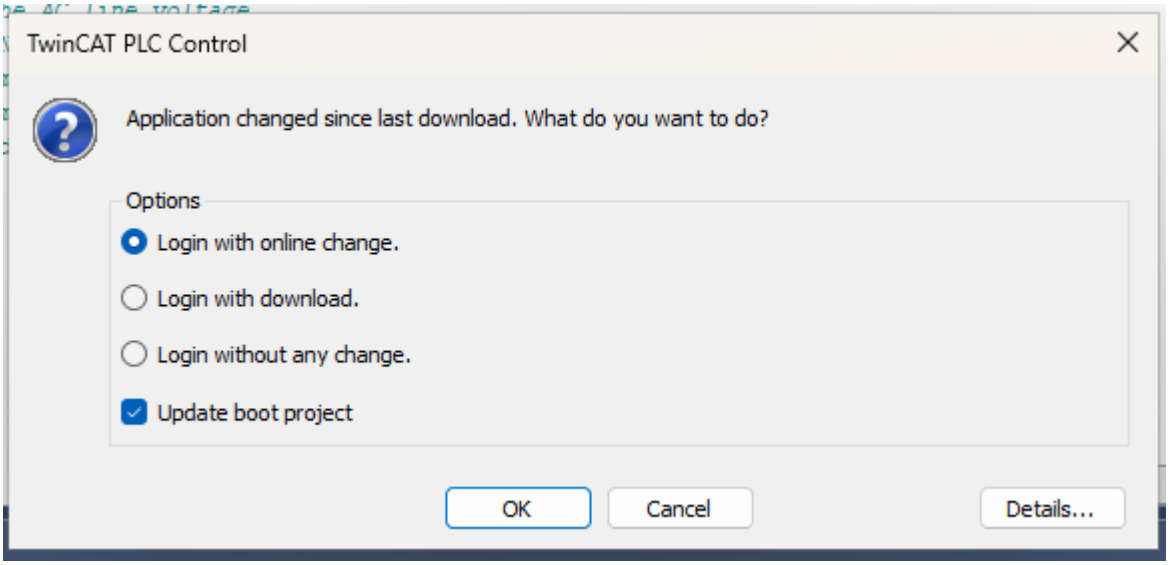

PLC
Team
Scope
Tools
Window
Help
MAIN
AtomExampleTwinCAT
RUN
SETPOINT (0-10,000)
AC Line Voltage (V)
40.0
60.0
20.0
80.0
0.0
100.0
100 %
Properties
Filter
Sort by
Sort order
Advanced
Property
Value
Element name
GenElemInst_1
Type of element
Dip switch
Position
X
157
Y
177
Width
70
Height
70
Variable
Element behavior
Image toggler
Texts
Tooltip
State variables
Invisible
Deactivate inputs
Background
Image
Gray


MAIN
AtomExampleTwinCAT
AC Line Voltage (V)
SETPOINT (0-10,000)
40.0
60.0
20.0
80.0
0.0
100.0
Properties
Filter
Sort by
Sort order
Advanced
Property
Value
Element name
GenElemInst_5
Type of element
Meter
Value
MAIN.AC_LINE_VOLTAGE
Position
X
500
Y
141
Width
162
Height
162
Background
Arrow
Scale
Sub scale position
Outside
Scale type
Lines
Scale start
0
Scale end
100
Main scale
20

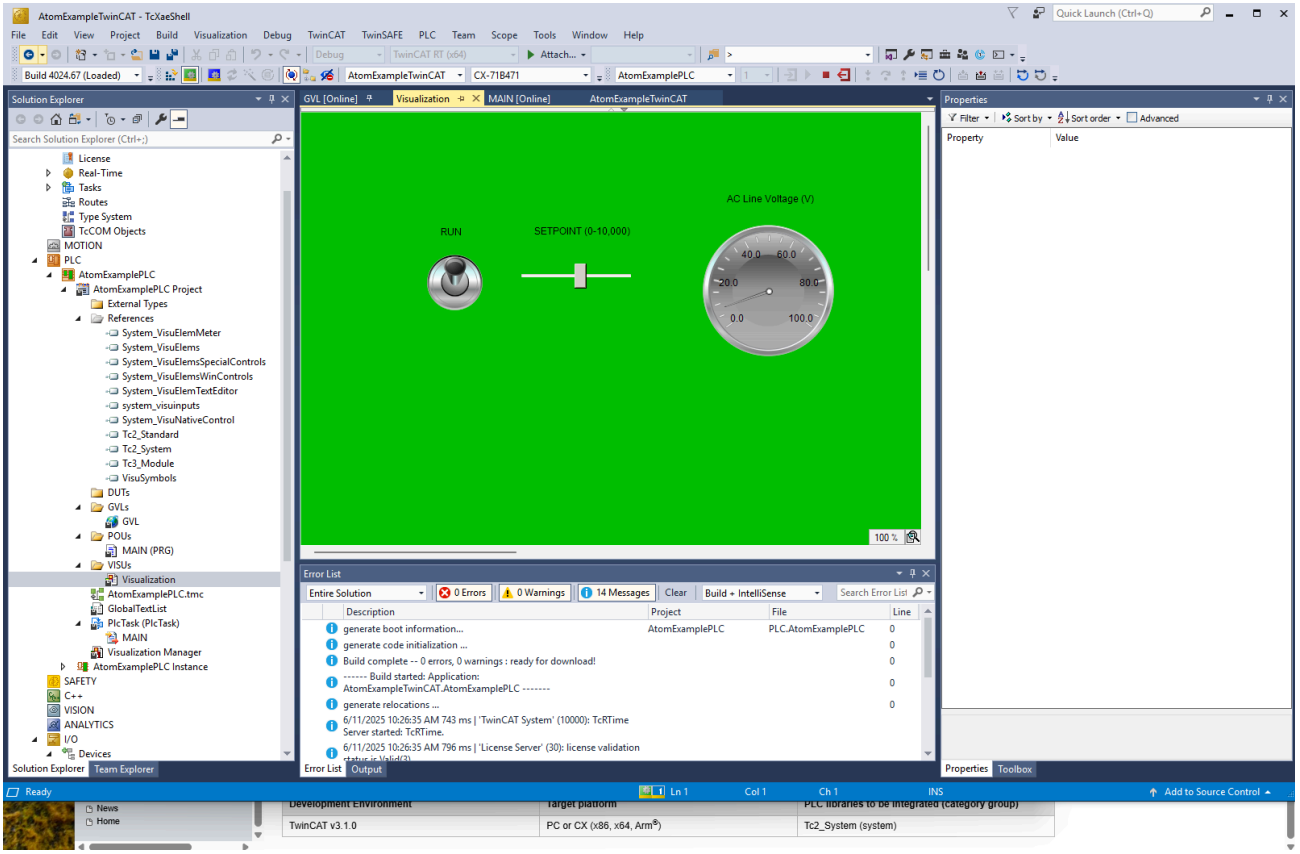


6. Build the project and hit **Login**. Select **Login with online change** and click **OK**:





7. If everything worked correctly, you should see the ATOM's AC line voltage in the meter, and you can toggle the run enable state and set the output setpoint percentage using the dip switch and slider, respectively:



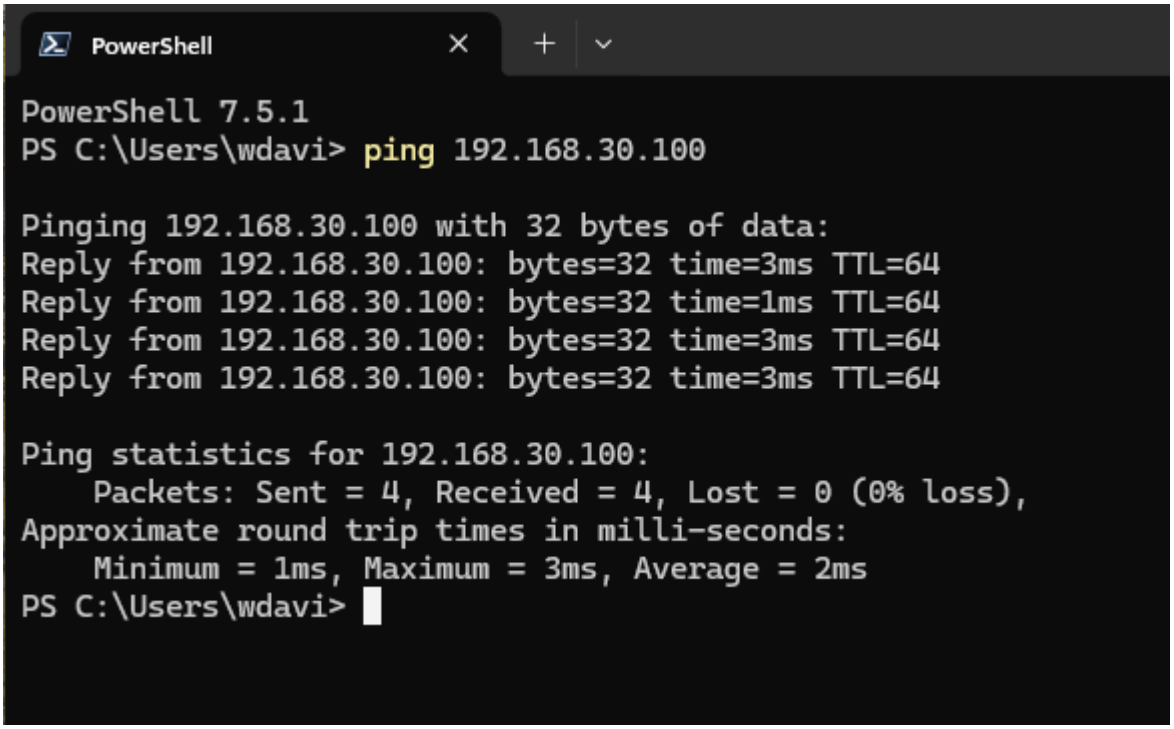
Troubleshooting

- My ATOM does not appear in the TwinCAT I/O Devices tree.
  - Ensure that ATOM is powered on and connected to the same network as your PC.
  - Check that the `Atom.xml` file is in the correct directory: `C:\TwinCAT\3.1\Config\Io\EtherCAT`.
  - Ensure that you have installed the ESI file correctly and reloaded the device descriptions in TwinCAT.
  - Check the network cable connection between your PC, ATOM, and PLC.
- I cannot connect to my PLC.
  - Ensure that the PLC is powered on and connected to the same network as your PC.

    - Check that you have configured the correct IP address and subnet mask for both the PLC and your PC.
    - Ensure that you have the correct username and password for your PLC.
- My variables are missing or an ESI file is working:
    - Select Reload Device Descriptions from the TwinCAT menu bar.
    - Click Config to restart the PLC in config mode.
    - Select the *Activate the configuration* button in the TwinCAT menu bar.

Can't connect to PLC or ATOM

Use the `ping` utility on Windows to check if your PC can reach the PLC/ATOM:



If:

- Ping is successful - you have a configuration problem with your PC
- Ping is unsuccessful - you have a hardware configuration, PLC configuration, or ATOM configuration problem.

Advanced

ATOM supports `FOE` (File Over EtherCAT) for firmware updates. If you receive a firmware update file from Control Concepts, you can update ATOM's firmware using TwinCAT 3: