APPLICATION NOTE

AC500 V3 ETHERNET/IP

AC500 AS SCANNER CONNECTED TO ANOTHER AC500 AS ADAPTER
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1 Introduction

1.1 Scope of the document

AC500 V3 PLCs support EtherNet/IP communication. This document describes how to configure the AC500 as scanner mode or adapter mode for EtherNet/IP communication.

1.2 Compatibility

For this application the following modules and engineering system versions were used. It should also work with other versions, nevertheless some small adaptations may be necessary for future versions.

- AC500 V3 PLC (PM56xx-2ETH)
- AC500-eCo V3 PLC (PM5032-x-ETH, PM5052-x-ETH and PM5072-x-2ETH(W))
- Automation Builder 2.5.0 or newer

1.3 Overview

Fig. 1: AC500 V3 as EtherNet/IP scanner and EtherNet/IP adapter protocol
2 Connect to AC500(-eCo) V3

This chapter shows how to configure AC500(-eCo) V3 PLC as EtherNet/IP Scanner and connect to another AC500(-eCo) V3 PLC as EtherNet/IP adapter module.

AC500 (-eCo) V3
(Ethernet/IP Scanner)

AC500 (-eCo) V3
(Ethernet/IP Adapter)

2.1 Create AC500(-eCo) V3 EtherNet/IP adapter

1. Launch Automation Builder and create a new project “AC500V3_EIP_Adapter.project” with the AC500 V3 PLC PM5650-2ETH as the target.

2. In the device tree, Go to the CPU Parameters tab and change the communication schema to “Realtime onboard Ethernet”. This selection provides high priority to the EtherNet/IP communication.
3. In the device tree, right-click on “ETH1 (IP Setting)” under “Ethernet” object and select “Add object”.

4. Select the “EtherNet/IP Adapter” and click the “Add object” button to continue.

5. The “ENIPAdapterIOTask” and “ENIPAdapterServiceTask” is created automatically under “Task Configuration”.

6. Double click on the “ENIPAdapterIOTask” to open the setting. In this example, change the “Priority” to 10 (this setting is based on user preference).

7. Double click on the “ENIPAdapterServiceTask” to open the setting. In this example, change the “Priority” to 11 (this setting is based on user preference).
AC500 V3 ETHERNET/IP
AC500 AS SCANNER CONNECTED TO ANOTHER AC500 AS ADAPTER

Note: The IEC user program has 17 priorities, from 0 (highest priority) to 15 (lowest priority) runs in the real-time area. The priority 16 is the non-real-time IEC task runs in the non-real-time area.

2.2 Data setup for implicit messaging

In this chapter, you will prepare the data exchange in the AC500 V3 adapter for implicit messaging with the EtherNet/IP scanner.
12 Byte input and 12 Byte output is used in this example. The size of the data exchange can be determined by the user.

1. Right-click on “EtherNet/IP Adapter” under “ETH1 (IP Setting)” object and select “Add object”.
2. At the add object windows, select the “EtherNet/IP Module” and click the “Add object” button to continue.
3. After that, double-click on the “EtherNet/IP_Module” to open the setting. The 12 Byte input and 12 Byte output will be entered into the Consuming Assembly and Producing Assembly respectively.
4. The 12 Byte input is split into these data type.
   - Data In 0, WORD
   - Data In 1, INT
   - Data In 2, DINT
   - Data In 3, REAL

In the Consuming Assembly, click on the “Add” button and enter the data based on the list.
5. Repeat the same step until all the data input is insert into the Consuming Assembly.

6. For Producing Assembly, the 12 Byte output is split into these data type.
   - Data Out 0, WORD
   - Data Out 1, INT
   - Data Out 2, DINT
   - Data Out 3, REAL

In the Producing Assembly, click on the “Add” button and enter the data based on the list. Repeat the step till all data output is insert.

When complete, you should have the list as below.

7. After that, select the “EtherNet/IP Module I/O Mapping” tab, type in the variable name for the data input and data output.

8. Now, create a simple application to simulate the output data.

Open the POU "PLC_PRG" and insert the code as below.

```plaintext
AC500_DataOut_0 := AC500_DataIn_0 + 1;
AC500_DataOut_1 := AC500_DataIn_1 + 5;
AC500_DataOut_2 := AC500_DataIn_2 + 111;
AC500_DataOut_3 := AC500_DataIn_3 + 55.55;
```
2.3 EDS export

A unique EDS (according to the project setup) can be exported and later imported to the EtherNet/IP scanner.

Before exporting the EDS, the product name, product code, major version and minor version can be changed.

1. Double-click on “EtherNet_IP_Adapter (EtherNet/IP Adapter)” under “ETH1 (IP Setting)” object to open the setting, change the product name to “AC500_EIP_Adapter”.

2. As we are using the same computer, click on the “Install to Device Repository...” button to install this EDS into the Automation Builder automatically.
   If the EDS file is needed for another system, click on “Export EDS file...” button and save it to the desired folder.
3. When complete, save the project.

2.4 Download the project to EtherNet/IP adapter

To set-up the communication between the PC and the PLC, e.g., for downloading the compiled program, you have to set-up the communication parameters.

The IP address of your PC must be in the same class as the IP address of the CPU.

The factory setting of the IP address of the CPU is 192.168.0.10.

The IP address of your PC should be 192.168.0.X. Avoid X = 10 in order to prevent an IP conflict with the CPU.

Subnet mask should be 255.255.255.0.

1. Follow the steps below to change the PC IP address.
   a) Open Windows Control Panel. Click “Network and Internet > Network and Sharing Center”.
   b) Click Change adapter settings.
   c) Right-click Local Area Connection (Ethernet) and select Properties.
d) Double-click “Internet Protocol Version 4 (TCP/IPv4)”.  

![Internet Protocol Version 4 (TCP/IPv4) Properties](image)

e) Enter your desired IP address and subnet mask.  
f) Click “OK” to continue.  

Note: If VPN is connected, it might influence the connection to the PLC. We recommend to disconnect from VPN before connecting to the PLC locally.

2. For the AC500 V3 EtherNet/IP adapter, the IP address “192.168.0.11” is used. To change the default IP address, go to Automation Builder menu and select “Tools > IP-Configuration”.

![Automation Builder menu](image)
3. Click on the “Scan” button, it will scan the network and the results will appear in this field.

Select the CPU in the field and insert the IP address, Subnet Mask and Gateway.

- **IP address**: 192.168.0.11
- **Subnet Mask**: 255.255.255.0
- **Gateway**: 192.168.0.1

Ensure the CPU is in “STOP” mode, the click on the “Send settings” button to download the setting.

4. In the Automation Builder device tree right-click “PLC_AC500_V3” and select the “Communication Settings”.

5. Type in the current IP address of the AC500 V3 PLC and select “OK” to implement the needed communications gateway.

6. After that, double-click “PLC_AC500_V3” in the device tree. Select “Communication Settings”.

The selected IP address is shown. To test the connection and/or to see the CPU information press [Enter] or click on the black dot next to the PLC picture.
The black dot will turn green when communication is established.

Logging-in to the CPU will load the project into the AC500 V3 CPU. The first log-in will also load the hardware set-up.

7. In the Automation Builder menu select "Online > Login [PLC_AC500_V3]."

8. Select "Yes" to download the application to the AC500V3 CPU.

PLC is in "stop" mode.

9. Select menu "Debug > Start [PLC_AC500_V3]." Alternatively, select the "start" icon in the tool bar. A pop-up appears, click "OK" to continue. After that, go to menu select "Online > Logout [PLC_AC500_V3]" and manually reboot the CPU.
When CPU reboot is completed, go to menu “Online > Login [PLC_AC500_V3]”. The project is downloaded and the CPU is in RUN mode.

2.5 Create AC500(-eCo) V3 EtherNet/IP scanner

1. Launch the Automation Builder and create a new project “AC500V3_EIP_Scanner.project” with the AC500 V3 PLC PM5650-2ETH as the target.

2. In the device tree, double-click on the CPU. Go to the CPU Parameters tab and change the communication schema to “Realtime onboard Ethernet”. This selection provides high priority to the EtherNet/IP communication.
3. In the device tree, right-click on “ETH1 (IP Setting)” under “Ethernet” object and select “Add object”.

![Image of device tree with right-click on ETH1 (IP Setting)]

4. Select the “EtherNet/IP Scanner” and click the “Add object” button to continue.

![Image of adding object dialog for EtherNet/IP Scanner]

The ENIPScannerIOTask and ENIPScannerServiceTask is created automatically under “Task Configuration”.

![Image of Task Configuration with ENIPScannerIOTask and ENIPScannerServiceTask]

5. Double-click on the “ENIPScannerIOTask” to open the setting. In this example, change the “Priority” to 10 (this setting is based on user preference).

![Image of ENIPScannerIOTask setting dialog with Priority set to 10]
6. Double click on the “ENIPScannerServiceTask” to open the setting. In this example, change the “Priority” to 11 (this setting is based on user preference).

Note: The IEC user program has 17 priorities, from 0 (highest priority) to 15 (lowest priority) runs in the real-time area. The priority 16 is the non-real-time IEC task runs in the non-real-time area.

2.6 Implicit messaging with AC500(-eCo) V3

1. Right-click on “EtherNet_IP_Scanner (EtherNet/IP Scanner)” under “ETH1 (IP Setting)” object and select “Add object”.

2. Select the “AC500V3_EIP_Adapter” and click the “Add object” button to continue.

3. Double-click on the “AC500V3_EIP_Adapter” to open the setting.

4. At the “General” tab, set the device IP address and cross-check the “Electronic Keying”. If the shown revision is different from the AC500(-eCo) V3 EtherNet/IP adapter module, leave the selection box “Check match” empty.
5. Move on to the “EtherNet/IP I/O Mapping” tab, type in the variable name for the data input and data output.

6. Now create a simple application to simulate the output data.

Open the POU “PLC_PRG”, insert the code as below.

```plaintext
AC500_DataOut_0 := AC500_DataIn_0 + 1;
AC500_DataOut_1 := AC500_DataIn_1 + 5;
AC500_DataOut_2 := AC500_DataIn_2 + 111;
AC500_DataOut_3 := AC500_DataIn_3 + 55.55;
```

7. When complete, save the project.
2.7 Download the project to EtherNet/IP scanner

1. In the Automation Builder device tree, right-click “PLC_AC500_V3” and select the “Communication Settings”.

![Communication Settings](image)

2. Keep the default value in the IP address of the CPU or type in the current IP address of the AC500 V3 PLC. If the IP address is unknown, select “…”.

![Pick IP Address](image)

The automatic scan will run and the results will appear in this field.

3. Select the CPU in the field and select “OK” to implement the needed communications gateway.

4. After that, double-click “PLC_AC500_V3” in the device tree. Select “Communication Settings”.

The selected IP address is shown. To test the connection and/or to see the CPU information press [Enter] or click on the black dot next to the PLC picture.

The black dot will turn green when communication is established.
Logging-in to the CPU will load the project into the AC500 V3 CPU. The first log-in will also load the hardware set-up.

5. In the Automation Builder menu select “Online > Login [PLC_AC500_V3]”.

6. Select “Yes” to download the application to the AC500V3 CPU.

PLC is in "stop" mode.
7. Select menu “Debug > Start [PLC_AC500_V3]”. Alternatively, select the “start” icon in the tool bar. A pop-up appears, click “OK” to continue. After that, go to menu select “Online > Logout [PLC_AC500_V3]” and manually reboot the CPU.

8. When CPU reboot is completed, go to menu select “Online > Login [PLC_AC500_V3]”. The project is downloaded and the CPU is in RUN mode. Now you can test the application.