APPLICATION NOTE

AC500 V3 ETHERNET/IP CONFIGURATION (TECHNOLOGY PREVIEW)
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1 Introduction

1.1 Scope of the document

New generation of AC500 PLC’s (V3) support Ethernet/IP as a new communication opportunity. This document describes how to configure the AC500 as scanner mode or adapter mode for Ethernet/IP communication.

1.2 Compatibility

The application example explained in this document have been used with the below engineering system versions. They should also work with other versions, nevertheless some small adaptations may be necessary, for future versions.

- AC500 V3 PLC (PM5630-2ETH, PM5650-2ETH, PM5670-2ETH and PM5675-2ETH)
- Automation Builder 2.4.1 or newer

1.3 Overview

The overview of the system is explained in the image below where it is demonstrating the AC500 V3 in Ethernet/IP Scanner and Ethernet/IP Adapter protocol.
2 AC500 V3 Ethernet/IP Setup

This chapter describes how Ethernet/IP adapter and Ethernet/IP Scanner are configure in the AC500 V3 controller.

2.1 Ethernet Port Setup

Configure the communication to the PLC via Ethernet (TCP/IP).

After that, go to ETH1 properties > General tab, assign the Interface to ETH1 by click on the “…” button and select the network interface.

Repeat the same step for ETH2.
2.2 Communication Schema

Go to the CPU Parameters tab and change the communication schema to “Realtime onboard Ethernet”

This give very high priority to the Ethernet/IP communication.

2.3 Ethernet/IP Adapter Setup

At the left of the Automation Builder “Devices” windows, right click on “ETH1 (IP Setting)” under “Ethernet” object and select “Add object”.

At the add object windows, select the “Ethernet/IP Adapter” and click the “Add object” button to continue.
The “ENIPAdapterIOTask” and “ENIPAdapterServiceTask” is created automatically under “Task Configuration”.

The “ENIPAdapterIOTask” is control/handle the Implicit (I/O data) Connections.

User can edit the “ENIPAdapterIOTask” priority and interval according to the need. The interval setting is related to the RPI setting in the Scanner Connections.

The “ENIPAdapterServiceTask” is control/handle the Explicit Messaging Connections.

In the “ENIPAdapterServiceTask” setting, user can change the priority and interval base on the requirement.

### 2.4 Data Exchange Setup in Adapter

Right click on “Ethernet/IP Adapter” under “ETH1 (IP Setting)” object and select “Add object”.

At the add object windows, select the “Ethernet/IP Module” and assign the object name, example - “EIP_WordIn_01”. After that, click the “Add object” button to continue.

Note: The data type is not indicated at the object display, therefore it is a good practice to name the “Ethernet/IP Module” base on the data type.

Double click on the “Ethernet/IP Module” to open the setting, at the “General” tab change the “Module” to the required data type.

At the “Ethernet/IP Module I/O Mapping” tab and assign the variable name, example: “Data_EIP_WordIn_01”.

![EIP_WordIn_01](attachment:image)

At the “Ethernet/IP Module I/O Mapping” tab and assign the variable name, example: “Data_EIP_WordIn_01”.

![EIP_WordIn_01](attachment:image)
Multiple “Ethernet/IP Module” can be created under the “Ethernet/IP Module”.

CAUTION!
In this technology preview, the AC500 V3 Ethernet/IP Adapter only support connection type “Exclusive Owner”. Others connection type (Input Only, Listen Only and Rack Connection) is not supported.

Note: The data exchange setup in this technology preview is complex. In the future release, the setup will be simplified.

The picture above is for reference only and subject to change without notice and should not be construed as commitment by ABB Inc.
2.5 EDS Export for Ethernet/IP Adapter

When the AC500 V3 Ethernet/IP Adapter setup is completed, a unique EDS (according to the project) can be export and later import to the Ethernet/IP Scanner.

Before export the EDS, the product name, product code, major version and minor version can be change.

After change, user need to close the windows and re-open before the EDS can be export.

![EDS Export for Ethernet/IP Adapter](image)

Note: Multiple AC500 V3 Ethernet/IP Adapter in the same network with different configuration, the "Product code" need to be unique and different "Product name" will help to recognize in the Ethernet/IP network.

Example: 2 AC500 V3 Ethernet/IP Adapter on the network with different configuration, the name and code are assigned as below.

- PLC 1
  - Product name: AC500_EIP_12001, Product code: 12001
- PLC 2
  - Product name: AC500_EIP_12002, Product code: 12002
2.6 Install EDS into Automation Builder

To use the AC500 V3 Ethernet/IP Adapter as I/O device under the Ethernet/IP Scanner, user need to import the EDS into the system.

EDS can be installed via the “Device Repository”.

2.7 Ethernet/IP Scanner Setup

At the left of the Automation Builder “Devices” windows, right click on “ETH1 (IP Setting)” under “Ethernet” object and select “Add object”.

At the add object windows, select the “Ethernet/IP Scanner” and click the “Add object” button to continue.
The “ENIPScannerIOTask” and “ENIPScannerServiceTask” is created automatically under “Task Configuration”.

The “ENIPScannerIOTask” is control/handle the Implicit (I/O data) Connections. User can edit the “ENIPScannerIOTask” priority and interval setting according to the need. The interval setting is related to the RPI setting in the Scanner Connections.

The “ENIPScannerServiceTask” is control/handle the Explicit Messaging Connections. In the “ENIPScannerServiceTask” setting and user can change the priority and interval base on the requirement.

2.8 Add AC500 V3 Ethernet/IP Adapter to Scanner

To communicate between the Ethernet/IP Scanner and Ethernet/IP Adapter, user need to have the EDS from the Ethernet/IP Adapter install and add under the Scanner configuration. To add the Ethernet/IP Adapter under the scanner configuration, right click on “EtherNet_IP_Scanner (Ethernet/IP Scanner)” under “ETH1 (IP Setting)” object and select “Add object”, then add the AC500 V3 Ethernet/IP Adapter.

The device IP address need to be set and select the “Electronic Keying” options set at the “General” tab.

Note: Electronic Keying signatures are used to identify the device. When the scanner starts, it compares each selected electronic keying value with the corresponding information in the device.
Note: The Electronic Keying options will be simplified in the future release.

The picture above is for reference only and subject to change without notice and should not be construed as commitment by ABB Inc.

At the “Connections” tab, user can change connection type.

CAUTION!
In this technology preview, the AC500 V3 Ethernet/IP Adapter only support connection type “Exclusive Owner”. Others connection type (Input Only, Listen Only and Rack Connection) is not supported. It will be support in the next version.

Before selecting the connection type, which you need to understand feature.

- Exclusive Owner: Exclusive owner is bidirectional connection for input and output data to the target device and sends configuration data to define behavior and begin operation.
- Input Only: Input-only connections allow a scanner to receive input data from the target device. Multiple owners are supported with input-only connection, they must have the identical configuration for that target device. The first owner to establish a connection with the target device sends the configuration data.
- Listen Only: Listen-only connections allow a scanner to receive data from an I/O module without being the owner.
- Rack Connection: Rack-connection is limited to the basic input and output data to optimize the number of connections to the target device.
Every I/O device in the Ethernet/IP system must be owned by an Ethernet/IP Scanner.
- The owner sends configuration data to the module to define behavior and begin operation.
- Each module must maintain communications with a minimum of one owner to continue operation.
- If the connection between the owner and the target device is broken, all listen-only connections are also lost.
- For multiple input-only connections, if an owner breaks its connection with the target device, it will continue to multicast data because of the connection maintained by an alternate owner.

Variables can be mapped at the “Ethernet/IP I/O Mapping” tab.

2.9 Add ACS380 with FENA-21 to Scanner

The FENA-21 adapter module needs to be installed at the ACS380 Drive according to the FENA-01/11/21 Ethernet Adapter Module user manual which can be downloaded from ABB website (https://new.abb.com/drives/connectivity/fieldbus-connectivity).

The table below gives the recommended drive parameter settings for Ethernet/IP.

<table>
<thead>
<tr>
<th>Drive parameter</th>
<th>Setting for ACS380 drives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.01 FBA A enable</td>
<td>Enable</td>
<td>Enables communication between the drive and the fieldbus adapter module.</td>
</tr>
<tr>
<td>50.02 FBA A comm loss func</td>
<td>1Fault</td>
<td>Enables fieldbus A communication fault monitoring.</td>
</tr>
<tr>
<td>50.03 FBA A comm loss t out</td>
<td>3.0 s</td>
<td>Defines the fieldbus A communication break supervision time.</td>
</tr>
<tr>
<td>50.04 FBA A ref1 type</td>
<td>Speed</td>
<td>Selects the fieldbus A reference 1 type and scaling.</td>
</tr>
<tr>
<td>51.01 FBA A type</td>
<td>ETHERNET</td>
<td>Displays the type of the fieldbus adapter module.</td>
</tr>
<tr>
<td>51.02 Protocol/Profile</td>
<td>EIP AC/DC</td>
<td>Selects the Ethernet/IP protocol and the ODVA AC/DC drive profile.</td>
</tr>
<tr>
<td>Drive parameter</td>
<td>Setting for ACS380 drives</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>51.03 Commrate</td>
<td>Auto</td>
<td>Ethernet communication rate is negotiated automatically by the device.</td>
</tr>
<tr>
<td>51.04 IP configuration</td>
<td>Static IP</td>
<td>Configuration will be obtained from configuration parameters 05...13.</td>
</tr>
<tr>
<td>51.05 IP address 1</td>
<td>192</td>
<td>First part of the IP address</td>
</tr>
<tr>
<td>51.06 IP address 2</td>
<td>168</td>
<td>Second part of the IP address</td>
</tr>
<tr>
<td>51.07 IP address 3</td>
<td>0</td>
<td>Third part of the IP address</td>
</tr>
<tr>
<td>51.08 IP address 4</td>
<td>12</td>
<td>Last part of the IP address</td>
</tr>
<tr>
<td>51.09 Subnet CIDR</td>
<td>24</td>
<td>Sets the network mask as 255.255.255.0, allowing access only to the last subnet.</td>
</tr>
<tr>
<td>51.23 ODVA speed scale</td>
<td>128</td>
<td>Sets the scaling for the ODVA speed reference.</td>
</tr>
<tr>
<td>52.01 FBA data in1</td>
<td>01.07[F]</td>
<td>Motor current</td>
</tr>
<tr>
<td>52.03 FBA data in3</td>
<td>01.10[F]</td>
<td>Motor torque</td>
</tr>
<tr>
<td>52.05 FBA data in5</td>
<td>01.11[F]</td>
<td>DC voltage</td>
</tr>
<tr>
<td>52.07 FBA data in7</td>
<td>05.11[F]</td>
<td>Inverter temperature</td>
</tr>
<tr>
<td>52.09 FBA data in9</td>
<td>04.01[16]</td>
<td>Tripping fault</td>
</tr>
<tr>
<td>52.10 FBA data in10</td>
<td>04.11[16]</td>
<td>Latest fault</td>
</tr>
<tr>
<td>53.01 FBA data out1</td>
<td>23.12[F]</td>
<td>Acceleration time 1</td>
</tr>
<tr>
<td>53.03 FBA data out3</td>
<td>23.13[F]</td>
<td>Deceleration time 1</td>
</tr>
<tr>
<td>53.05 FBA data out5</td>
<td>22.26[F]</td>
<td>Constant speed 1</td>
</tr>
<tr>
<td>53.07 FBA data out7</td>
<td>22.27[F]</td>
<td>Constant speed 2</td>
</tr>
<tr>
<td>53.09 FBA data out9</td>
<td>22.28[F]</td>
<td>Constant speed 3</td>
</tr>
<tr>
<td>51.27 FBA A par refresh</td>
<td>Refresh</td>
<td>Validates the FENA-21 configuration parameter settings.</td>
</tr>
<tr>
<td>20.01 Ext1 commands</td>
<td>Fieldbus A</td>
<td>Selects the fieldbus A interface as the source of the start and stop commands for external control location 1.</td>
</tr>
<tr>
<td>22.11 Speed ref1 source</td>
<td>FB A ref1</td>
<td>Selects the fieldbus A reference 1 as the source for speed reference 1.</td>
</tr>
</tbody>
</table>

When the ACS380 Drive is setup, the user needs to install the EDS into Automation Builder via the “Device Repository”.

- EDS files are available from the ABB website (https://new.abb.com/drives/connectivity/fieldbus-connectivity).
- User can also generate the EDS file from the Drive Composer Pro software.
When EDS is installed, user can right click on “EtherNet_IP Scanner (Ethernet/IP Scanner)” under “ETH1 (IP Setting)” object and select the “Add object” then add the device “AC380 with FENA”.

The device IP Address need to be set and select the Electronic Keying options set at the “General” tab.

At the “Connections” tab, user need to delete the existing connection.

After that, add the connection “121/171 Enhanced Speed Control plus Drive Parameters”.

The ACS380 drive variables can be mapped at the “Ethernet/IP I/O Mapping” tab.
3 Ethernet/IP Services

3.1 Get Attribute

“Get_Attribute_Single” and “Get_Attribute_All” is to query the attribute of a certain instance of a Common Industrial Protocol (CIP) object.

Before proceeding, user need to know the Class, Instance and Attribute of the Ethernet/IP device. Example for ACS380, user can obtain the information via the FENA-21 user manual.

To access the ACS380 drive parameter group, the class is always 144 (16#90).

For example, Parameter 05.03 (Hours Run) is accessed as follows:

- Class = 144 = 16#90
- Instance = 05 = 16#05
- Attribute = 3 = 16#03

3.2 Set Attribute

“Set_Attribute_Single” and “Set_Attribute_All” is to set the attribute of a certain instance of a Common Industrial Protocol (CIP) object.

Before proceeding, user need to know the Class, Instance and Attribute of the Ethernet/IP device. Example for ACS380, user can obtain the information via the FENA-21 user manual.

To access the ACS380 drive parameter group, the class is always 144 (16#90).

For example, Parameter 22.29 (Constant Speed 4) is accessed as follows:

- Class = 144 = 16#90
- Instance = 22 = 16#16
- Attribute = 29 = 16#1D
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