EtherNet/IP Adapter for SIMATIC

S7-1200/ S7-1500/ EtherNet/IP

https://support.industry.siemens.com/cs/ww/en/view/109782315

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Table of contents

1 Preface

Purpose

This document contains information about the LCCF_EnetAdapter function block for SIMATIC S7-1200 and S7-1500. It will explain its usage and parameterization as well as provide some basic background information about the implemented services defined by the ODVA®.

Core content

The following core issues are covered in this document:

- Purpose of the function block
- Parameterization
- Data exchange with EtherNet/IP scanner based on SIMATIC scanner and Rockwell scanner

Required basic knowledge

General knowledge in communications over Ethernet, programming and configuring the S7-1200 or S7-1500 with the TIA Portal is assumed and will not be part of this document. It is also assumed that the terms Server and Client and their meaning are familiar to the reader. Furthermore, the reader shall be proficient in the technology of PROFINET as several concepts will be referred to.

As the configuration procedures for EtherNet/IP scanners of different vendors differ from each other, this document does not assume completeness in this regard. The read shall refer to the manuals of the specific scanner to learn how to parameterize and configure the scanner functionality for their system.

Delimitation

The document does not describe:

- How to setup Ethernet networks
- How to assign IP addresses and the split into subnets
- How to configure the controllers in this example
- How to configure the LCCF_EnetScanner function block for SIMATIC S7
- How to take network traces and/ or analyze network traffic

Basic knowledge about the above topics is assumed

Validity

This document is valid for the following components

- TIA Portal
- SIMATIC S7 Controller

The following hardware and software are used throughout this document:

Table 1-1: used components

Name	Part number	Version
SIMATIC S7-1215C	6ES7 215-1AG40-0XB0	V4.2 (or above)
SIMATIC S7-1512C	6ES7 512-1CK00-0AB0	V2.6 (or above)
TIA Portal STEP7 Prof.		V15.1 Update 5
Rockwell Studio 5000		V32.13
Allen-Bradley CompactLogix	L27ERM-QBFC1B	V32.13

In this application example the S7-1200 is operated as EtherNet/IP Adapter, while the S7-1500 is operated as EtherNet/IP Scanner. A configuration for an Allen-Bradley CompactLogix operating as EtherNet/IP scanner is also described.

The application example for the LCCF_EnetScanner function block can be downloaded using the SIOS ID: 109782314

https://support.industry.siemens.com/cs/ww/en/view/109782314

2 Introduction

2.1 Description

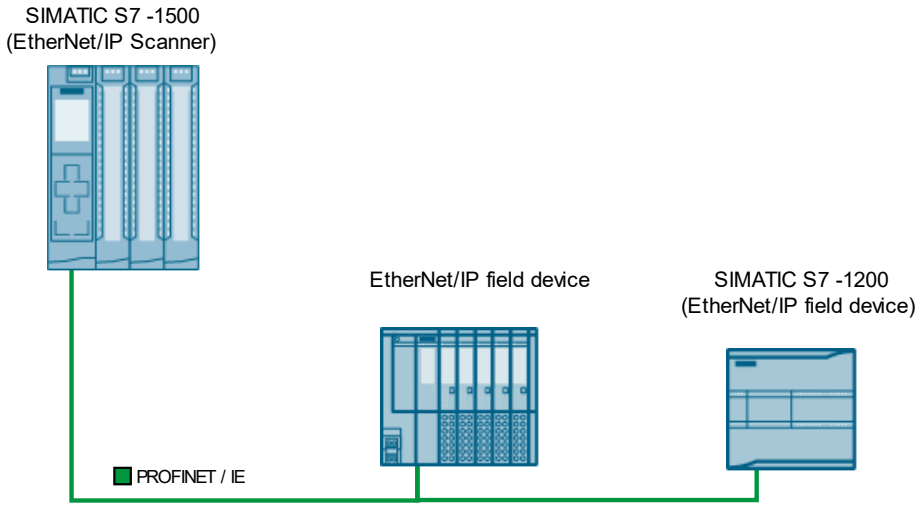
Although, according to the number of installed nodes PROFINET is the largest Ethernet based fieldbus in the world, EtherNet/IP is at number 3. Especially in several regions of the world EtherNet/IP has a dominating role. SIMATIC controller inherently don't have support for field devices using EtherNet/IP nor can they act as EtherNet/IP field device.

In this application example a possible solution is demonstrated and explained, how such EtherNet/IP field devices can still be emulated with SIMATIC controller. Here the term SIMATIC controller applies to both S7-1500 and S7-1200.

In this example the S7-1200 will be operated as such EtherNet/IP field device. The S7-1500 shown in the below schematic is operated as the device controlling the field devices.

NOTE The roles of the S7-1200 and S7-1500 can be exchanged without changes in the description as the LCCF_EnetAdapter function block exists for both systems.

Figure 2-1:simplified setup



As mentioned above the ET 200SP MF and the S7-1200 controller are operated as field devices providing sensor signals to the S7-1500 controller and accepting control signals from the S7-1500.

The real setup also contains a SCALANCE X208 switch for easier connectivity. However, the switch is not necessary as a line topology (as shown above) is also possible.

2.2 EtherNet/IP

Even though in the above schematic setup the cables are named with PROFINET/ IE, any other Ethernet based protocol can co-exist on the same network. Especially if such protocol uses IP as networking protocol and either TCP or UDP as transport protocol.

EtherNet/IP is such a protocol. It is Ethernet based (IEEE 802.3) and uses IPv4 as networking protocol as well as TCP and UDP as its transport protocol. EtherNet/IP is an open standard maintained by the ODVA® (Open DeviceNet Vendor Association). Yet it should not be mixed up with so called TCP native/ socket communications.

EtherNet/IP is a best effort approach to achieve higher performance and lower jitter compared to regular TCP communications while maintaining maximum interoperability to the other TCP or UDP based communication protocols.

The IP in the name EtherNet/IP is not to be mixed up with IPv4. It is an abbreviation for CIP (Common Industrial Protocol). This CIP is embedded into the payload of the TCP or UDP packets used to exchange data between two or more devices.

The devices creating an EtherNet/IP network are called:

- Scanner, which are scanning the network. They are collecting the information, such as sensor data, from the other field devices. In PROFINET terms this would be equivalent to a Controller or a Master on other networks.
- Adapter, which are providing such sensor data to the Scanner. The adapters translate the EtherNet/IP protocol into a proprietary intra device protocol. They adapt the protocols. The PROFINET equivalent term is Device or Slave on other networks.

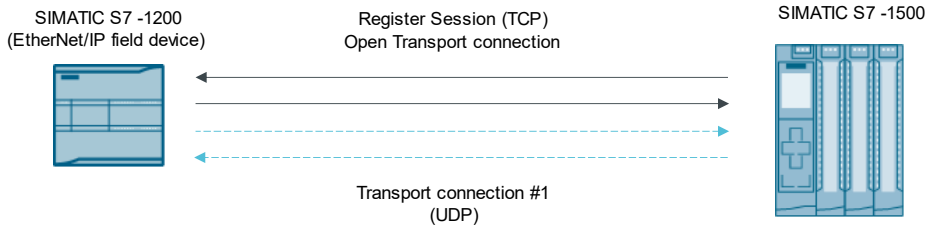
As the Open User Communication allows a SIMATIC programmer to create the payload for packets send via UDP or TCP, the SIMATIC can implement the necessary features and functions to provide EtherNet/IP as loadable function block. This functionality can be used with any Open User Communication capable interface of the SIMATIC, such as integrated PROFINET ports as well as Industrial Ethernet CMs and CPs.

2.3 Function principle

The application example demonstrates the necessary steps to configure the SIMATIC S7-1200 to operate as EtherNet/IP Adapter with the help of the LCCF_EnetAdapter function block.

The communication will use both transport protocols mentioned above. The Adapter is configured to exchange data with a single Scanner using a single I/O connection (shown as dashed lines).

Figure 2-2 schematic functional principle



The communication is established by the Scanner using a TCP connection. After registering the Scanner with the Adapters, a transport connection is negotiated with each of the Adapters. Once this is successfully done, the transport connection is opened, and the data exchange takes place using UDP datagrams.

There are two more terms associated with EtherNet/IP.

- Originator: is the device, which initiates the transport connection. This is typically the Scanner.
- Target: is the device, which accepts the transport connection. This is typically the Adapter.

In this application example the transport connection uses UDP transport and unicast communications. With EtherNet/IP the target may also vote for a multicast connection. The target would then send the sensor data to many devices (incl. the originator) instead of only to the originator.

NOTE In this application example the terms Adapter and Target as well as Originator and Scanner are used as synonyms. This is correct for this application example. In other scenarios this might not hold true anymore.

2.4 Scope of delivery

The application example consists of this document and a TIA Portal project as well as two EDS files (S7-1200.eds and S7-1500.eds).

The program in the TIA Portal program can be easily adopted into a "S7-1500 as Adapter" scenario, as the LCCF_EnetAdapter function block uses the identical parameterization.

The parameterization for the Scanner is not in focus of this document.

3 Commissioning

3.1 Preparation

As preparation for the application example to function, the above-mentioned hardware components should be placed into a rack or on a solid table to prevent slip or fall.

WARNING	**Risk of electric shock** To operate this application example the connection of the above hardware to electrical power is required. Disregarding local regulations and common sense may cause an electric shock and because of that injury or death. Always follow the rules for working with electrical equipment. If in doubt, have someone familiar with these rules and regulations set up the hardware for you.

Download the TIA Portal project and store it on your mass storage, where you can easily access it.

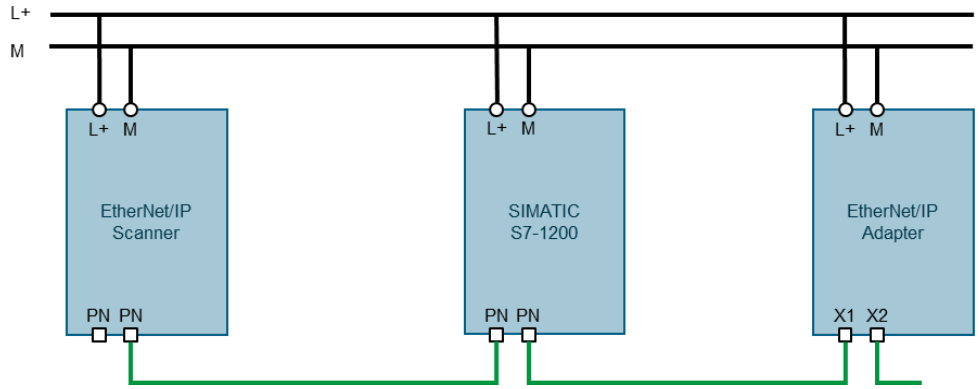
3.2 Connecting the hardware components

As mentioned above please observe electrical guidelines and rules when connecting power to the components, which is the first step to take. Switching the power on is always the last.

Secondly setup the Ethernet cables. There are two options to do that.

The first option is the Line topology as shown below:

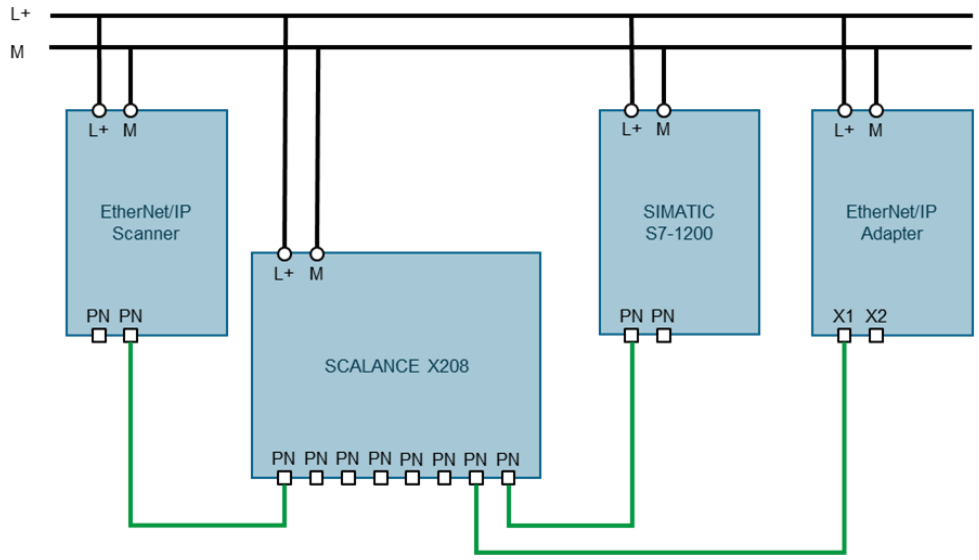
Figure 3-1: Line topology setup



NOTE The line topology is an easy to setup topology. Although it does not allow network debugging as easy on a protocol level.

Another topology is the star topology, which in the application example is used. It is shown in the next schematic.

Figure 3-2: Star topology setup



NOTE

The star topology is using a network switch as the center point. If the used switch allows port mirroring/ port spawning network protocol analysis is much easier.

In this document some network traces will be shown to illustrate the explained mechanisms.

Network traces are taken used the application Wireshark®.

4 Configuration/Engineering

4.1 Creating and managing projects

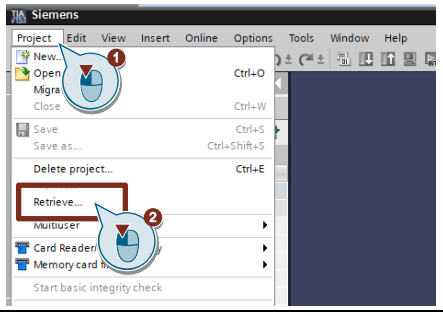
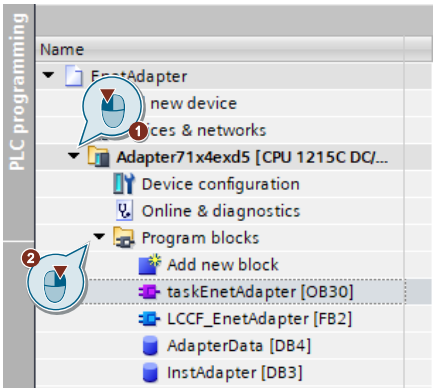
To follow along with this application example the TIA Portal project and the EDS files should have been downloaded from SIOS.

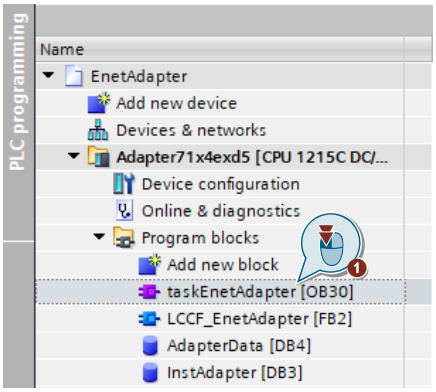
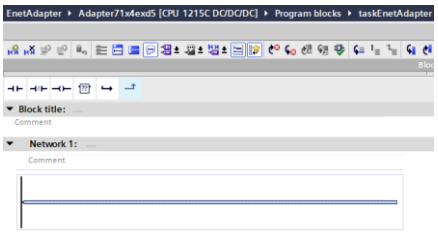
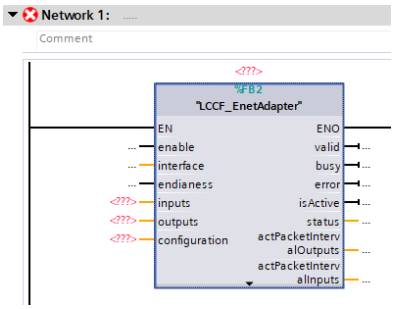
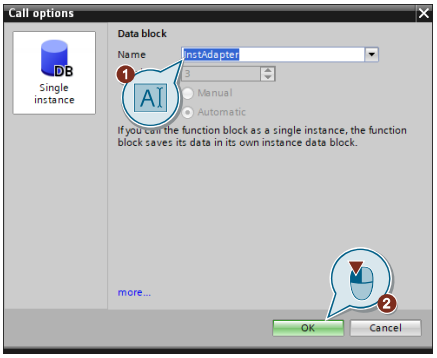
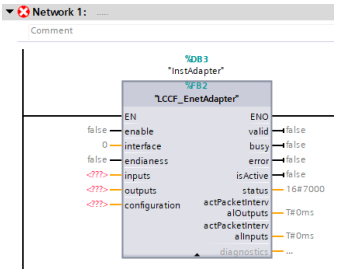
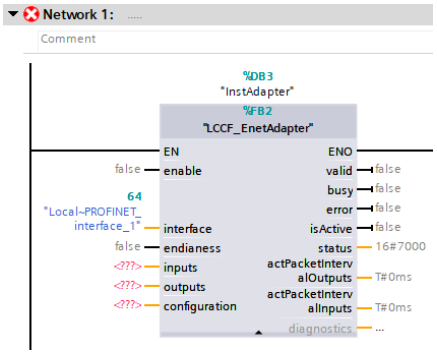
NOTE

A new TIA Portal project may also be created as it allows to adopt the hardware platform accordingly.

However, it is not part of this document to explain the setup of the hardware being used as EtherNet/IP Adapter.

Table 4-1: Configuration instructions – part 1

Step	Instruction	Result
1.	Start TIA Portal.	
2.	Retrieve the downloaded TIA Portal project (EnetAdapter.zap15_1). 	This will extract the compressed TIA Portal archive into a folder of your selection.
3.	Open the contained SIMATIC S7-1200 controller. 	You will see the function block LCCF_EnetAdapter in the program folder as well as two data blocks. • AdapterData • InstAdapter You will also see a Cyclic Interrupt OB.

Step	Instruction	Result
4.	Open the existing OB "taskEnetAdapter" with a double-click on it. 	The block opens in the editor. 
5.	Place a call to the LCCF_EnetAdapter onto the network.  TIA Portal will request an instance DB. Type in the name of the existing instance DB or select it from the drop-down list. 	As the result the block call is placed with the instance DB. In this example the instance DB is named "InstAdapter". 
6.	Assign the interface you want to use to the actual parameter of the block call. 	Here the integrated PROFINET interface used. Although any OUC capable interface is possible.

NOTE

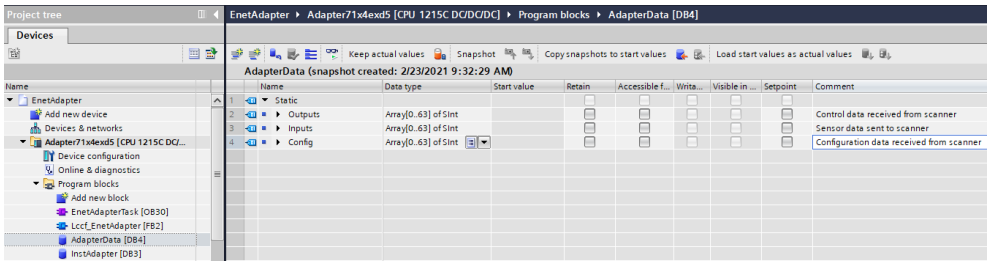
It is recommended to use the TIA Portal maintained global constants for the interface identifier. Otherwise, the function block may not work properly.

However, any Open User Communication (OUC) capable interface may be used, including Industrial Ethernet CM or CP extension cards.

At this point the LCCF_EnetAdapter function block is not operable. An area to store control-, sensor- and configuration data for the EtherNet/IP adapter needs to be declared.

For this the provided data block "AdapterData" contains already areas, which can be easily adopted to application needs.

Figure 4-1: data exchange area declaration in "AdapterData"



In this application example the following data will be exchanged with the scanner.

Table 4-2: data exchange are a description

Name	Type	Direction	Description
Outputs	Array[0..63] of Sint	read	In this data area the control/ output signals from the scanner's point of view are stored. For the adapter these values represent readable variables.
Inputs	Array[0..63] of Sint	write	This area stores sensor/ input signals from the scanner's point of view. The adapter writes values into this area.
Config	Array[0..63] of Sint	read	This area stores data, which are transferred acyclic. They represent a data set, which can be used for several different purposes. The adapter reads them.

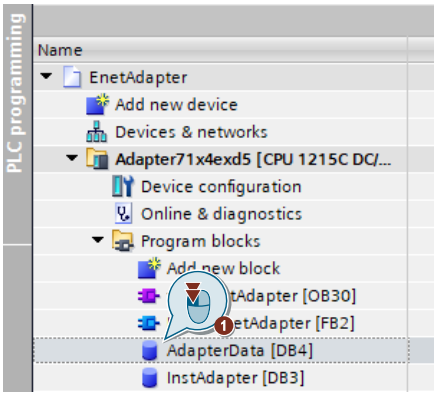
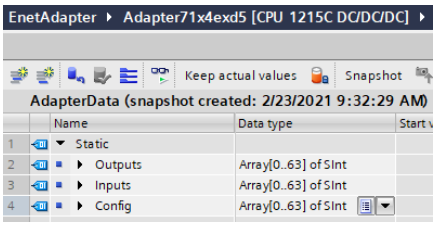
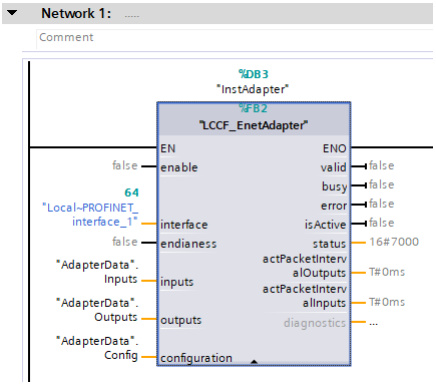
NOTE

The definition of this data exchange area is, that it should contain data, which are being used to configure the application. The LCCF_EnetAdapter does not make use of any of these data.

Even though the Config data are transferred acyclic, their meaning is undefined. This means they may also contain process values sent from the scanner.

The completed configuration for the LCCF_EnetAdapter block is achieved, when following the next instructions.

Table 4-3: Configuration instructions – part 2

Step	Instruction	Result
1.	Open a data block (in this document the provided data block is used). 	You see three data areas. Each of it of 64 Sint in size. 
2.	Review the size and data type of the data exchange areas not to exceed the maximum possible values and are of the valid data types.	Maximum sizes are: • Outputs: 496 Sint • Inputs: 500 Sint • Config: 500 Sint Valid data types for array elements are: • Sint • Int • Dint • Real
3.	Assign the parameters to the LCCF_EnetAdapter block. 	

4.2 Configure the EtherNet/IP Scanner

As in PROFINET or PROFIBUS there is a managing device in an EtherNet/IP network. In this application example it is realized by the S7-1500. The managing system is called the Scanner.

For the Scanner to know, which managed devices, called Adapters, are in the scope, it requires some information. This information is describing the parameters of the data exchange. They contain as minimum:

- Addressing information of the Adapter
- Update rates for both Inputs and Outputs
- Amount of data to be exchanged

Other EtherNet/IP scanner configuration system use different methods but will always refer to the above-mentioned minimum information.

There are two possibilities to provide the required information to the scanner's engineering system:

- Import a description file
- Manually enter the necessary information

In the first case such description file needs to contain the required information and it needs to be standardized. Like a GSD file for PROFIBUS or PROFINET (GSDML) on EtherNet/IP these files are called Electronic Data Sheet (EDS). This document explains in a condensed way the structure and the meaning of specific information of an EDS file in the following chapter.

The second possible way to enter the necessary information is to manually enter them into the respective engineering system. This is obviously unique to every engineering system.
For the configuration EtherNet/IP refer to the SIOS entry for the LCCF_EnetScanner block with SIOS ID: 109782314

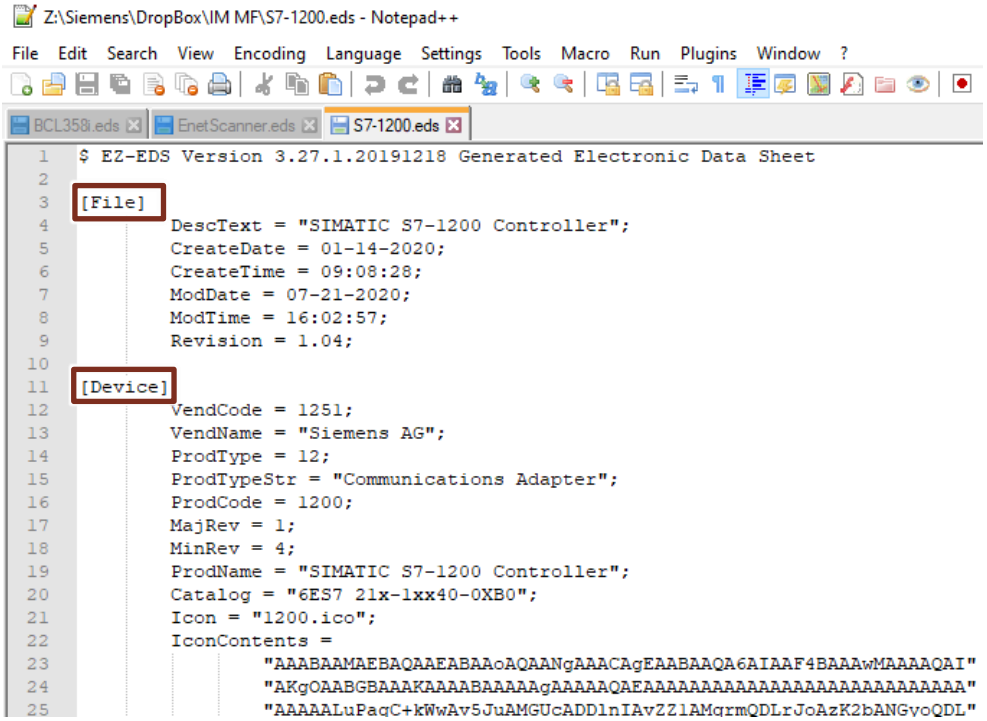
https://support.industry.siemens.com/cs/ww/en/view/109782314

This document shows how to configure the SIMATIC S7-1200 or S7-1500 as EtherNet/IP adapter in the Rockwell Automation engineering system Studio 5000. Both methods will be described.

4.2.1 EDS files

The EDS file format is standardized by the ODVA® and is text based and human readable. It contains several clusters of information. These clusters are called segments. They are identified by their name and marked by '[' and ']' characters (squared brackets).

Figure 4-2: EDS file for S7-1200



Throughout this document the marked areas will be called sections. The sections contain assignments to items.

The Adapter description required for the EtherNet/IP scanner, is mostly taken from such EDS files. In the following this document explains, which sections and items are relevant to a scanner and therefore, necessary to be entered into the engineering system.

After that the procedure is shown for Rockwell Automation's Studio 5000 engineering system.

Device parameters

The device describing parameters are relevant for the Scanner, as it uses this information to verify the real existing device against the configured device. In case there is a mismatch the operation of this device is not started.

Such information is:

- vendorIdentifier, in the EDS file called "VendCode" is an ODVA® assigned number to the manufacturer of this device.
- productType, in the EDS file called "ProdType" is a standardized number identifying the type of the device.
- productCode, the "ProdCode" called number identifies this product together with its type and vendor ID.
- revisionMajor, the major revision number, together with the minor revision number serves the purpose of compatibility check.
- revisionMinor, as above serves the minor revision number the purpose of a compatibility check.

They can be found at the section [Device] as shown in the below figure.

Figure 4-3: EDS file [Device] section

```
11  [Device]
12          VendCode = 1251;
13          VendName = "Siemens AG";
14          ProdType = 12;
15          ProdTypeStr = "Communications Adapter";
16          ProdCode = 1200;
17          MajRev = 1;
18          MinRev = 4;
19          ProdName = "SIMATIC S7-1200 Controller";
20          Catalog = "6ES7 21x-1xx40-0XB0";
21          Icon = "1200.ico";
22          IconContents =
```

Further parameters are taken from different other sections of the EDS file.

Data sizes and update times

In the [Params] section, several parameter sets are defined, which are used later in the EDS file.

The relevant information in this section for the configuration of the scanner are:

- Update interval
- Size of Inputs, Outputs and Configuration data

Figure 4-4 [Params] section RPI and Input Data and Output Data size

```
[Params]
        Param3 =
                0,                      $ reserved, shall equal 0
                ,,                      $ Link Path Size, Link Path
                0x0020,                 $ Descriptor
                0xC8,                   $ Data Type
                                        $ Data Size in bytes
                "RPI",                  $ name
                "microseconds",         $ units
                "Requested Packet Interval",    $ help string
                10000,20000000,25000,   $ min, max, default data values
                ,,,,                    $ mult, div, base, offset scaling
                ,,,,                    $ mult, div, base, offset links
                ;                       $ decimal places
        Param101 =
                0,                      $ reserved, shall equal 0
                ,,                      $ Link Path Size, Link Path
                0x0000,                 $ Descriptor
                0xC7,                   $ Data Type
                                        $ Data Size in bytes
                "inputDataSize",        $ name
                "USint",                $ units
                "Input Data Size in USint",     $ help string
                0,502,64,               $ min, max, default data values
                ,,,,                    $ mult, div, base, offset scaling
                ,,,,                    $ mult, div, base, offset links
                ;                       $ decimal places
        Param102 =
                0,                      $ reserved, shall equal 0
                ,,                      $ Link Path Size, Link Path
                0x0000,                 $ Descriptor
                0xC7,                   $ Data Type
                                        $ Data Size in bytes
                "outputDataSize",       $ name
                "USint",                $ units
                "Output Data Size in USint",    $ help string
                0,502,64,               $ min, max, default data values
                ,,,,                    $ mult, div, base, offset scaling
                ,,,,                    $ mult, div, base, offset links
                ;                       $ decimal places
```

In the above shown figure the parameter, marked with 1 describes the RPI called "Requested Packet Interval" or update rate in µs.

The update rates in the range between 10.000µs (10ms) and 20.000.000µs (20s) are valid for this device. The default setting is 25.000µs (25ms).

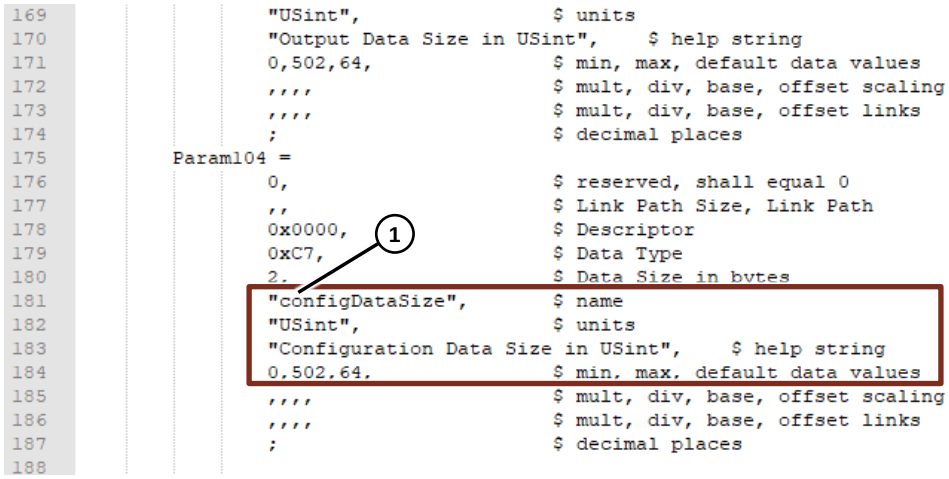
The parameter Param101 marked with 2 describes the size of the Input data in Bytes. The valid range is in between 0 Bytes and 502 Bytes, where the default is set to 64 Bytes.

The parameter Param102 marked with 3 describes the size of the Output data in Bytes. The valid range is in between 0 Bytes and 502 Bytes, where the default is set 64 Bytes.

NOTE The maximum size of 496 Bytes is a limitation given by the ODVA® specification for EtherNet/IP. Added by 6 further bytes for a header providing validity information it forms the provided 502 Bytes as a maximum size. This limitation is introduced for compatibility reasons to ControlNet, which is another network using the same communication mechanisms defined in CIP as EtherNet/IP.

Further down in the [Params] section you will find the other relevant information for the configuration data size. They are shown in the below figure.

Figure 4-5: [Params] section and Configuration Data size



Same as in the previous figure the with 1 marked area shows the relevant parameter Param104. In here the size of the configuration data is provided.

NOTE The values for RPI and I/O sizes from the EDS file provide a valid range. The user can choose any value in between the minimum and maximum possible value.

The above retrieved values are to be entered into the appropriate positions of the adapter description in the respective engineering system, if it cannot import the EDS files provided with this application example.

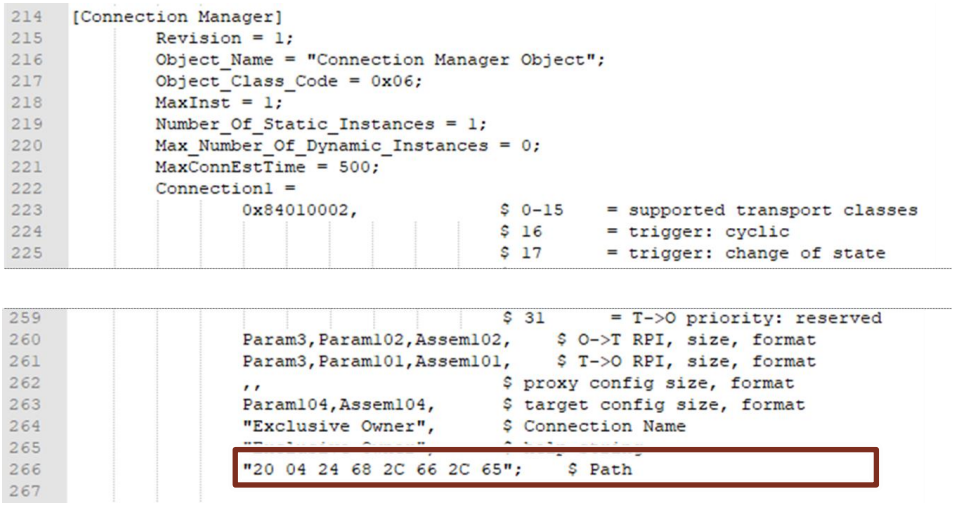
NOTE The Output direction is also called the "Originator To Target" direction (short OT direction), while the Input direction is called the "Target To Originator" direction (short TO direction).

AssemblyID and Connection Point IDs

They are called the Assembly instances, AssemblyIDs, or pointIdentifier. The EDS file contains them in a somewhat cryptic way in the [Connection Manager] section.

In the below shown figure the with "Path" commented line (line 266) is of particular interest as it contains the access path to the assembly objects.

Figure 4-6 [Connection Manager] section AssemblyIDs

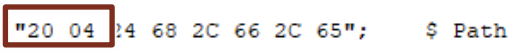


```
214  [Connection Manager]
215          Revision = 1;
216          Object_Name = "Connection Manager Object";
217          Object_Class_Code = 0x06;
218          MaxInst = 1;
219          Number_Of_Static_Instances = 1;
220          Max_Number_Of_Dynamic_Instances = 0;
221          MaxConnEstTime = 500;
222          Connection1 =
223                  0x84010002,             $ 0-15    = supported transport classes
224                                          $ 16      = trigger: cyclic
225                                          $ 17      = trigger: change of state
...
259                                          $ 31      = T->O priority: reserved
260                  Param3,Param102,Assem102,    $ O->T RPI, size, format
261                  Param3,Param101,Assem101,    $ T->O RPI, size, format
262                  ,,                          $ proxy config size, format
263                  Param104,Assem104,          $ target config size, format
264                  "Exclusive Owner",          $ Connection Name
265
266                  "20 04 24 68 2C 66 2C 65";    $ Path
267
```

The access path is a series of hexadecimal numbers, which follows a specified format.

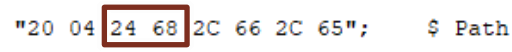
This series is split into segments which are in the order of:

1. Class Segment (ID: 20hex) addressing the Assembly class (ClassID = 04hex)

   ```
   "20 04 24 68 2C 66 2C 65";    $ Path
   ```

2. Instance Segment (ID 24hex or 25hex) addressing the Configuration Assembly (68hex = 104dec)

   ```
   "20 04 24 68 2C 66 2C 65";    $ Path
   ```

3. Connection Point Segment (ID 2Chex or 2Dhex) addressing a Connection Point (66hex = 102dec)

   ```
   "20 04 24 68 2C 66 2C 65";    $ Path
   ```

4. Connection Point Segment (ID 2Chex or 2Dhex) addressing a Connection Point (65hex = 101dec)

   ```
   "20 04 24 68 2C 66 2C 65";    $ Path
   ```

The order of the connection points is also predefined and is always in the same order. First the OT direction (Originator to Target), which is, from the Scanner's point of view, the Output direction.
Followed by the TO direction (Target to Originator), which is the Input direction for the Scanner.

NOTICE

Wrong decoding of the Connection Point or Instance IDs can occur.

As the byte ordering is "big endian" in the EDS file, the numbers may be mistakenly ordered in "little endian" and therefore decoded wrong. This may end up addressing the wrong connection points causing non-functional behavior of the scanner.

Make sure the byte ordering is adjusted.

```
"20 04 25 00 07 03 2D 00 00 03 2D 00 01 03";    $ Path
```

As example the instance segment's value is 25 00 07 03, where

- 25 00 is the segment identifier for the instance segment.
- 07 03 is the value for the instance. Here the bytes must be swapped otherwise the decimal representation of 07 03hex is 1795dec.
  This would address a different instance instead of the correct instance 775.

NOTE

The direction can also be derived from the EDS file as it is described there in the correct order.

```
260                 Param3,Paraml02,Assem102,     $ O->T RPI, size, format
261                 Param3,Paraml01,Assem101,     $ T->O RPI, size, format
262                 ,,                            $ proxy config size, format
263                 Paraml04,Assem104,            $ target config size, format
264                 "Exclusive Owner",            $ Connection Name
265                 "Exclusive Owner",            $ help string
266                 "20 04 24 68 2C 66 2C 65";    $ Path
267
```

The O->T direction is listed before the T->O direction.

Do not assume, that the numbers in the Paramxxx or Assemxxx name always indicate the Connection Point identifier. Here this is the case, however this is not always like this, as these numbers are arbitrary numbers.

NOTE

The AssemblyIDs or connection point identifiers are specific for each device type. They may be different for different devices. This means they are hard coded in each device.

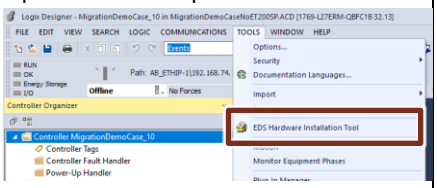
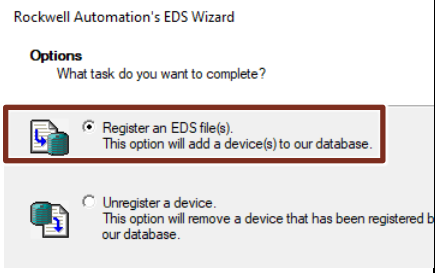
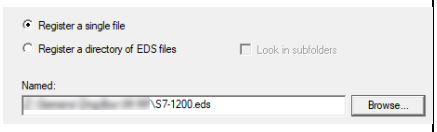
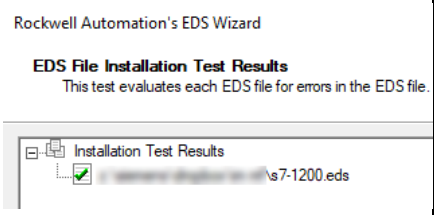
4.2.2 Configuration in Studio 5000

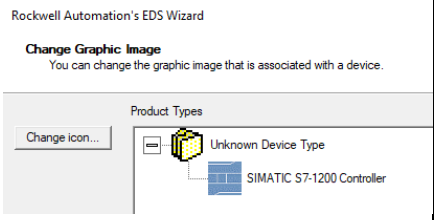
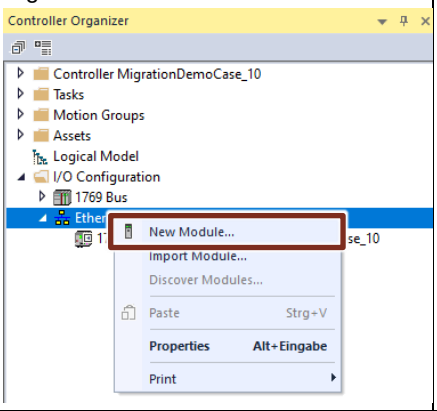
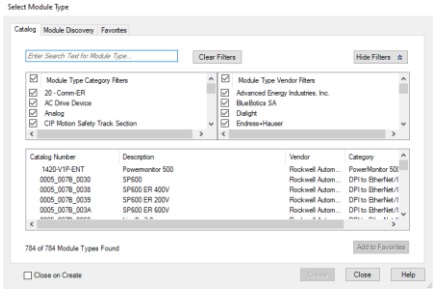
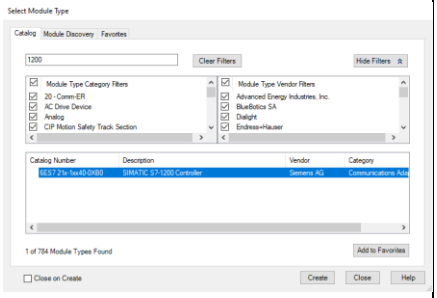
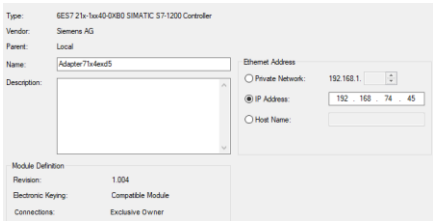
With Rockwell Automation a principal member of the ODVA follows the specification strictly. Therefore, it is a good test to run the LCCF_EnetAdapter block equipped SIMATIC S7-1200 or S7-1500 as EtherNet/IP adapter on one of Rockwell Automation EtherNet/IP scanner systems.

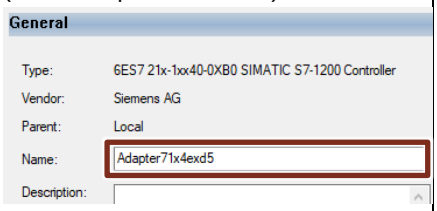
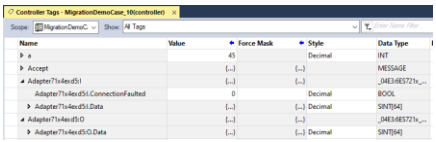
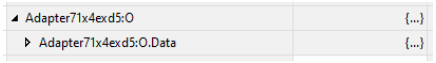
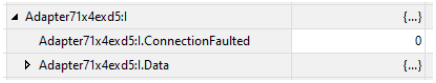
Configuration with EDS file

The engineering system of Rockwell Automation supports the import of EDS files. This allows an easy configuration of EtherNet/IP adapters. The import performs syntax checks and therefore gives already an indication, whether an EDS file is valid.

Table 4-4: Instructions – SIMATIC S7 as EtherNet/IP adapter via EDS

Step	Instruction	Result
1.	This import only needs to be done once. Open the EDS Import Tool.  Follow the instructions of the Rockwell Automation's EDS Wizard.  Click on "Next".	
2.	Select the EDS file (S7-1200.eds) use the "Browse" button.  Click on "Next".	
3.	Review the test result.  Click on "Next".	

Step	Instruction	Result
4.	Review the icon for the the imported SIMATIC controller.  Click on "Next".	Once the import is finalized you can continue with the configuration.
5.	Right-Click on the "Ethernet" network. 	The hardware catalogue opens. 
6.	Select the "SIMATIC S7-1200 Controller". You may want to filter for "1200".  Confirm your selection with a click on "Create".	A "New Module" dialog allows further configuration. 

Step	Instruction	Result
7.	Enter a Name (here "Adapter71x4exd5").  and the adapter's IP address (here 192.168.74.45).  Confirm your entries with a click on "OK".	In the "Controller Tags" you will get two new entries.  One represents the Outputs sent to the adapter.  The other represents the Inputs received from the adapter. 

NOTE Currently the configuration via the EDS file import does not allow the use of configuration data.

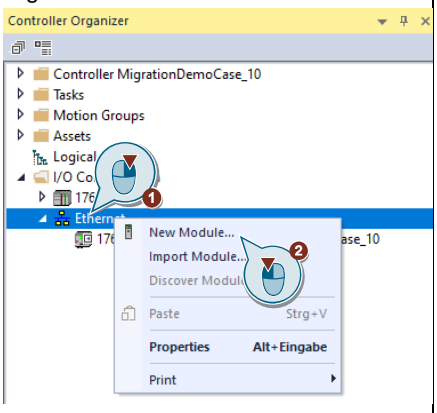
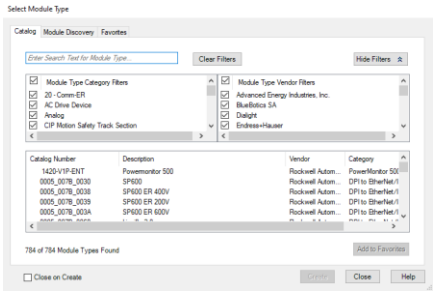
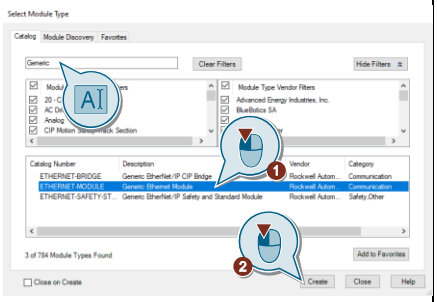
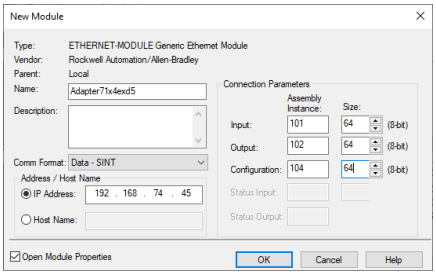
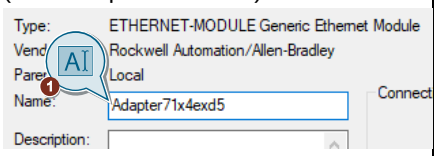
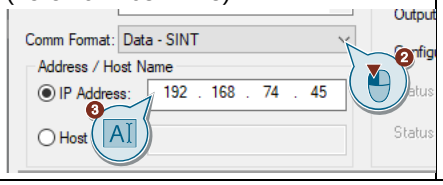
NOTE The EtherNet/IP standard calls out for electronic keying, which is supported by the provided implementation. Therefore, you should be aware, that when you disable the keying, the adapter may not function as it rejects any communication.

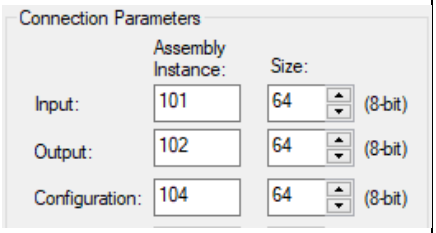
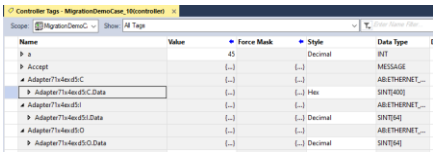
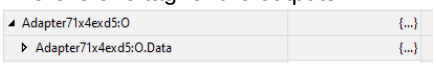
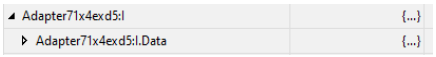
Configuration with manual entry

In the Rockwell Automation engineering system, the configuration of a "Generic Device" is possible. This is the method recommended to make devices without EDS files available to the scanner.

The following table of this document shows the necessary steps.

Table 4-5: Instructions – manually configure SIMATIC S7 as EtherNet/IP adapter

Step	Instruction	Result
1.	Right-Click on the "Ethernet" network.  Click on "New Nodule …".	The hardware catalogue opens. 
2.	Select the "Generic Module". You may want to filter for "Generic".  Confirm your selection with a click on "Create".	The "New Module" dialog allows for further settings. 
3.	Enter the name (here Adapter71x4exd5).  Select the communication format (here SINT) and enter the adapter's IP address (here 192.168.74.45)  	This are the settings, which needed to be made also for the EDS Import procedure.

Step	Instruction	Result
4.	Enter the Assembly Instances and the data sizes. Both the SIMATIC S7-1200 and the S7-1500 only allow for the following assembly instances: • Input: 101 • Output: 102 • Configuration 104  Confirm your entries with a click on "OK".	In the "Controller Tags" you will get three new entries.  There is one tag for the outputs.  Another tag provides the input signals.  Additional to the EDS import procedure you now have the Configuration data available as a tag. 

NOTICE	**Configuration data size is not accurate.** The size of the configuration data in this method is always set to 400 Sint even though it has been configured smaller. It appears to be an error inside the engineering system. Make sure in the program not to address more than the configured amount.

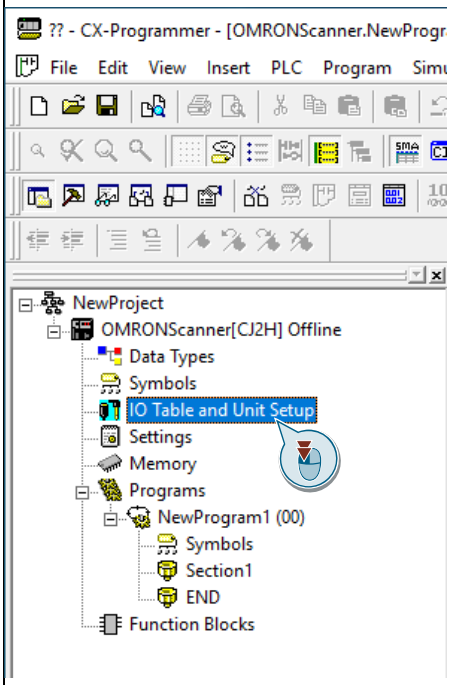
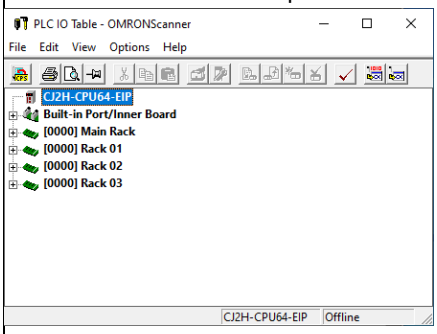
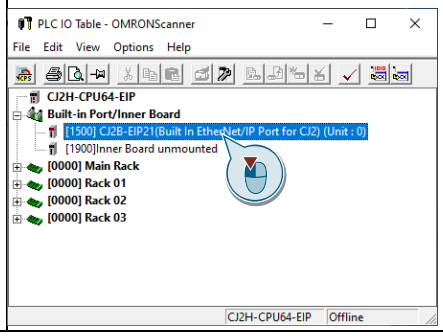
4.2.3 Configuration of OMRON EtherNet/IP scanner

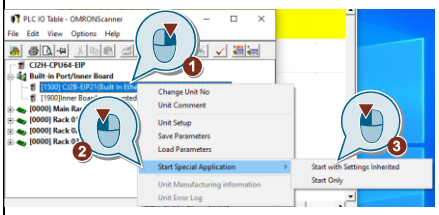
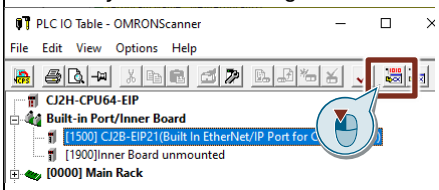
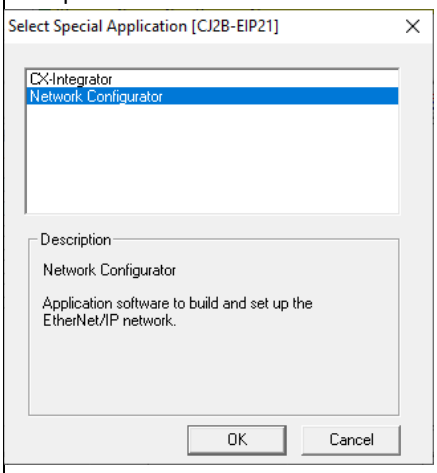
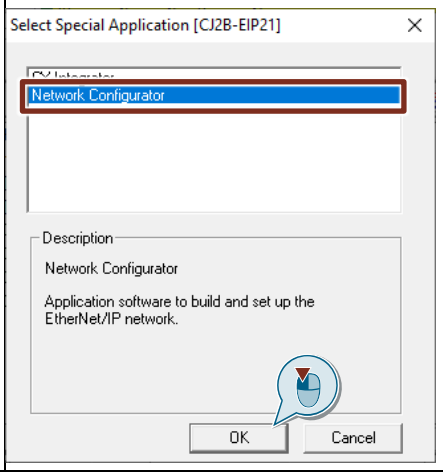
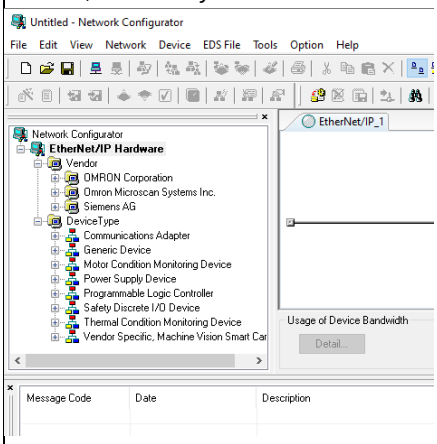
With OMRON another automation system vendor supports EtherNet/IP as one of their field busses. The programming of the OMRON provided EtherNet/IP scanner is done, using either the CX Programmer for the legacy CJ/ CS/ CX series controller or the Sysmac Studio for the NJ/ NX series controller.

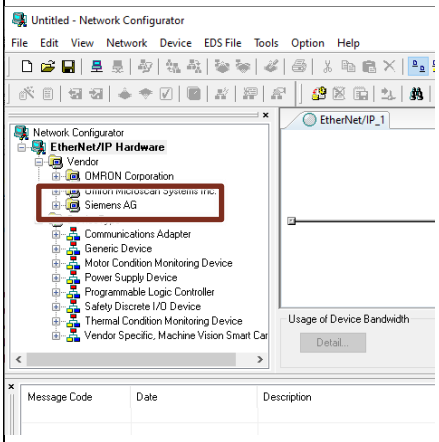
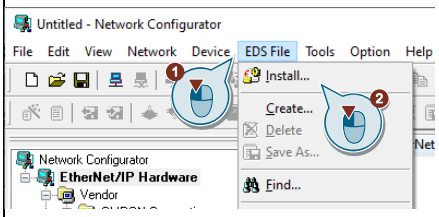
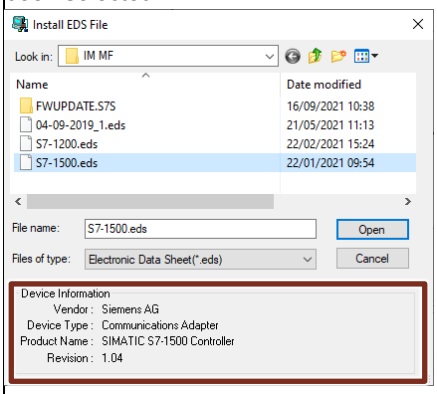
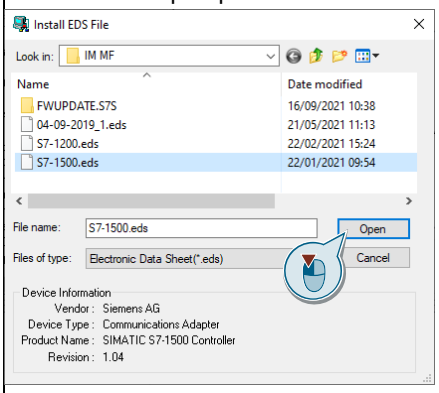
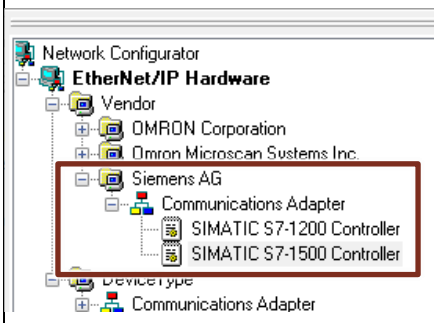
4.2.3.1 Configuration using CX Programmer

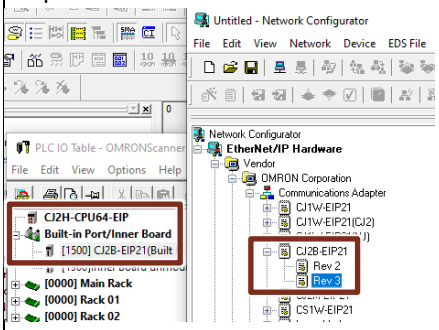
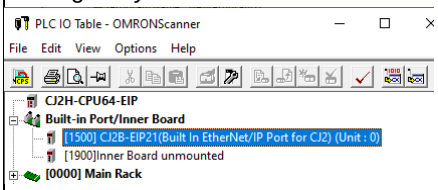
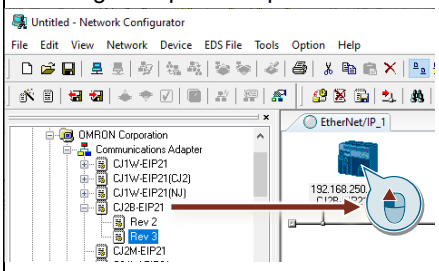
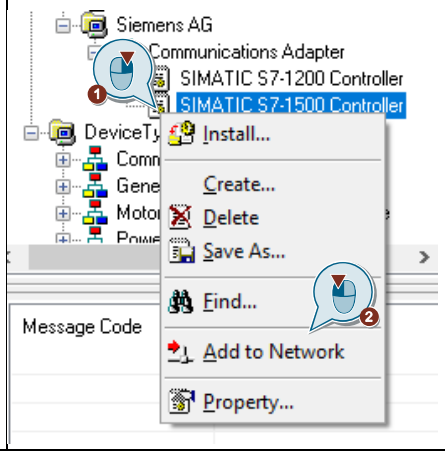
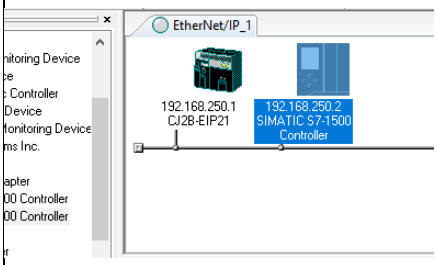
The following steps guide you through the setup process for the CX Programmer. Individual settings may differ from the shown values depending on version and system used.

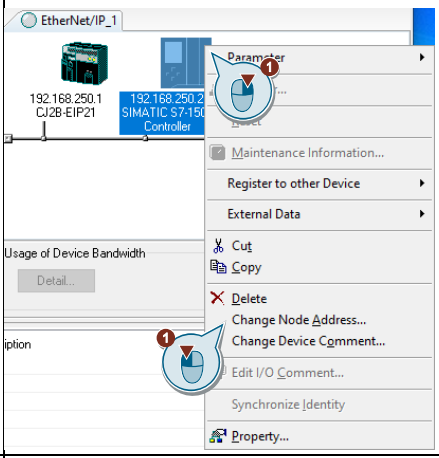
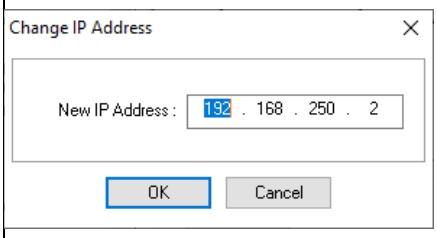
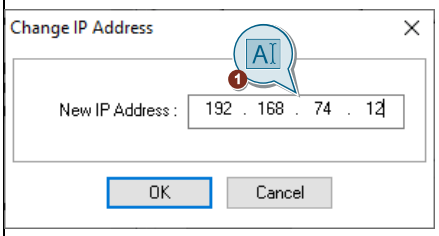
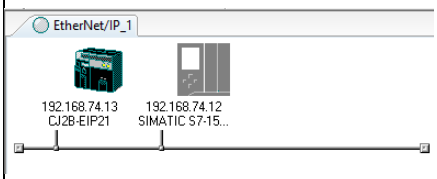
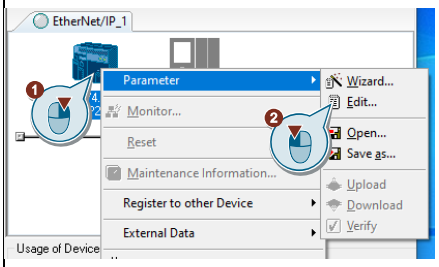
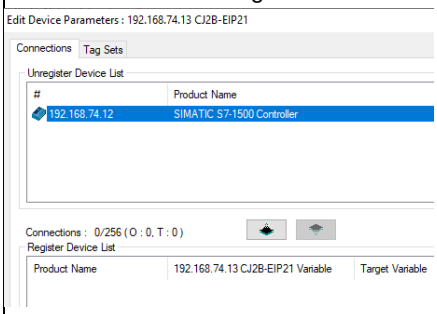
Table 4-6: Instructions –configure SIMATIC S7 as EtherNet/IP adapter in CX Programmer

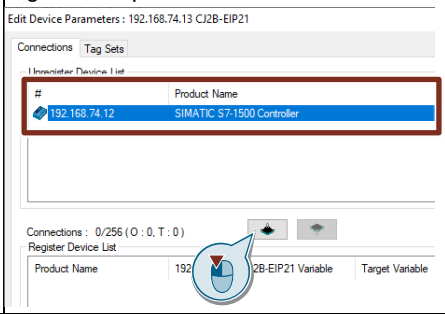
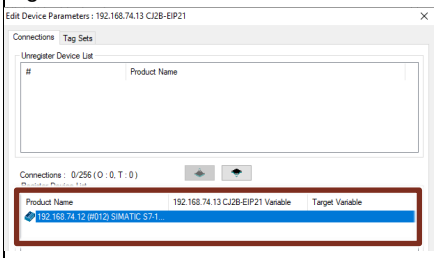
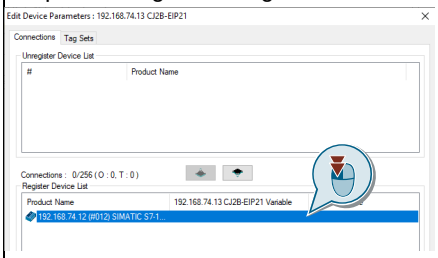
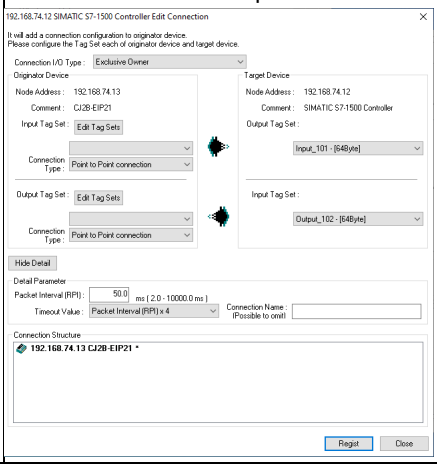
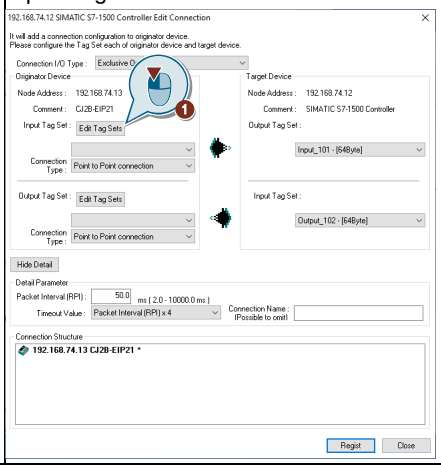
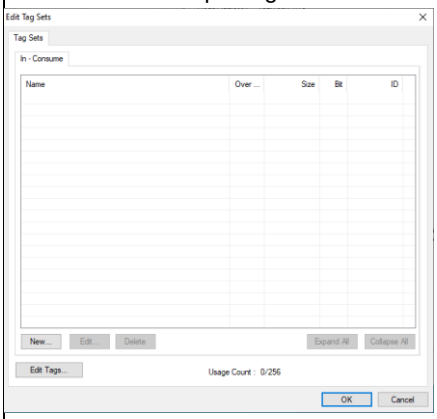
Step	Instruction	Result
1.	In your CX Programmer project open the "PLC IO Table" with a double click. 	The PLC IO Table Editor opens.  In this scenario we use a CPU with integrated EtherNet/IP port.
2.	Select the EtherNet/IP port the Adapter will be connected to. 	In here we will use the integrated EtherNet/IP port and assume a properly configured IP address. Here will use 192.168.74.13/24.

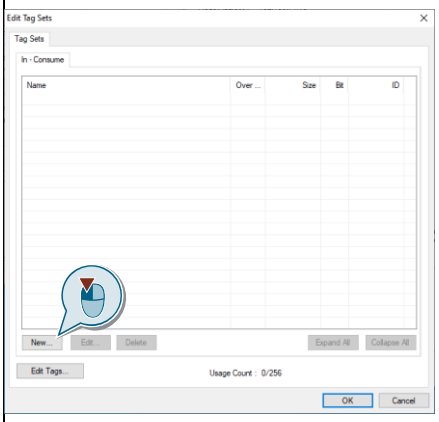
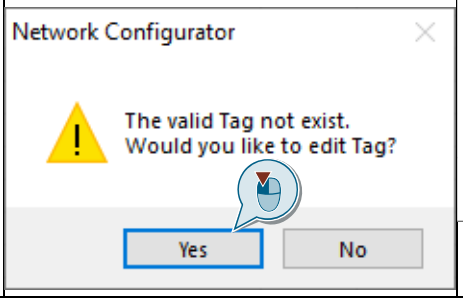
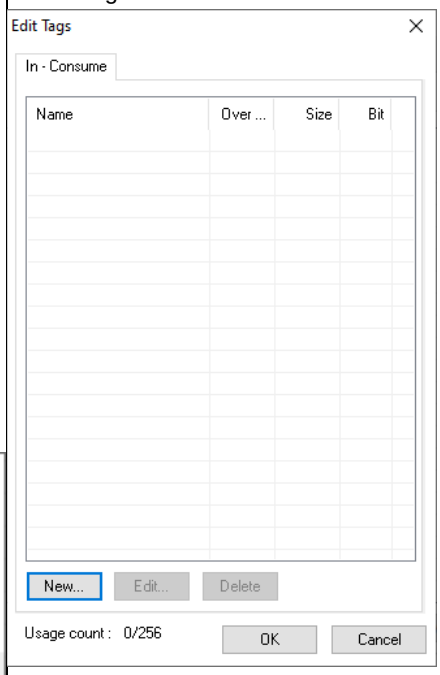
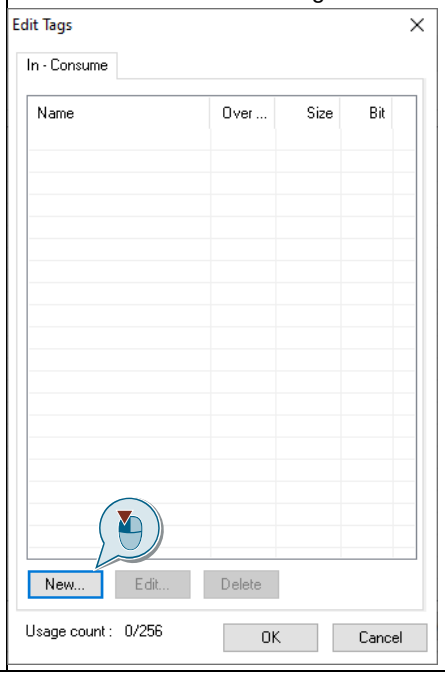
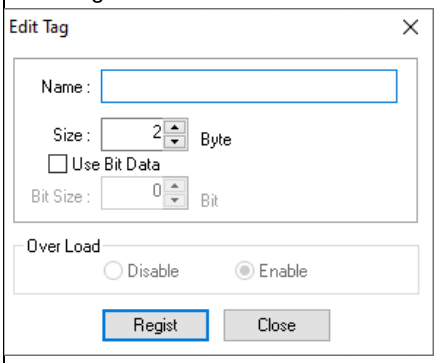
Step	Instruction	Result
3.	Open the Special Application Selection Dialog. This can be done either via the context menu.  Or via the menu bar symbol  . Use the symbol with setting inheritance. 	The Special Application selection dialog box opens. 
4.	Select the "Network Configurator" entry and click on "OK". 	The Network Configurator open in a new window, which may be hidden. 

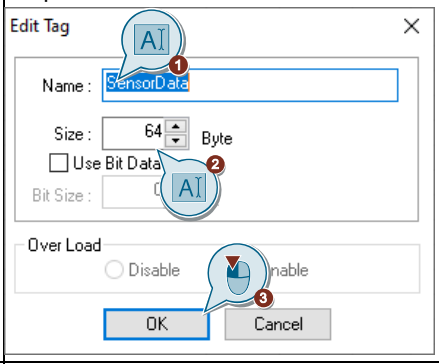
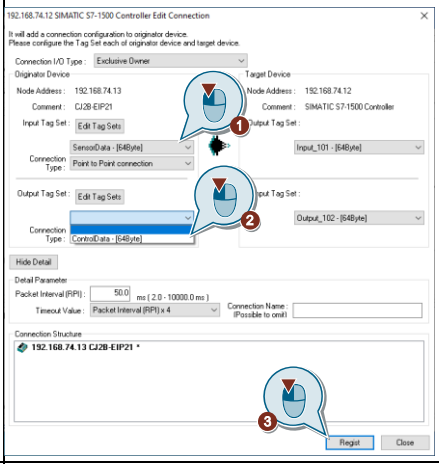
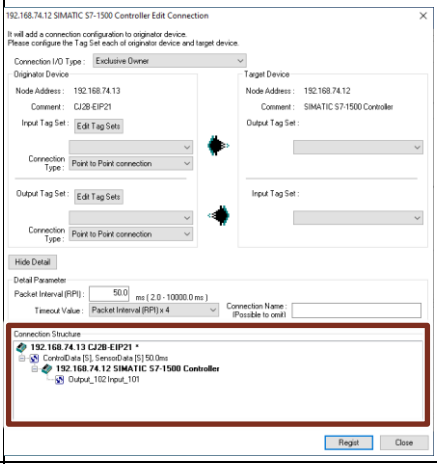
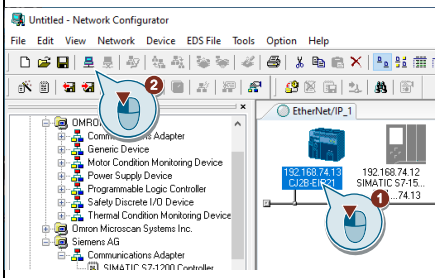
Step	Instruction	Result
5.	If you don't see an entry for "Siemens AG", then you need to install the provided EDS files.  For this to achieve click in the menu on "EDS File" and click on "Install…"  	When installing the provided EDS File, you will get a file selection dialog. The generic device information will be shown, when the appropriate file has been selected.  Here we selected the S7-1500 in it's adapter implementation Revision 1.04.
6.	Click on "open" to confirm the selection and start the import process.  	Once the import process is completed, you will see the "Siemens AG" entry in the vendor list.  You must import both EDS files to see the S7-1200 and the S7-1500 listed here.

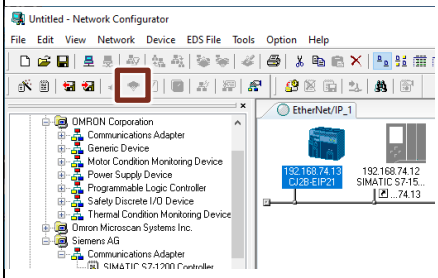
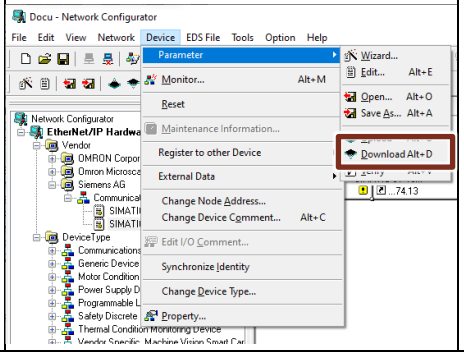
Step	Instruction	Result
7.	Select the appropriate EtherNet/IP scanner board from the OMRON Corporation vendor entries.  Here we select the Rev 3 of our CJ2B-EIP21 communications adapter.	You can get the revision information from the EtherNet/IP card or processor directly. Which card is to be used, depends on your specific configuration. The PLC IO Table gives you a hint. 
8.	Place the EtherNet/IP scanner card onto the EtherNet/IP network. Use Drag'n'Drop for this procedure.  or the "Add to Network" menu item in the context menu as shown for the S7-1500.  	As a result, both the devices are placed onto the network.  You may have noticed, that the IP addresses are default values, which do not match with the one we use.

Step	Instruction	Result
9.	Change the node addresses using with Right Click on the device. 	A dialog opens, where you can adjust the IP addresses. 
10.	Adjust the node addresses and confirm with a click on "OK". 	We use in this application example the following IP addresses: Scanner: 192.168.74.13 Adapter: 192.168.74.12 
11.	Open the parameter settings of the EtherNet/IP scanner module.  Right Click on the EtherNet/IP scanner module and use the "Parameter" entry in the context menu. Click on "Edit" in the sub menu.	An editor opens, to allow to set up the connection and the "Tag Sets". 

Step	Instruction	Result
12.	Click on the arrow pointing downwards to register the preselected connection. 	This moves the connection to the registered connections list. 
13.	Double Click on the registered connection to open the tag set configuration. 	The connection editor opens. 
14.	Click on "Edit Tag Sets" to create the Input Tag Set. 	In the now opening editor we can create new or edit such input tag sets. 

Step	Instruction	Result
15.	Click on "New".  And confirm the message box with a click on "Yes". 	Another dialog opens to allow the creation of new tags. 
16.	Click on "New" to create a tag. 	The following dialog allows the definition of the tag and its size. 

Step	Instruction	Result
17.	Define the tags for both Inputs and Outputs. 	We created 2 tag sets: • Input Tag Set: "SensorData" with 64 Bytes • Output Tag Set: "ControlData" with 64 Bytes
18.	Select the Tag Sets and Register them with the connection: 	The connection is now completely configured. 
19.	Select the EtherNet/IP Scanner module and click on "connect". 	

Step	Instruction	Result
20.	Next step is to download the configuration to the EtherNet/IP Scanner module. Click on the download button, which becomes available once connected.  Alternatively, you can use the "Device" menu and click on "Download".  	

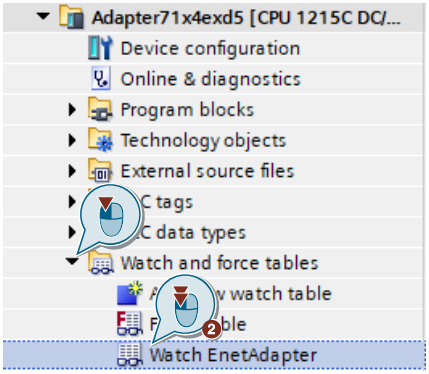
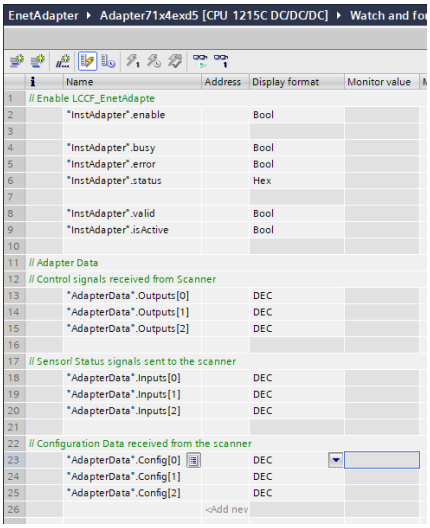
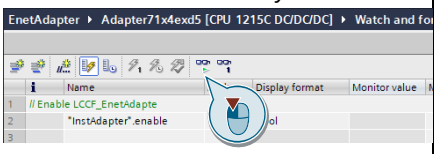
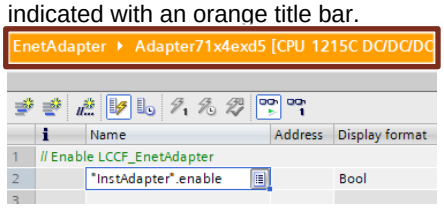
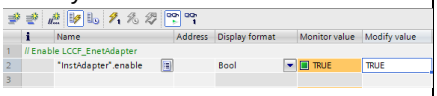
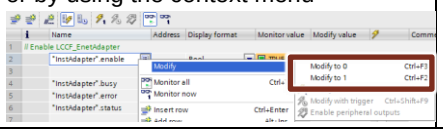
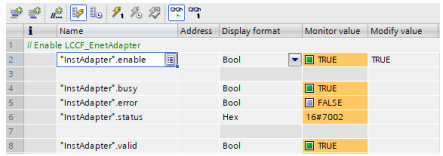
5 Operating

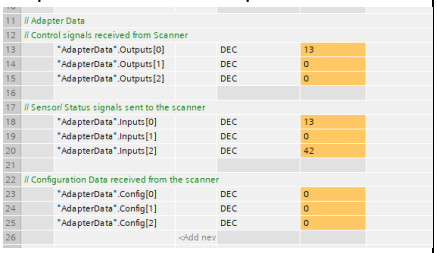
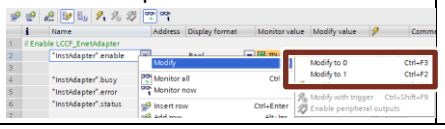
5.1 Start the application

The application will be operated by simply toggle the "enable" input parameter of the LCCF_EnetAdapter function block to "TRUE" and monitor the exchanged data.

For this follow the below instructions as a watch table has been prepared in the application examples TIA Portal project.

Table 5-1:

Step	Instruction	Result
1.	Open the prepared watch table "Watch EnetScanner". 	The watch table opens. 
2.	Switch the watch table online to be able to monitor and modify values. 	The watch table switches online. This is indicated with an orange title bar. 
3.	Modify the "enable" variable to "TRUE" This can be done either by typing the value "1" or "TRUE" into the "Modify value" column.  or by using the context menu 	As a result, the LCCF_EnetAdapter accepts connections from a scanner and starts the data exchange. The status of the LCCF_EnetAdapter is reported as 16#7002, which means busy. The appropriate flags are set as well accordingly. 

Step	Instruction	Result
4.	Modify the input data and monitor the output data for the adapter. 	
5.	To stop the LCCF_EnetAdapter toggle the "enable" parameter to "FALSE". 	As a result of that, the output values are frozen, the update stops. The LCCF_EnetAdapter shuts down the connections to the scanner.

NOTE When the scanner has configuration data configured for the adapter, you may also see a change in the configuration data during operation. The configuration data will be updated in 5s. intervals.

5.2 Troubleshooting

In case the result is not as expected the cause could be found on both sides of the communication path.

Before you try to change any of the program or configuration, check the physical installation first.

5.2.1 Physical check

Verify the following causes for malfunctions or not functioning at all.

1. Is the SIMATIC powered up?
2. If used, is the SCALANCE switch powered up?
3. Are the network cables properly inserted into the LAN sockets of the devices? This can be determined by evaluating the port LEDs of the devices. At least the Link LED should be illuminated.

Table 5-2: physical checks

observation	possible cause	remedy
SIMATIC is not reachable from TIA Portal	SIMATIC is not powered up	• Check power supply and wiring with the installation manual • Correct wiring Power the Power Supply up
	SIMATIC doesn't have network connection	• Check network cable to be inserted properly into the network socket (P1.X1 or P1.X2) Check and correct network settings of your PC
SIMATIC cannot communicate with SIMATIC EtherNet/IP adapters	Network switch is not powered up	Check and correct power supply to the network switch
	network cables are not properly inserted into the Adapter	• Check all network cable sockets to have their "link" lights illuminated. • If necessary, remove the network cable from the LAN socket and reinsert until you hear a click. • Replace the network cable

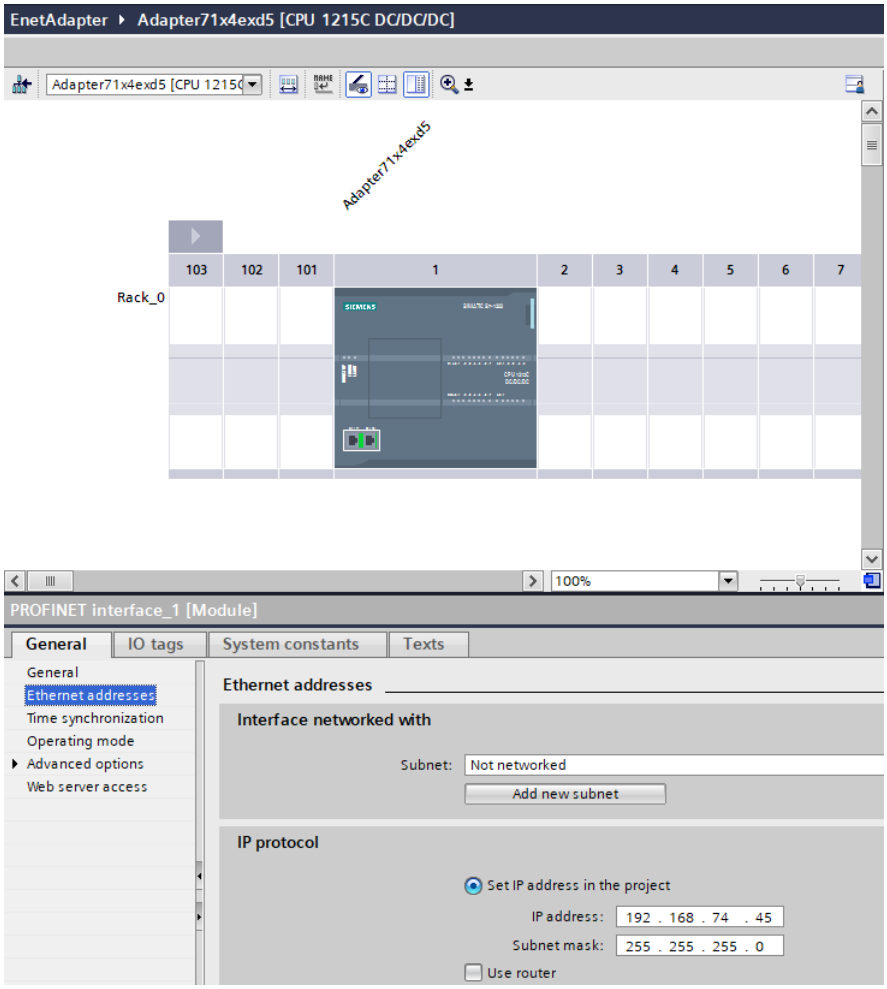
If you checked everything and there is no communication at all, then perform the checks recommended in the next chapter.

5.2.2 Network Settings

Missing communication can be caused by any partner along the line of communication. Therefore, make sure the network settings for the devices are compatible to each other.

In this application example the Ethernet settings for the adapter is shown below.

Figure 5-1: Network settings – Adapter PLC



Important settings are the IP address and the subnet mask. As shown above the are:

- IP: 192.168.74.45
- Mask: 255.255.255.0

Compatible IP addresses differ on a network with subnet mask 255.255.255.0 only in the last octet. Otherwise, a communication without network router is not possible.

5.2.3 SIMATIC Program

Answering the following questions may give you a hint on what needs to be corrected.

Table 5-3: LCCF_EnetAdapter checks

observation	possible cause	remedy
status information doesn't change their values, when enable is set to true	The block is not executed	place an unconditional call to the block in cyclic interrupt program
error is true, the moment enable is set to true	Parameterization error	check the status code and correct the parameterization
valid becomes false after a certain time	Connection problems	check the status code and follow the specific recommendations further down in the document
valid doesn't change to true, even though the block says busy	Keying problem	Make sure you have set the Keying properly in the used engineering system. The Keying includes: • Vendor ID • Device Type • Product Code • Major and Minor Revision Check these setting to match with the EDS file

The LCCF_EnetAdapter block reports certain error codes to inform the user about issues in the execution. This document describes the status codes the LCCF_EnetAdapter block reports in the chapter 6.2.

6 LCCF_EnetAdapter block

6.1 Requirements

As EtherNet/IP is a communication protocol the LCCF_EnetAdapter requires communication resources on the executing platform. Besides that, the protocol stack is implemented as part of the user program and therefore, runs in the same priority context. The implementation's performance heavily relies on the environment it is being executed in.

The LCCF_EnetAdapter block allocates 4 communication resources.

- 2x connection resources for TCP port 44818
- 1x connection resource for UDP port 44818
- 1x connection resource for UDP port 2222

NOTICE	**No connection may be established** If there are concurrent applications serving the above-mentioned ports, the LCCF_EnetAdapter may not be able to allocate the resources. This would lead to no connection to the controlling EtherNet/IP scanner. Make sure the there are no other applications allocating these ports.

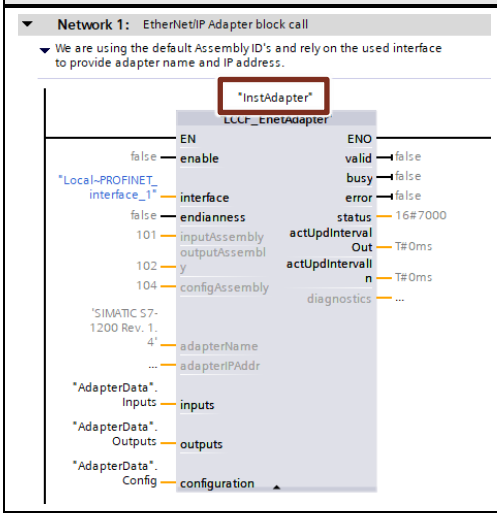
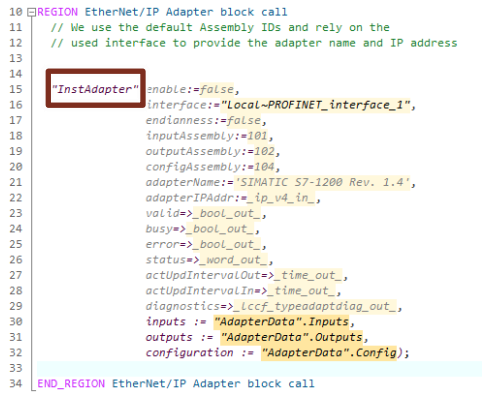
NOTICE	**Loss of communication** As other process control software may have prolonged execution times, the setup update intervals cannot be guaranteed. It is strongly recommended to place the LCCF_EnetAdapter in a cyclic interrupt to create a more stable execution schedule, helping to maintain a stable update rate. It is recommended to call the block at least twice as fast (2x faster) than the update rate is set to.

6.2 Parameters

The LCCF_EnetAdapter has been designed to require a minimum of parameters to make its use as easy as possible. Still a minimum external configuration is necessary, which is explained in the following chapter.

A call to the LCCF_EnetAdapter block requires an instance DB to store operation relevant data internally as shown in the below figure.

Table 6-1: block call to "LCCF_EnetScanner"

LAD	SCL
	


```
REGION EtherNet/IP Adapter block call
  // We use the default Assembly IDs and rely on the
  // used interface to provide the adapter name and IP address

  "InstAdapter"(enable:=false,
                interface:="Local~PROFINET_interface_1",
                endianness:=false,
                inputAssembly:=101,
                outputAssembly:=102,
                configAssembly:=104,
                adapterName:='SIMATIC S7-1200 Rev. 1.4',
                adapterIPAddr:=_ip_v4_in_,
                valid=>_bool_out_,
                busy=>_bool_out_,
                error=>_bool_out_,
                status=>_word_out_,
                actUpdIntervalOut=>_time_out_,
                actUpdIntervalIn=>_time_out_,
                diagnostics=>_lccf_typeadaptdiag_out_,
                inputs := "AdapterData".Inputs,
                outputs := "AdapterData".Outputs,
                configuration := "AdapterData".Config);

END_REGION EtherNet/IP Adapter block call
```

The instance DB is generated automatically by the TIA Portal, when you place the call to the block. In this application example the instance DB is named "InstAdapter".

Besides the instance DB the other shown parameters are necessary and are explained in the below table.

Table 6-2: Parameter of the LCCF_EnetAdapter block

Name	Direction	Data Type	Description
enable	Input	BOOL	Rising edge enables the functionality of the block. Any previously reported fault will be cleared, and conditions re-evaluated. Falling edge shuts the block down and stops any communications.
interface	Input	HW_ANY	Hardware Identifier of the interface to use for the communication. This typically uses a system defined constant. It is possible to use any "Open User Communication" supporting interface. This includes Industrial Ethernet CMs and CPs.

Name	Direction	Data Type	Description
endianness[1]	Input	BOOL	Switches the Endianness (Byte ordering) of the received and sent data. TRUE: switches the byte order to "BigEndian". This means that the MostSignificantByte is at the later/ higher address in memory or on the network. FALSE: switches the byte order to "Little Endian", which puts the LeastSignificantByte at the later/ higher address in memory or on the network.
inputAssembly	Input	UINT	Defines the Assembly ID used for the Target to Originator direction. This data transfer typically contains sensor- or status information from the Scanner's point of view. The default value is 101
outputAssembly	Input	UINT	Defines the Assembly ID used for the Originator to Target direction. This data transfer typically contains control data from the Scanner's point of view. The default value is 102
configAssembly	Input	UINT	Defines the Assembly ID used for the Originator to Target direction. This data transfer typically contains configuration information for the adapter. The default value is 104
adapterName[2]	Input	String[32]	Allows the user to specify an optional adapter name, which will be used to identify the adapter in the third-party engineering system.
adapterIPAddr[3]	Input	IP_V4	Allows the user to specify the adapter's IPv4 address, which will be used to identify the adapter to the scanner.
inputs	InOut	Variant	refers to a storage area for the sensor/ status signals, which will be sent to the scanner.
outputs	InOut	Variant	refers to a storage area for control signals received from the scanner.

[1] The parameter "endianness" may be hidden in the block call
[2] The adapterName parameter value is only being used, when the specified interface is not returning the data.
[3] The adapterIPAddr parameter value is only used, when the specified interface does not return the information.

Name	Direction	Data Type	Description
configuration[4]	InOut	Variant	refers to a storage area containing received configuration data for the application.
valid	Output	BOOL	TRUE indicates that the values in the mapping variables are valid and the data exchange with the scanner is ongoing. FALSE some or all values are invalid and should NOT be used for process control.
busy	Output	BOOL	TRUE indicates the CIP Client block is actively processing requests. FALSE indicates the block is not processing requests.
error	Output	BOOL	TRUE indicates that an error occurred during the operation of the block. Depending on the type of the error indicated by status (see below) cycling of the enable flag may clear the error. FALSE indicates no error.
status	Output	WORD	Status information about the operational state of this block. For details see the chapter Block status messages below.
actUpdIntervalOut	Output	Time	contains the currently achieved update interval for receiving control signals from the scanner. The time is provided in ms. The value may differ from the set "Requested Packet Interval".
actUpdIntervalIn	Output	Time	Contains the currently achieved update interval for sending sensor/ status signals to the scanner. The time is provided in ms. The value may differ from the set "Requested Packet Interval".
diagnostics[5]	Output	LCCF_typeAdaptDiag	A structure containing additional information in case of an error, which are relevant for debugging the CIP server block. The content is of value for the developer.

[4] The assembly IDs may be hidden in the block call
[5] The parameter "diagnostics" may be hidden in the block call.

6.2.1 Block status messages

The LCCF_EnetAdapter block reports a status information to the user, which follows a standardized pattern.

The status code is split into the error flag and a status information value.

Table 6-3: Error and status message format

15	14		12	11			8	7							0
Error	Info/ Warning			Class Code				Specific Status Codes							
16#7 = Information 16#8 = Error				0 = Information											
				2 = Parameter related											
				4 = Internal Cause											
				6 = External Cause											

The LCCF_EnetAdapter reports specific status codes. They are listed and explained in the following table.

Table 6-4: status messages

Valid	Busy	Error	Status Code (in hex)	Cause	Remedy
TRUE	TRUE	FALSE	16#0000	Success/ OK	--
FALSE	FALSE	FALSE	16#7000	No Call/ Idle	Block is called with enable = FALSE. Create rising edge on enable to start execution.
FALSE	TRUE	FALSE	16#7001	Initial call	Block starts initialization and performs parameter check.
TRUE	TRUE	FALSE	16#7002	Follow Up call	Block continues operation.
FALSE	TRUE	FALSE	16#7003	Initialization	Block initializes internal variables and establishes connections.
FALSE	TRUE	FALSE	16#7004	Shutdown	Block resets connections and stops internal timers.
FALSE	TRUE	FALSE	16#7201	Invalid Input Assembly ID	The as actual parameter provided assembly ID for the inputs is invalid, meaning non-positive. The default assembly ID 101 is being used.

Valid	Busy	Error	Status Code (in hex)	Cause	Remedy
FALSE	TRUE	FALSE	16#7202	Invalid Output Assembly ID	The as actual parameter provided assembly ID for the inputs is invalid, meaning non-positive or identical to the input assembly ID. The default assembly ID 102 is being used.
FALSE	TRUE	FALSE	16#7203	Invalid Configuration Assembly ID	The as actual parameter provided assembly ID for the configuration data is invalid, meaning non-positive or identical to either the input or output assembly ID. The default assembly ID 104 is being used.
FALSE	TRUE	FALSE	16#7414	Vendor ID or Product code Mismatch	The by the scanner requested Vendor ID or Product Code does not match with the adapter supported.
FALSE	TRUE	FALSE	16#7415	Device Type Mismatch	The by the scanner requested device type cannot be emulated by the adapter.
FALSE	TRUE	FALSE	16#7416	Revision Mismatch	The by the scanner requested adapter revision cannot be emulated by the adapter. The major number must match exactly. The minor revision number needs to be less or equal to the adapter's revision.
FALSE	TRUE	FALSE	16#7427	O->T size exceeds maximum possible size	The requested amount of data for the control signals exceeds the currently configured buffer size.
FALSE	TRUE	FALSE	16#7428	T->O size exceeds maximum possible size	The expected amount of data for the sensor signals exceeds the currently configured buffer size.
FALSE	TRUE	FALSE	16#7601	Error connecting TCP socket	The system call to TCON failed, while setting up a TCP server socket. Details are provided at the "diagnostics" parameter.

Valid	Busy	Error	Status Code (in hex)	Cause	Remedy
FALSE	TRUE	FALSE	16#7602	Failed to reset TCP socket	The system call to TDISCON failed while resetting a TCP server socket. Details are provided at the "diagnostics" parameter.
FALSE	TRUE	FALSE	16#7603	Failed Receive on TCP socket	The system call to TRCV failed. The TCP server socket will be reset. This may affect the Configuration data. They should be considered stale. Details are provided at the "diagnostics" parameter.
FALSE	TRUE	FALSE	16#7604	Failed Send on TCP socket	The system call to TSEND failed. The TCP server socket will be reset. Details are provided at the "diagnostics" parameter.
FALSE	TRUE	FALSE	16#7605	Failed to transfer Output data	The internally used MOVE_BLK_VARIANT block reported an error during the transfer of the respective data. They must be considered unreliable. Details are provided at the "diagnostics" parameter.
FALSE	TRUE	FALSE	16#7606	Failed to transfer Input data	
FALSE	TRUE	FALSE	16#7607	Failed to transfer Configuration data	
FALSE	FALSE	TRUE	16#8001	Error connecting UDP socket	The system call to TCON failed, while setting up the UDP socket. Details are provided at the "diagnostics" parameter.
FALSE	FALSE	TRUE	16#8201	Invalid Interface	The as interface specified hardware doesn’t support necessary features. Use a system constant provided for a communication interface, such as the integrated PROFINET interface.
FALSE	FALSE	TRUE	16#8202	Inputs are not an Array	The parameterized variable for Inputs needs to be an array.

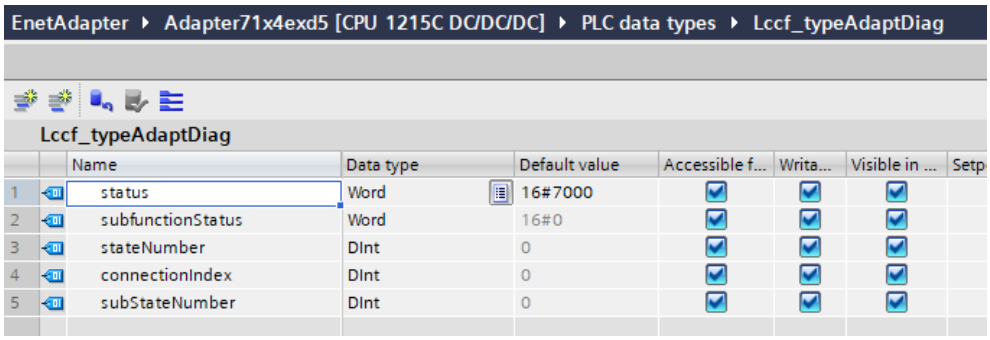
Valid	Busy	Error	Status Code (in hex)	Cause	Remedy
FALSE	FALSE	TRUE	16#8203	Outputs are not an Array	the parameterized variable for Outputs needs to be an array.
FALSE	FALSE	TRUE	16#8204	Configurations are not an Array	the parameterized variable for Configurations needs to be an array.
FALSE	FALSE	TRUE	16#8205	Inputs Array elements are of an unsupported type	The array elements need to be of anyone of the types: • Sint • Int • Dint • Real Other data types are currently not supported.
FALSE	FALSE	TRUE	16#8206	Outputs are not an Array	
FALSE	FALSE	TRUE	16#8207	Configurations are not an Array	
FALSE	FALSE	TRUE	16#8208	Inputs Array is too small	The Inputs array is too small to hold the data requested by the scanner. Verify the scanner parameterization or adjust the array size.
FALSE	FALSE	TRUE	16#8209	Outputs Array is too small	The Outputs array is too small to hold the data provided by the scanner. Verify the parameterization of the scanner or adjust the array size.
FALSE	FALSE	TRUE	16#820A	Configurations Array is too small	The Configurations array is too small to hold the data provided by the scanner. Verify the parameterization of the scanner or adjust the array size.
FALSE	FALSE	TRUE	16#8600	Undefined internal state	The block internally requested an undefined state. This will cause the block to hang. No further operation until block reset is possible. Report this to the developer.

Valid	Busy	Error	Status Code (in hex)	Cause	Remedy
FALSE	FALSE	TRUE	16#8613	Failed to receive on UDP socket	An error has been reported on the TURCV system call, which is responsible for the receipt of the Control data. Control data are unreliable and shall NOT be used for process control.
FALSE	FALSE	TRUE	16#8614	Failed to send on UDP socket	An error has been reported by the underlying TUSEND system call. This means that the sensor/ status signals couldn't be send to the scanner.

Extended Diagnostics

Extended diagnostics are provided at a parameter of the block called "diagnostics". This parameter is of a type provided as part of the application example. The structure is shown in the below figure.

Figure 6-1: LCCF_typeAdaptDiag



The contained information is relevant for the developer and could help identifying the cause of a misbehavior.

Table 6-5: LCCF_TypeAdaptDiag description

Name	Description
status	This variable contains the reported status code of the block at the time an error occurred. It is the same status code you also see at the status parameter of the block.
subfunctionStatus	In case an underlying functionality reports a status causing the LCCF_EnetAdapter block to fail, the status is stored in here.
stateNumber	This number represents the internal state of the block and provides information of the location of the failure occurred.
connectionIndex	As the LCCF_EnetAdapter maintains up to two TCP server sockets, this number represents the server socket causing the error.
subStateNumber	This number represents the internal state of each TCP server socket. With this this value provides a more detailed location of an occurred error.

6.2.2 Technical data

For better planning of the automation program the user must be aware, that the operation of the LCCF_EnetAdapter block has impacts on both memory loading and cycle time of the remaining automation program.

As all the protocol handling is done as part of the user program, the cycle time will be extended by the time the selected CPU model requires to execute the protocol stack. As one could imagine a performance influencing factor is the RPI. The shorter the RPI is, the more often communication to the scanner needs to be done.

The average load shown in the below table are based on measurements taken on a CPU 1512C and a CPU 1215C used throughout the application example.

Table 6-6: Execution times for LCCF_EnetAdapter

CPU	min. load	average load	max. load
1512C	0,6 ms	1,5 ms	2,6 ms
1215C	1,2 ms	1,7 ms	2,4 ms

The measured load is based on a 10ms cyclic interrupt and the data exchange configured in the application example.

SIMATIC S7-1500

Besides program execution time memory consumption should be taken into consideration, when selecting the CPU model for a specific automation task. The LCCF_EnetAdapter block contributes to the memory loading a certain amount of memory plus the data required per configured adapter. The following tables will provide the detailed information.

Table 6-7: Memory consumption S7-1500

Block	Load Memory	Work Memory
LCCF_EnetScanner	705.446 Bytes	41.737 Bytes
instance DB	23.612 Bytes	7.852 Bytes

SIMATIC S7-150xS Software Controller

The SoftwareController S7-150xS requires the below listed amount of memory.

Table 6-8: Memory consumption S7-1508S SoftwareController

Block	Load Memory	Work Memory
LCCF_EnetScanner	701.925 Bytes	41.737 Bytes
instance DB	23.058 Bytes	7.852 Bytes

SIMATIC S7-1200

For the S7-1200 controller the technical data are listed below

Table 6-9: Memory consumption S7-1200

Block	Load Memory	Work Memory
LCCF_EnetScanner	688.098 Bytes	41.165 Bytes
instance DB	23.550 Bytes	7.748 Bytes

NOTICE	**Risk of overloading the controller**
	Configuring a small "Requested Packet Interval" may cause overload to the SIMATIC Controller as the whole protocol handling is done as part of the user program.
	This could cause the process control program to become unresponsive.

6.3 What’s next?

The current implementation leaves some room for further developments. Such implementations may include:

- modular adapter with multiple slots
- reductions in the memory requirements, providing a alternative block "Lccf_EnetAdapterLite" with reduced functionality

7 Appendix

7.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:
support.industry.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:
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For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:
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Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:
support.industry.siemens.com/cs/sc

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:
support.industry.siemens.com/cs/ww/en/sc/2067

7.2 Related literature

Table 7-1

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Download page of this entry https://support.industry.siemens.com/cs/ww/en/view/109782315

7.3 Change documentation

Table 7-2

Version	Date	Modifications
V1.0	11/2021	First version