Siemens TCP/IP Ethernet Driver Help

Table of Contents

Siemens TCP/IP Ethernet Driver Help

Help version 1.032

CONTENTS

Overview

The Siemens TCP/IP Ethernet Driver provides an easy and reliable way to connect Siemens TCP/IP Ethernet devices to OPC Client applications, including HMI, SCADA, Historian, MES, ERP, and countless custom applications. It is intended for use with Siemens S7-200, 300, 400, and 1200 PLCs. There are two options for communications:

- Industrial Ethernet TCP/IP interface communication processor (CP). The protocol used is S7 Messaging on Industrial Ethernet (ISO 8073 Class 0) over TCP/IP as defined in RFC1006.
- Hilscher's NetLink adapter. Only an MPI port is required. The Netlink adapter does not support the S7-200 model.

The driver requires no special libraries or hardware. A standard Ethernet card is all that is needed.

Device Setup

Supported Devices

S7-200 via CP243
S7-300 via CP343
S7-400 via CP443
S7-1200*
S7-300 via NetLink
S7-400 via NetLink

*The S7-1200 device has a built-in Ethernet module.

Connection Timeout

This parameter specifies the time that the driver will wait for a connection to be made with a device. Depending on network load, the connect time may vary with each connection attempt. The default setting is 3 seconds. The valid range is 1 to 30 seconds.

Request Timeout

This parameter specifies the time that the driver will wait on a response from the device before giving up and going on to the next request. Longer timeouts only affect performance if a device is not responding. The default setting is 2000 milliseconds. The valid range is 100 to 30000 milliseconds.

Retry Attempts

This parameter specifies the number of times that the driver will retry a message before giving up and going on to the next message. The default setting is 2 retries. The valid range is 1 to 10.

Device IDs

Up to 1024 devices may be defined on a given channel. The Device ID is formatted as YYY.YYY.YYY.YYY, where YYY designates the device IP address. Each YYY byte should be in the range of 0 to 255. If the device supports host name resolution, the Device ID may also be specified as a standard UNC/DNS name.

Note: For NetLink users, NetLink communication parameters (such as IP Address, Subnet Mask and Baud Rate) can be configured using the **NetLink Configuration Utility**. This application is located in the server's **Utilities** sub-directory and can be launched using the Start Menu shortcut.

General Communications Parameters

Port Number

This parameter specifies the port number that the remote CP is configured to use.

Default Port
IE TCP/IP: 102 (TSAP)
NetLink: 1099

It is recommended that the default port is used for most normal applications where the OPC Server and the PLC exist on the same network. For an application that will be using the Internet through firewalls and advanced routers, the port number can be changed to allow these operations to occur. In most cases, however, the PLC will only accept a connection on port 102/1099 and may require router forwarding.

MPI ID (NetLink Only)

The MPI ID is configured for the port in which the NetLink adapter is connected. This setting does not apply to models utilizing the IE TCP/IP CPs (S7-300, and S7-400). A maximum of 2 connections (or devices) via TCP are possible when using the NetLink adapter.

S7 Communications Parameters

S7-200 Communications Parameters

There are two ways the Siemens TCP/IP Ethernet Driver can communicate to the S7-200 device on an Ethernet network.

- PG Connection (i.e. Connection utilized by Micro/WIN). 1 connection is available.
- Configured Connection (i.e. Connection configured in Micro/WIN via the Ethernet Wizard). 8 connections are available.

Note: Configured Connections are recommended because they free the PG port for Micro/WIN and also provide flexibility to make multiple concurrent connections.

Local TSAP

Link Type	TSAP Value (hex)
PG	4B57 ('KW')
Configured	A Remote (Client) TSAP configured in Micro/WIN's Ethernet Wizard. If Micro/WIN Remote TSAP=xx.yy*, Set Local TSAP to xxyy.

Remote TSAP

Link Type	TSAP Value (hex)
PG	4B57 ('KW')
Configured	A Local (Server) TSAP configured in Micro/WIN's Ethernet Wizard. If Micro/WIN Remote TSAP=xx.yy*, Set Local TSAP to xxyy.

*TSAP as displayed in Micro/WIN's Ethernet Wizard. When accessed from V memory, the value may be in decimal form. For example, If TSAP is 10.00; the V memory value will be 1000 hex or 4096 decimal. The values entered for Local TSAP must be in hexadecimal notation; thus, in this example, the value 1000 would be entered.

Rule Of Thumb (from the perspective of the OPC Server)

Local TSAP==Micro/WIN Remote TSAP
Remote TSAP==Micro/WIN Local TSAP

For details on using the CP243-1 module and more information in general, refer to **How to Configure S7-200 Connections in Micro/WIN**.

S7-300/S7-400 Communications Parameters

This setting does not apply to models utilizing the NetLink adapter (NetLink: S7-300 and NetLink: S7-400).

Link Settings

The communication link refers to the connection between the Siemens TCP/IP Ethernet Driver and the CP.

Type

The type of link chosen determines the number of simultaneous requests allowed. The greater the number of simultaneous requests, the greater the data throughput. Each device connection is allowed one outstanding request. To achieve multiple simultaneous requests, multiple connections must be configured. This is achieved by defining the device multiple times in the OPC server (identical device properties). The devices can be defined within the same channel or under separate channels. For more information, refer to **Optimizing Siemens TCP/IP Ethernet Communication**.

Channel.Device=1 CP Connection

There are three types of links: PC (applications), OP (operator panel) and PG (programming device). OP and PG are usually reserved but can be used if all PC connections are taken.

Type	S7-300 CPU 314, 315	S7-400 CPU 412, 413	S7-400 CPU 414	S7-400 CPU 416
PC	2	14	30	62
OP	1	1	1	1
PG	1	1	1	1

Default Number Simultaneous Requests

Example

Given an S7-400 CPU 412, 14 simultaneous requests can be achieved by defining 14 identical devices in the OPC Server with all configured for Link Type PC. In addition to the PC connections, two more devices can be configured for Link Type OP and PG. This provides 16 connections overall.

Caution: Connection resources are shared amongst applications communicating with the CP. If another application such as STEP 7 is configured to use Industrial Ethernet over TCP/IP, at least one PG/PC connection must be left open for that application to use.

Note: For information on increasing the number of PG, OP and PC type connections, refer to **How to Configure S7-300/400 Connections in STEP 7**.

CPU Settings

The following settings must match the values entered in STEP 7's HW Configuration program.

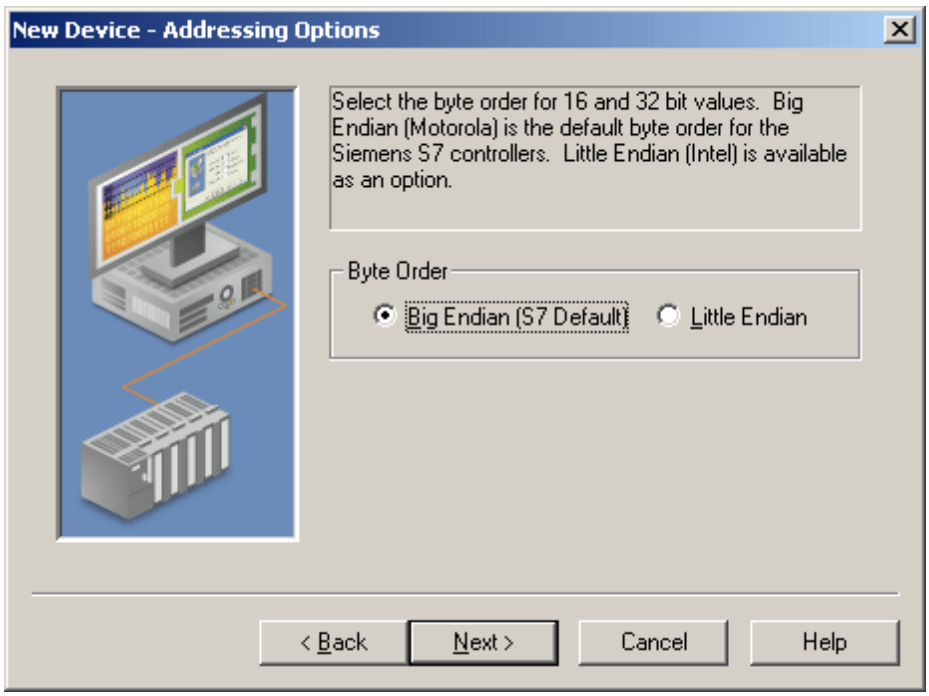
Rack

This parameter specifies the number of the rack in which the CPU of interest resides. To read/write the rack number using an internal tag, refer to **Internal Tags** for more information.

CPU Slot
This parameter specifies the number of the slot in which the CPU of interest resides. To read/write the slot number using an internal tag, refer to **Internal Tags** for more information.

Addressing Options

Addressing Options is used to set the byte order for 16 bit and 32 bit values. Click to select either **Big Endian (S7 Default)** or **Little Endian**.



Note: Big Endian uses bytes ordered from highest to lowest. Little Endian uses bytes ordered from lowest to highest. With either of these methods the bit order is never changed.

Big Endian

DWord 1																															
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	23	22	21	20	19	18	17	16	31	30	29	28	27	26	25	
Word 1																Word 3															
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	
Byte 1								Byte 2								Byte 3								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	

Bits
1. The bit range for DWord 1 is 31-0.
2. The bit range for Word 1 and Word 3 is 15-0.
3. The bit range for Byte 1, Byte 2, Byte 3 and Byte 4 is 7-0.

Little Endian

DWord 1																															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Word 3																Word 1															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Byte 4								Byte 3								Byte 2								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	

Bits
1. The bit range for DWord 1 is 31-0.
2. The bit range for Word 3 and Word 1 is 15-0.

3. The bit range for Byte 4, Byte 3, Byte 2 and Byte 1 is 7-0.

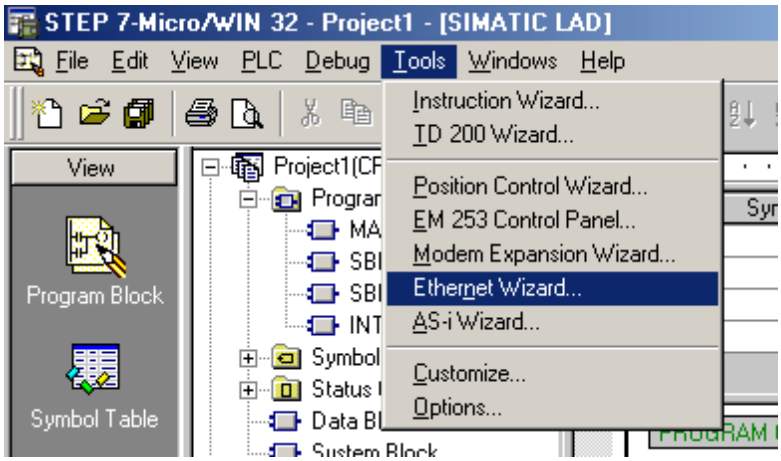
How To Configure Connections in Micro/WIN

Configured Connections are accomplished through the Ethernet Wizard in Micro/WIN. The following instructions illustrate each step in the Ethernet Wizard and also describe any precautions that should be taken as well. Follow these instructions closely in order to use Configured Connections with the Siemens TCP/IP Ethernet Driver correctly.

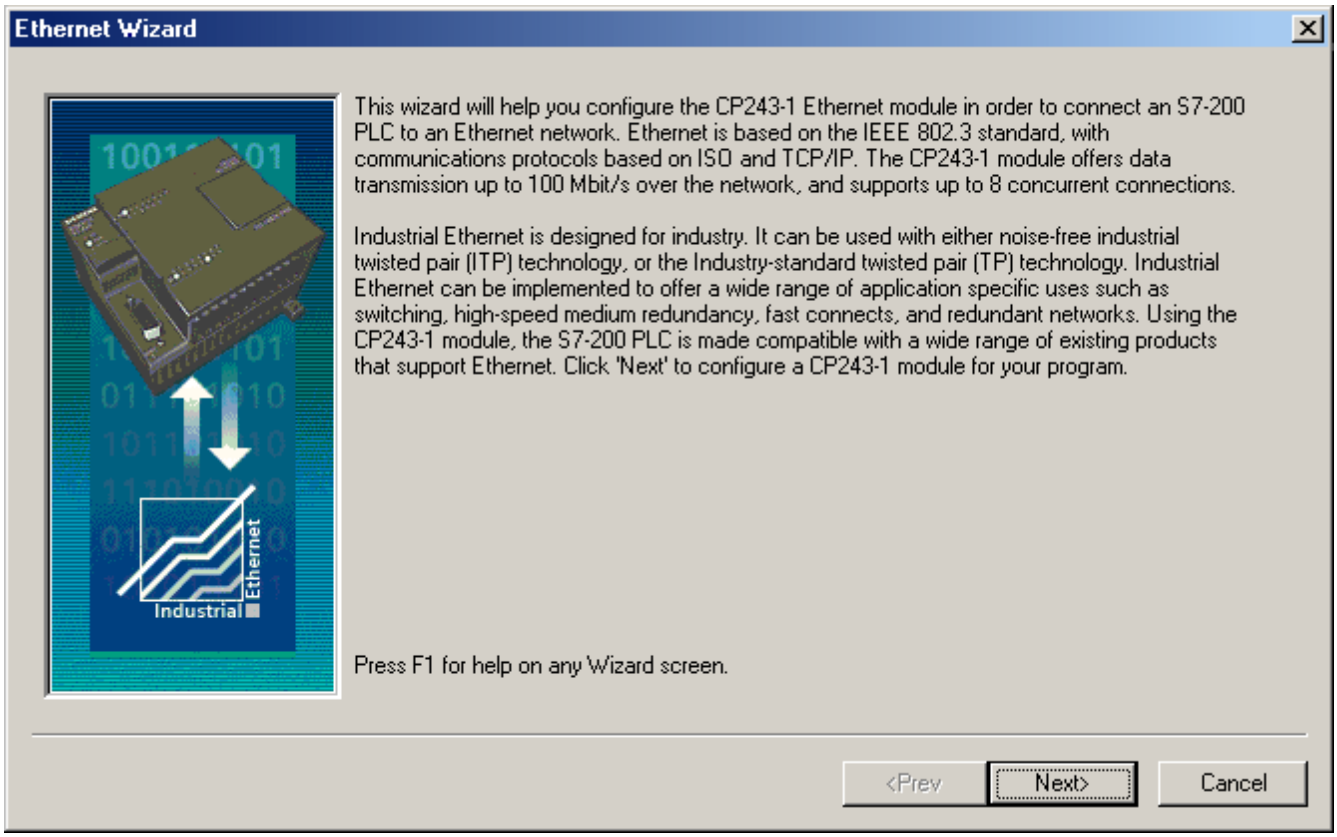
Note: The Micro/WIN software may require an upgrade before the Ethernet Wizard is made available.

Step 1: Launching the Ethernet Wizard

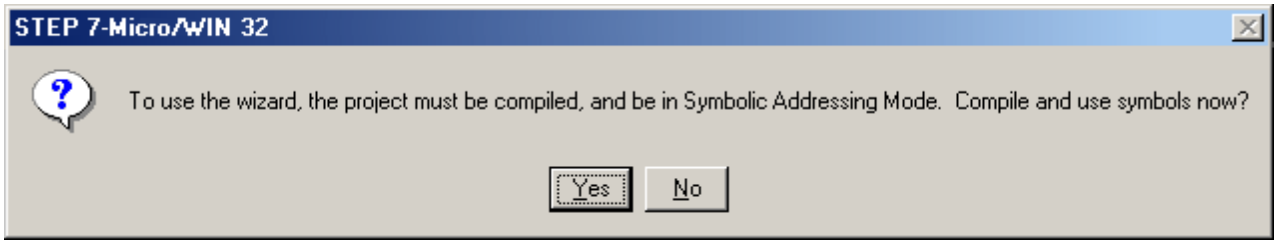
1. In the Micro/WIN main menu, click **Tools** | **Ethernet Wizard**.



2. Then, click **Next**.



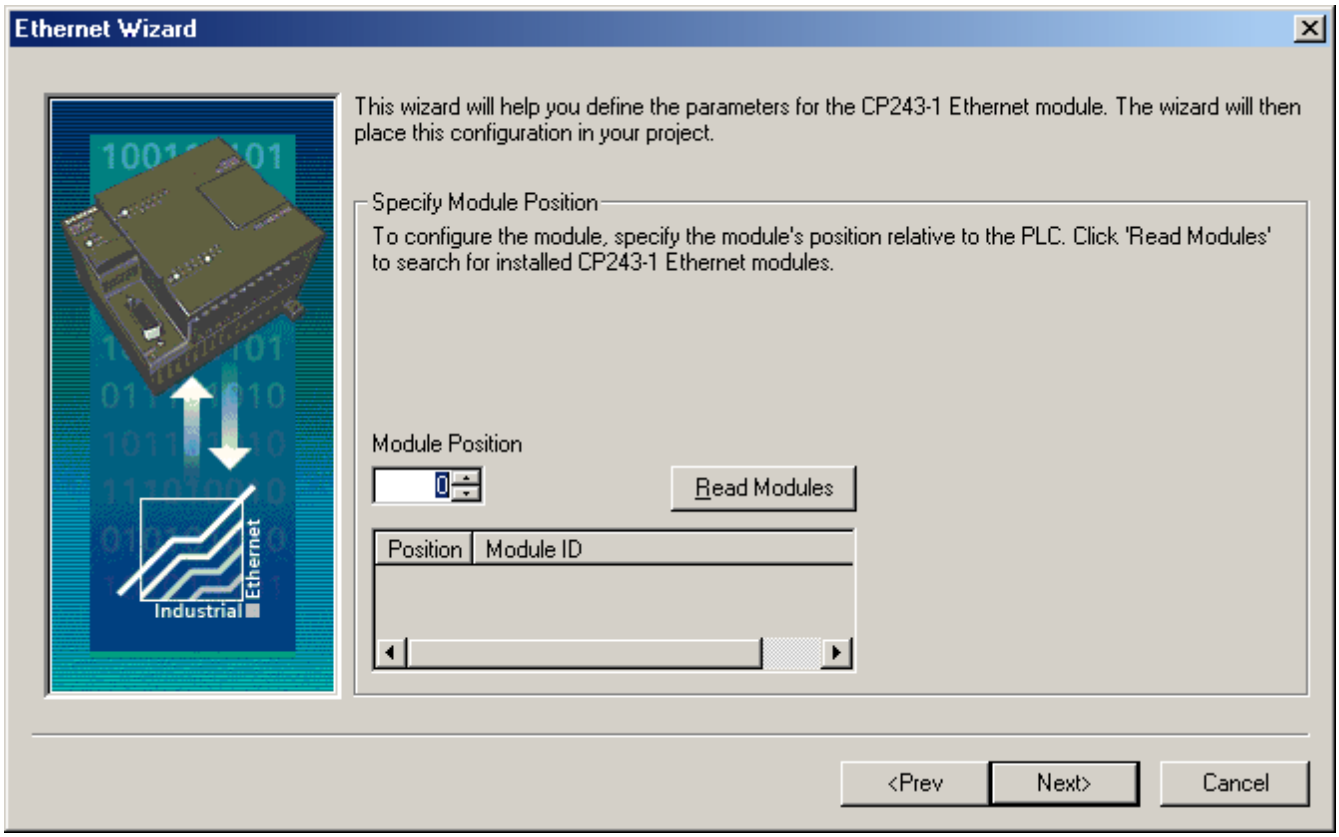
3. Click **Yes** to proceed.



Note: The program must be compiled before the Ethernet Wizard can execute. Correct any errors in the program before continuing.

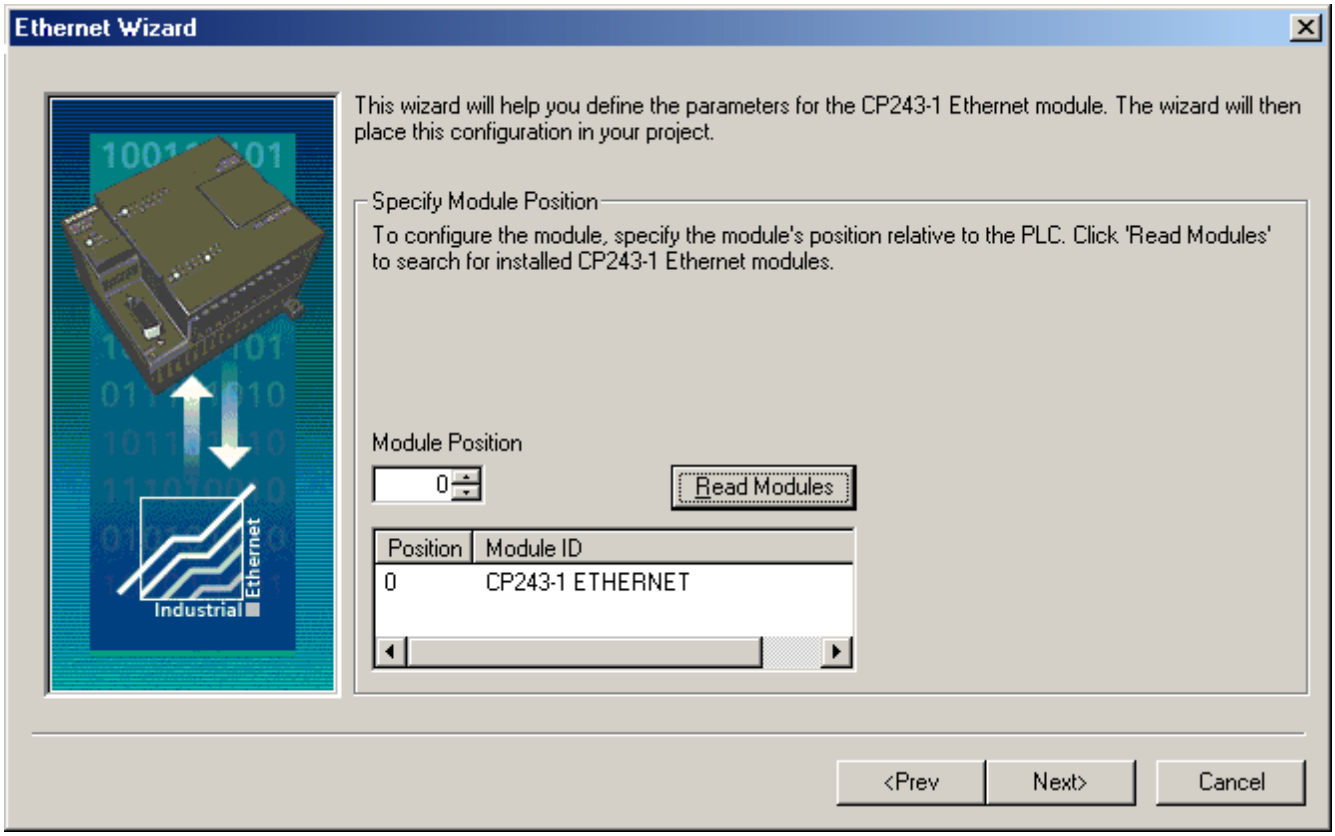
Step 2: Setting CP243-1 Module Position

1. Click **Read Modules**.



Note: While it is recommended that the **Read Modules** function be used, this does require that the PLC be connected to the PC either serially or by Ethernet. In either case, the communications parameters for **Micro/WIN** must be properly set for the Read Modules operation to occur.

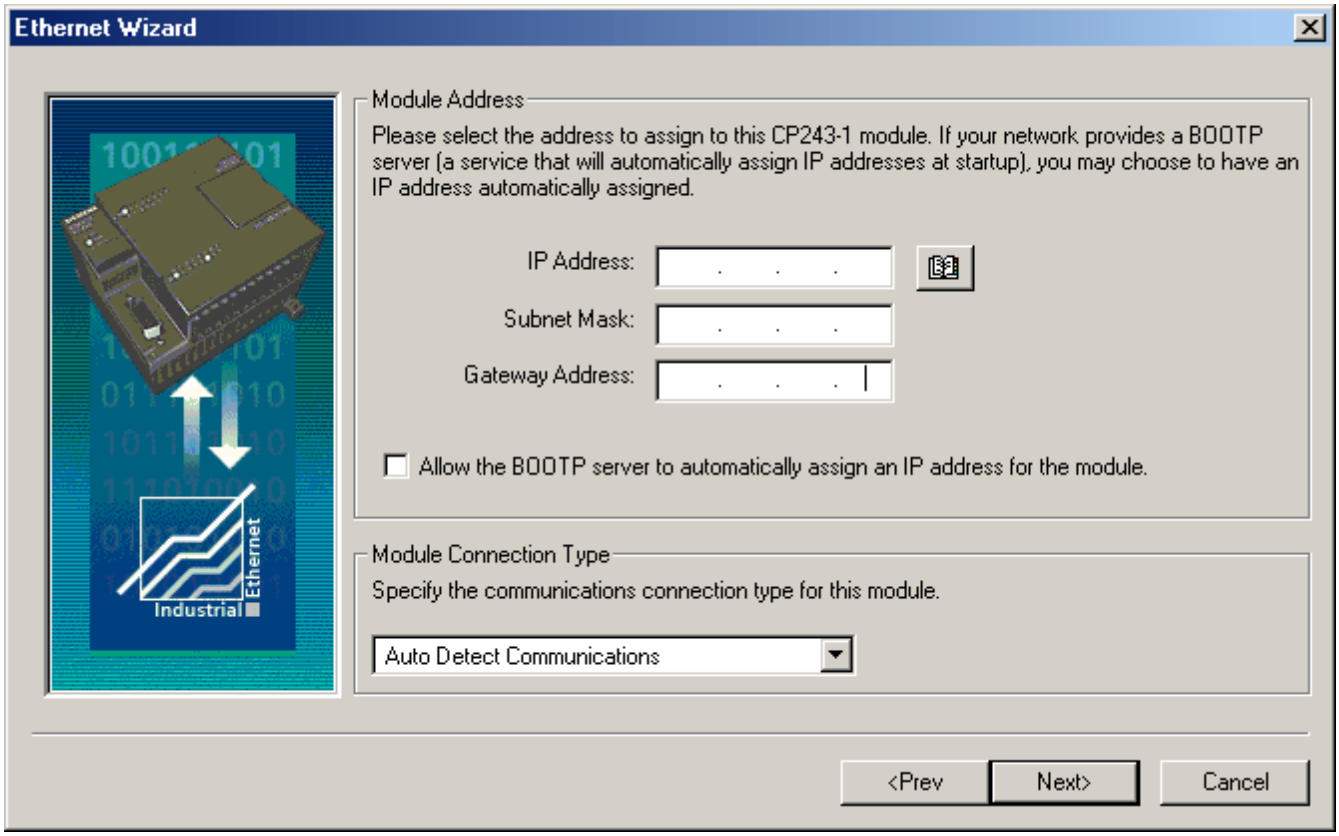
2. To view the results of Read Modules, select the **Ethernet module**. Click **Next**.



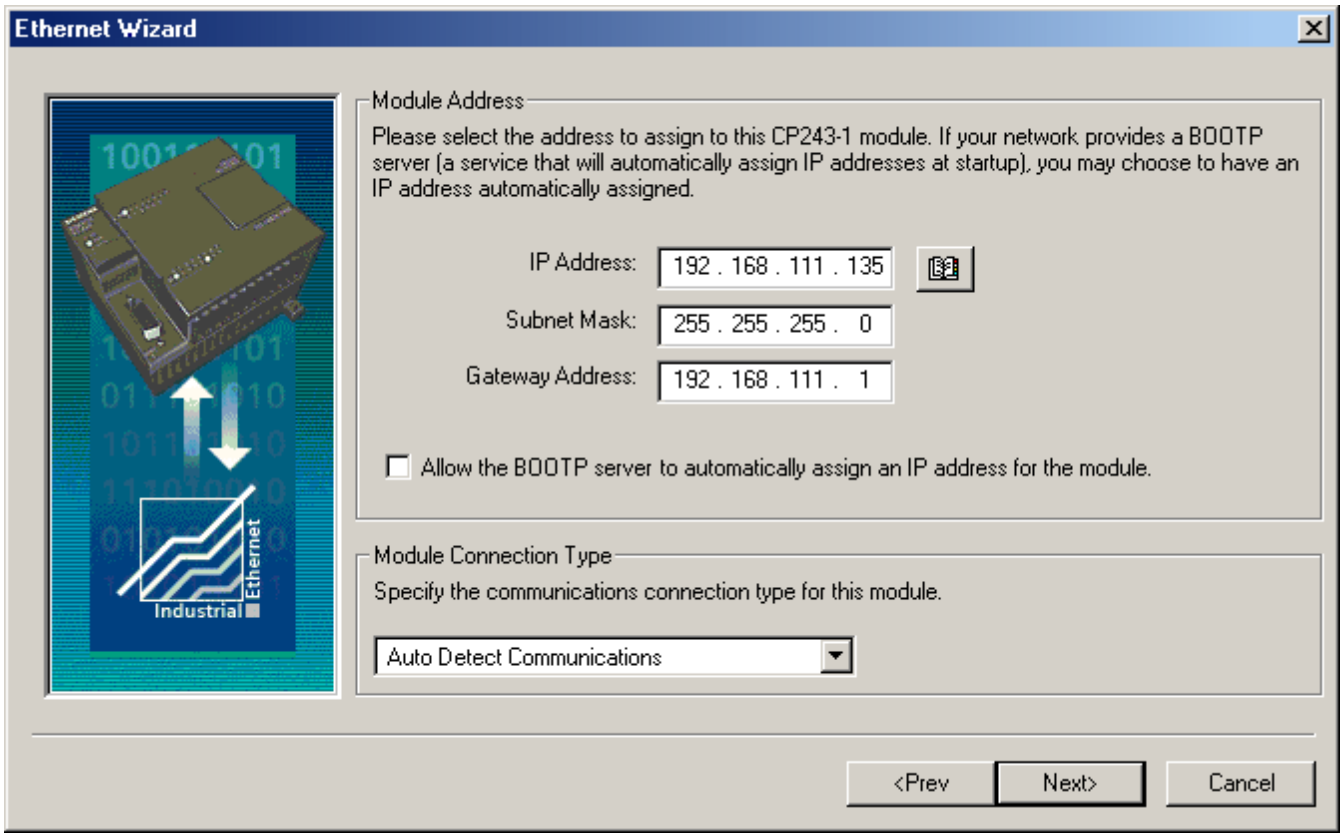
Step 3: Assigning Module Address

1. Enter the **IP Address**, **Subnet Mask** and **Gateway Address** if applicable. Alternatively, enable **BOOTP** if applicable.

2. Select **Auto Detect Communications** in order to allow the module to automatically select either **10BaseT** or **100BaseT**. In rare cases where there may be a cable issue that does not allow the module to operate properly at 100BaseT, force the module to use 10BaseT. This will increase the modules' tolerance to a bad Ethernet line.

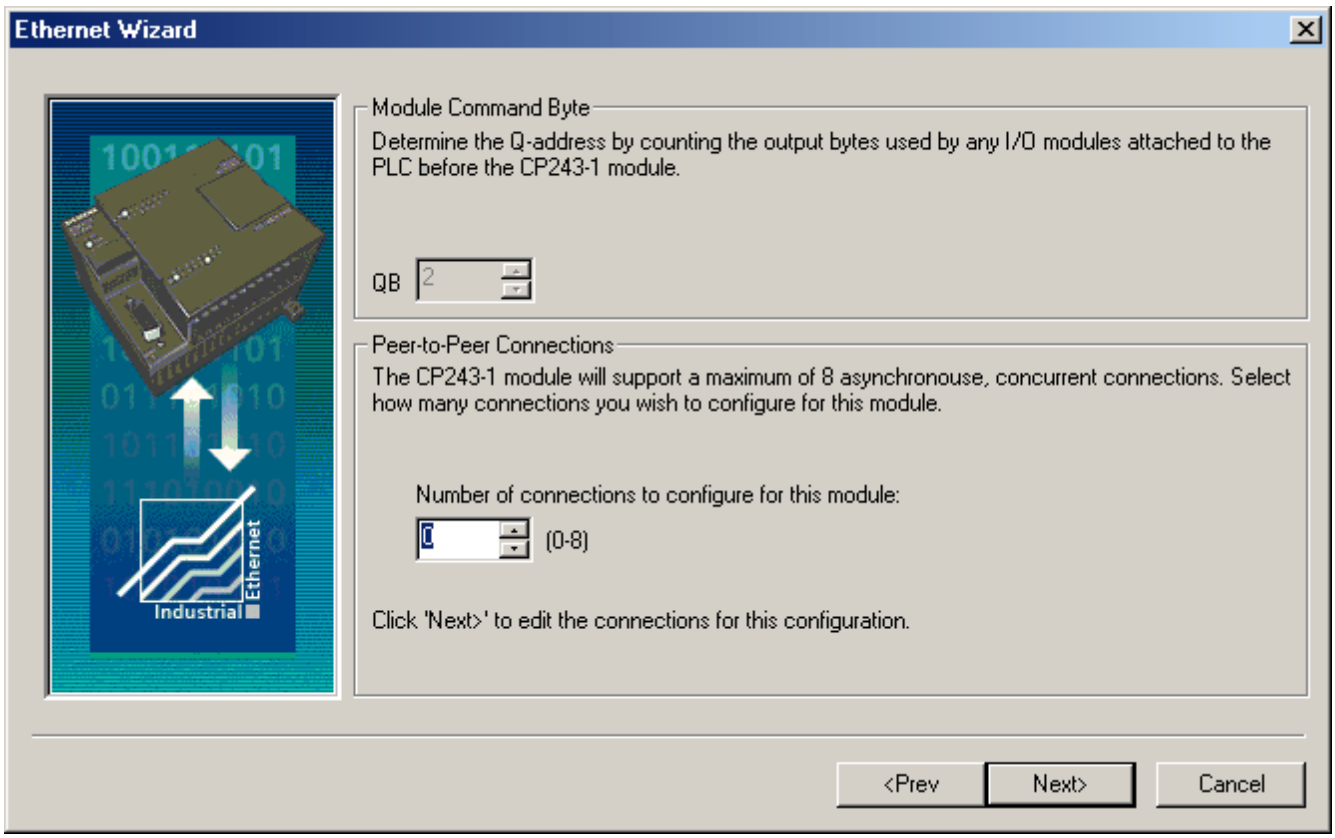


3. The image shown below contains demonstration values.



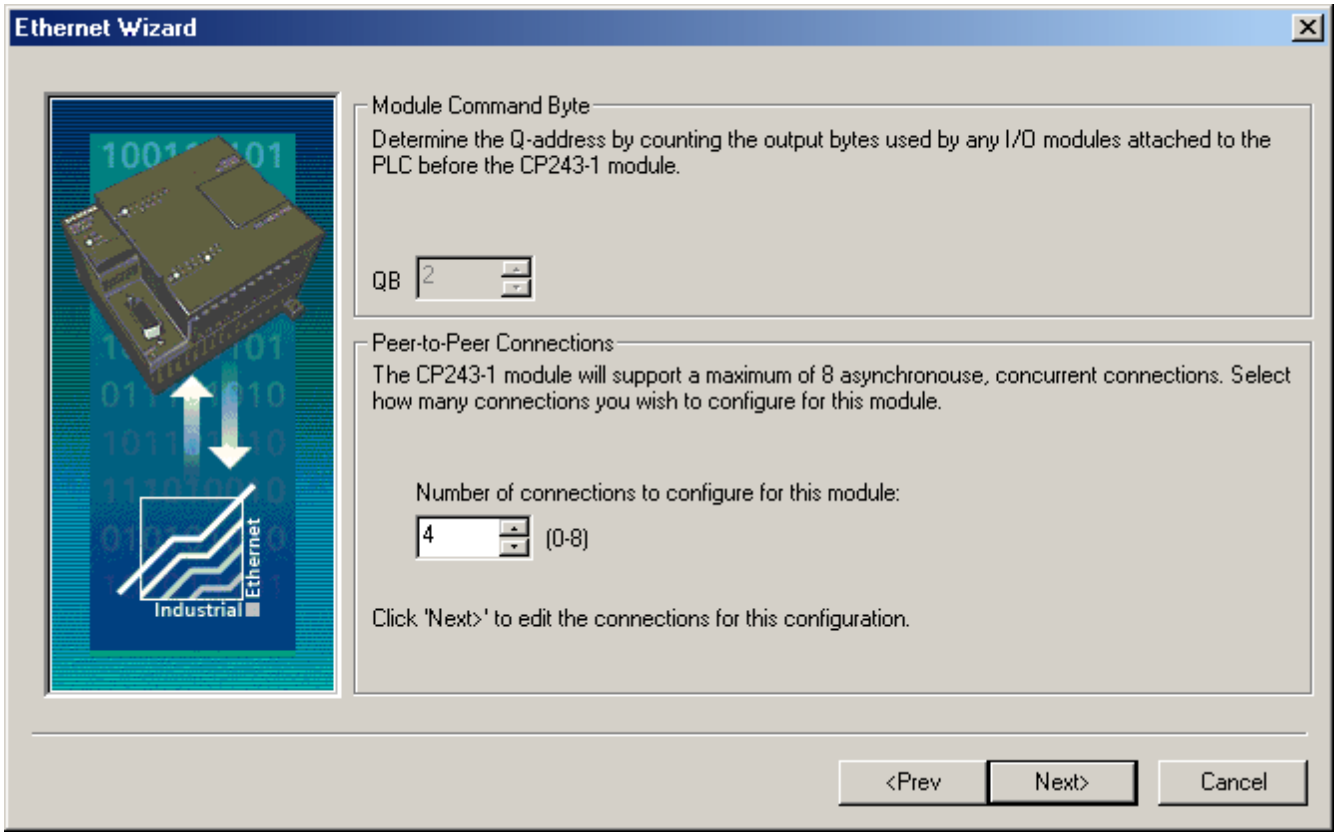
Step 4: Number of Configured Connections

1. Enter the number of desired available connections for this device. If 0 is entered, the only connection available will be the PG connection used by Micro/WIN.



Note: The number of connections selected determines how many simultaneous connections the PLC can support. When intending to have only one OPC Server talking to the PLC, set up only one connection. This will ensure the best performance for the OPC Server. When intending to have more than one active connection to the PLC, use multiple connections. Keep in mind, however, that the performance of the module will be impacted as each connection is used.

2. The image shown below contains 4 connections.



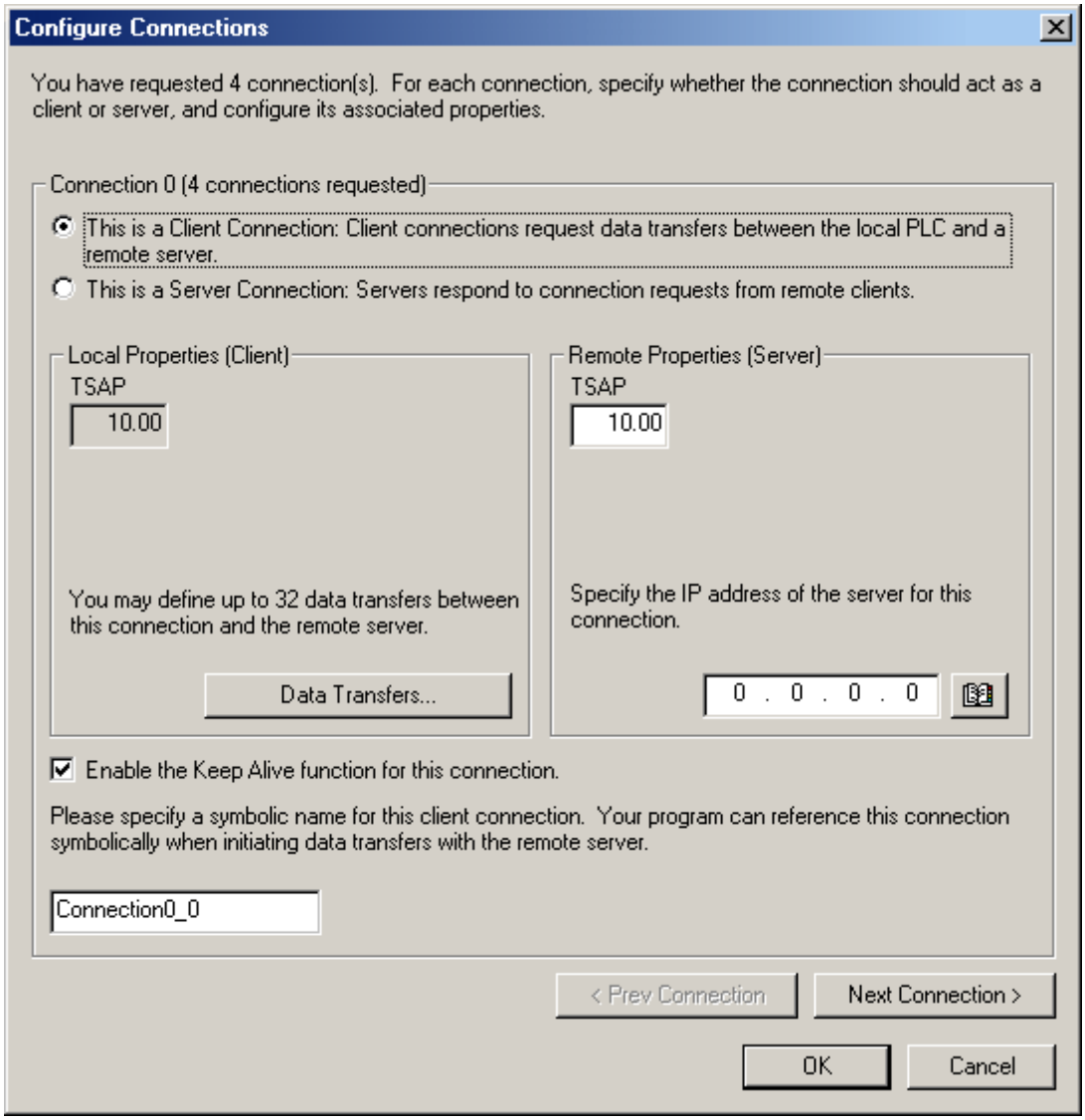
Step 5: Configuring Connections

Each connection is configured individually. For this example, 4 connections have been selected.

Step 5a: Connection 0

There are two types of connections, Client and Server. In a Client Connection, the device is a client and makes request with servers (i.e. other devices). In a Server Connection, the device is a server and handles requests from clients (such as the OPC Server and other devices). The latter is required for communications with the Siemens TCP/IP Ethernet Driver.

1. Select **This is a Server Connection...**.



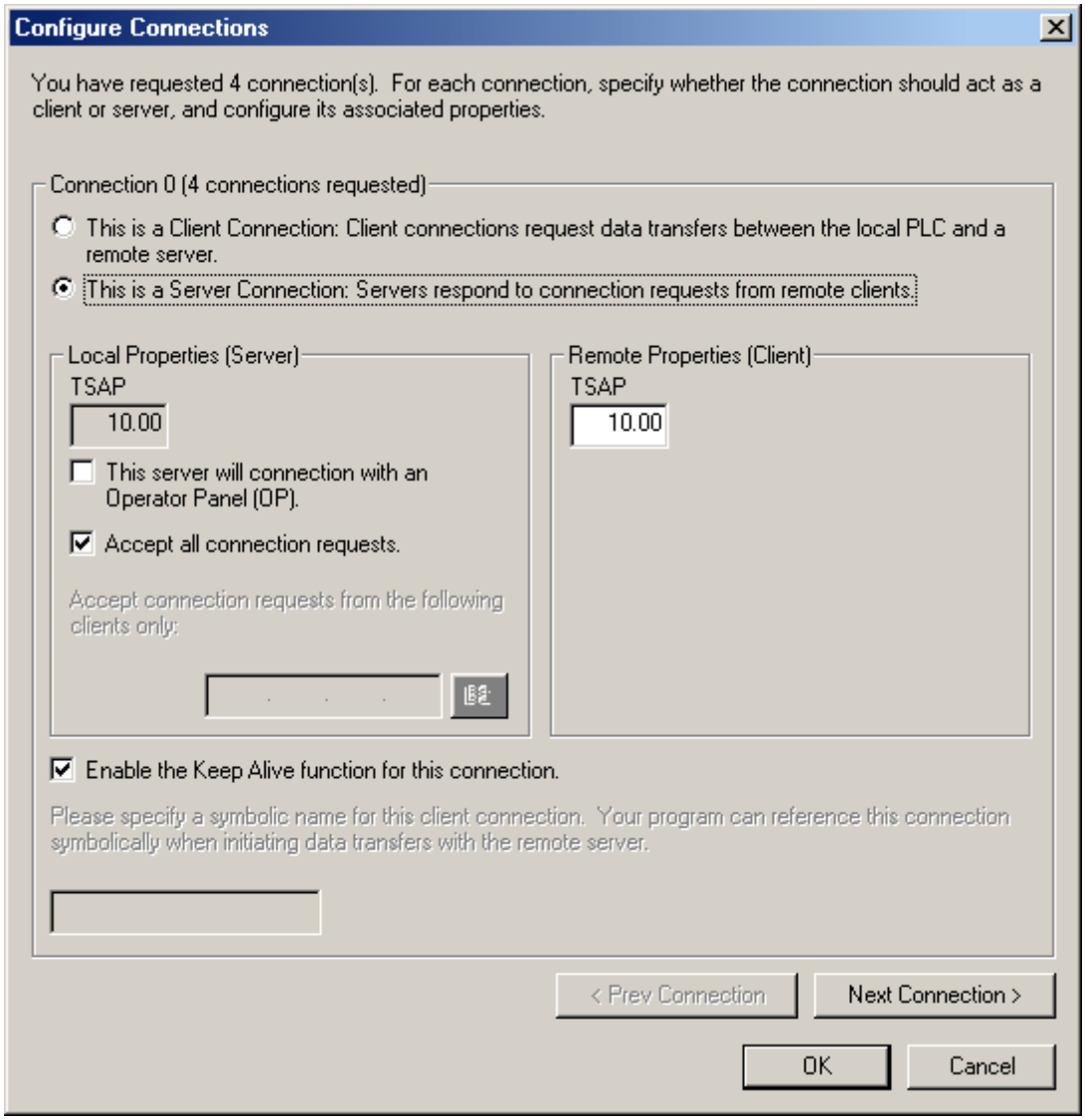
2. From this standpoint, the **CP243-1 is** considered the **Server** (**Local**) and the **OPC Server Channel**. The device is considered the **Client (Remote)**.

3. Enter a **Remote TSAP** or accept the default. This will be the **Local TSAP** in the **OPC Server**.

4. **Optional:** Accept all connection requests or limit to a particular remote machine. It is recommended that **Accept all connection requests** be selected. If concerned about device security (or if intending to access this device over the Internet) select a specific IP address. Users must ensure that the OPC server is running on a PC that has a known and fixed IP address.

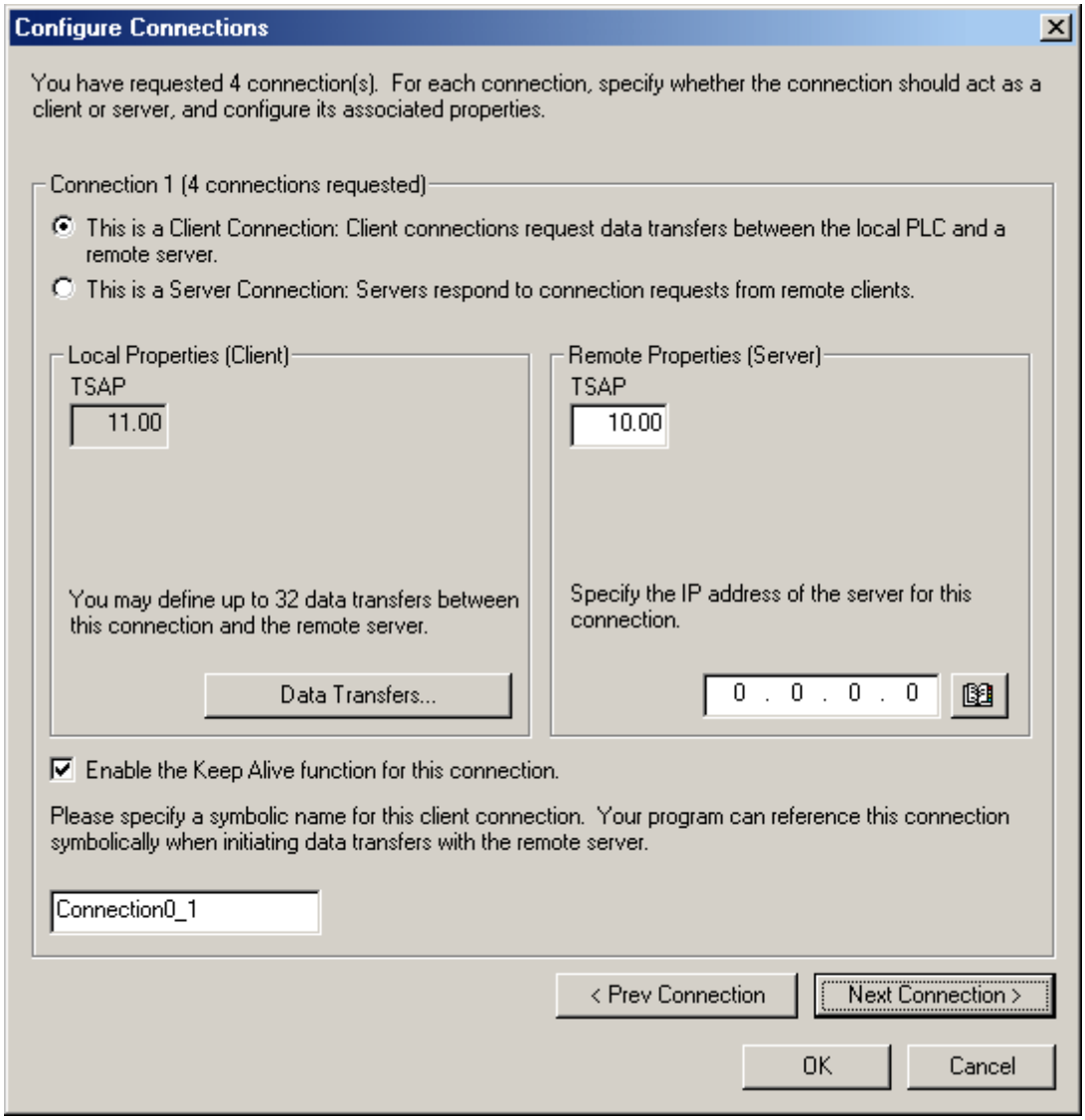
5. Select **Enable the Keep Alive**.

6. Click **Next Connection**.



Step 5b: Connection 1

1. Select **This is a Server Connection...**



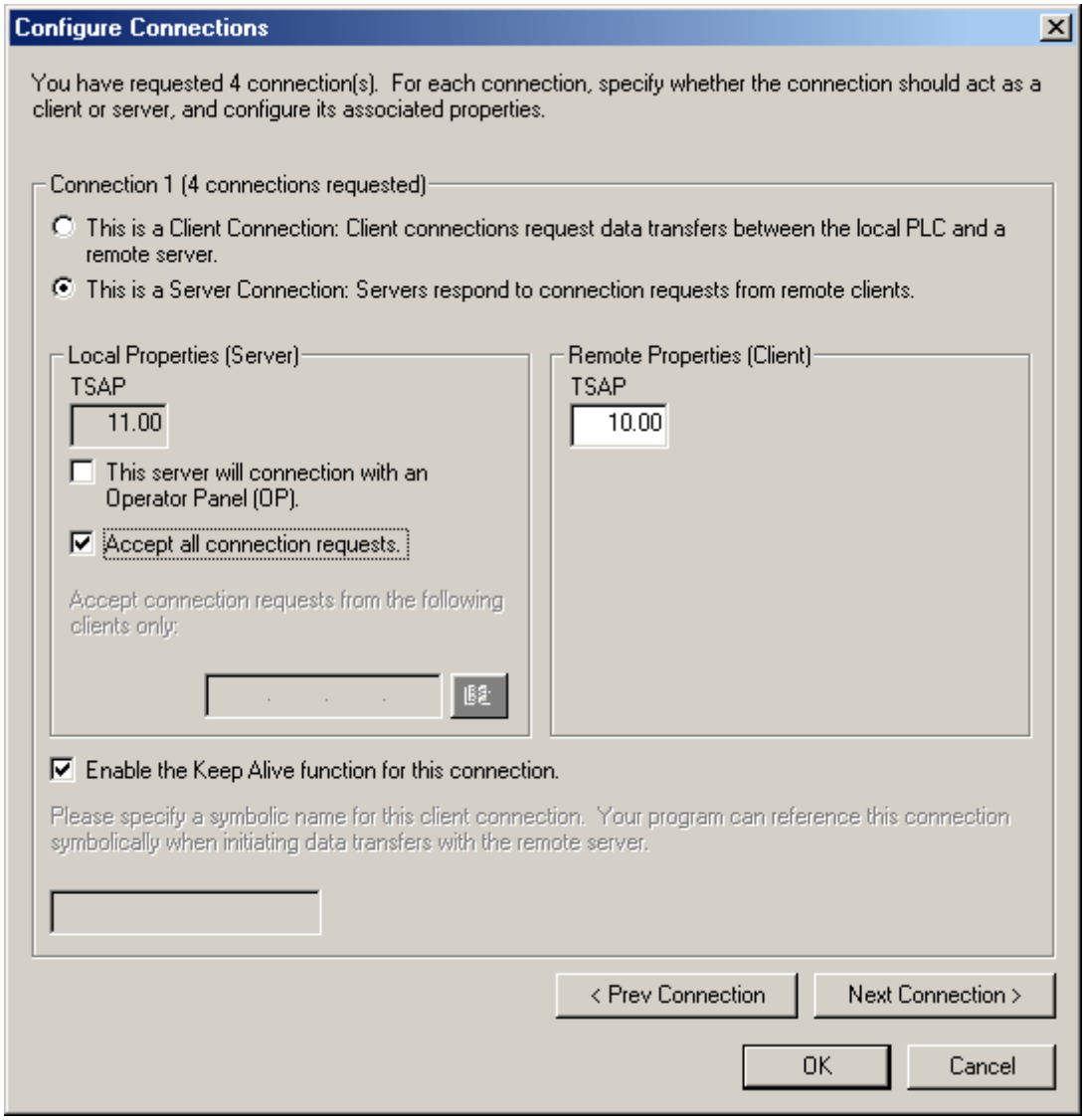
2. Notice the **Local TSAP** automatically incremented to 11.00.

3. Enter a **Remote TSAP** or accept the default. This will be the **Local TSAP** in the **OPC Server**.

4. **Optional: Accept all connection requests**.

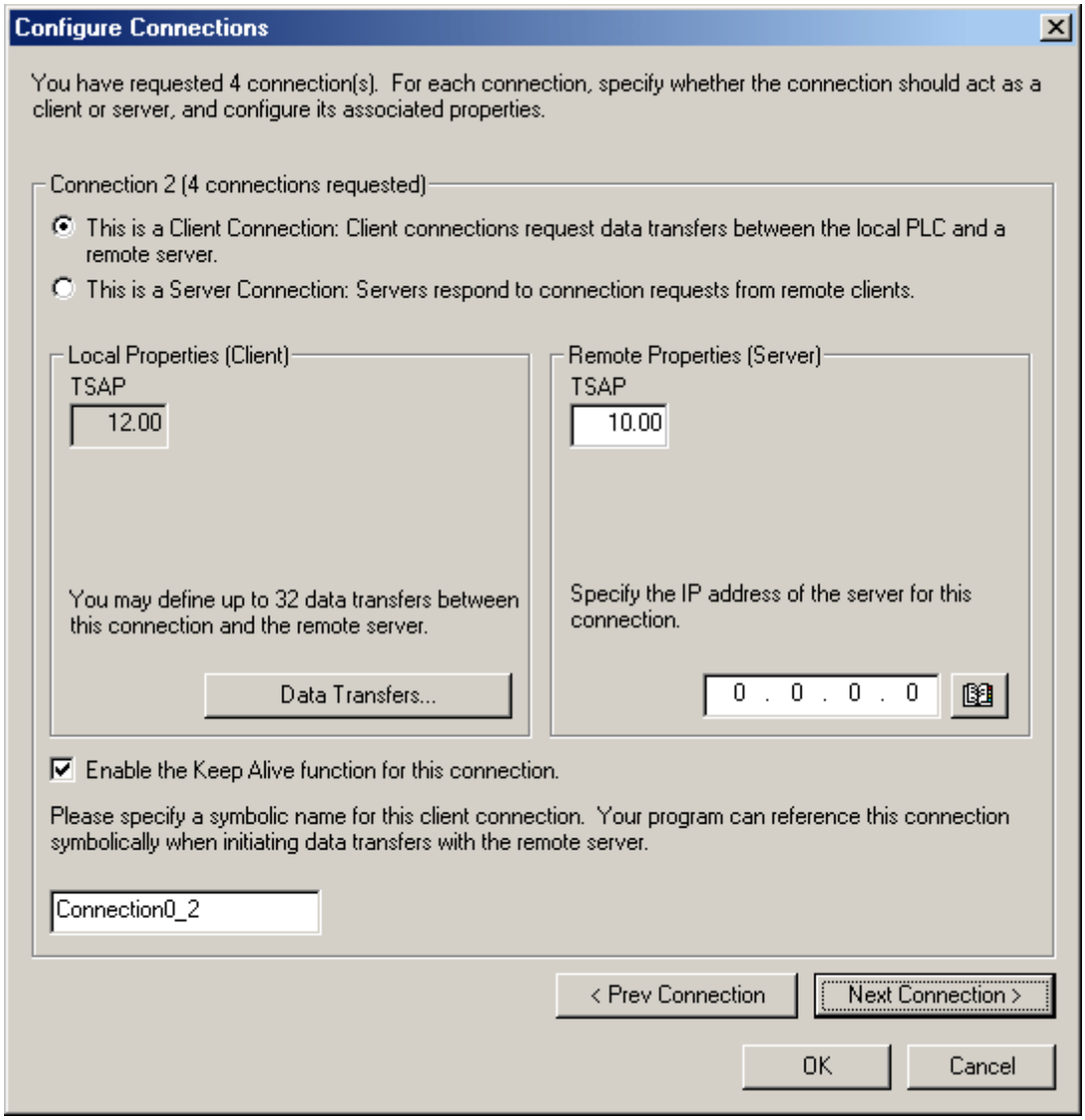
5. Select **Enable the Keep Alive**.

6. Click **Next Connection**.



Step 5c: Connection 2

1. Select **This is a Server Connection...**



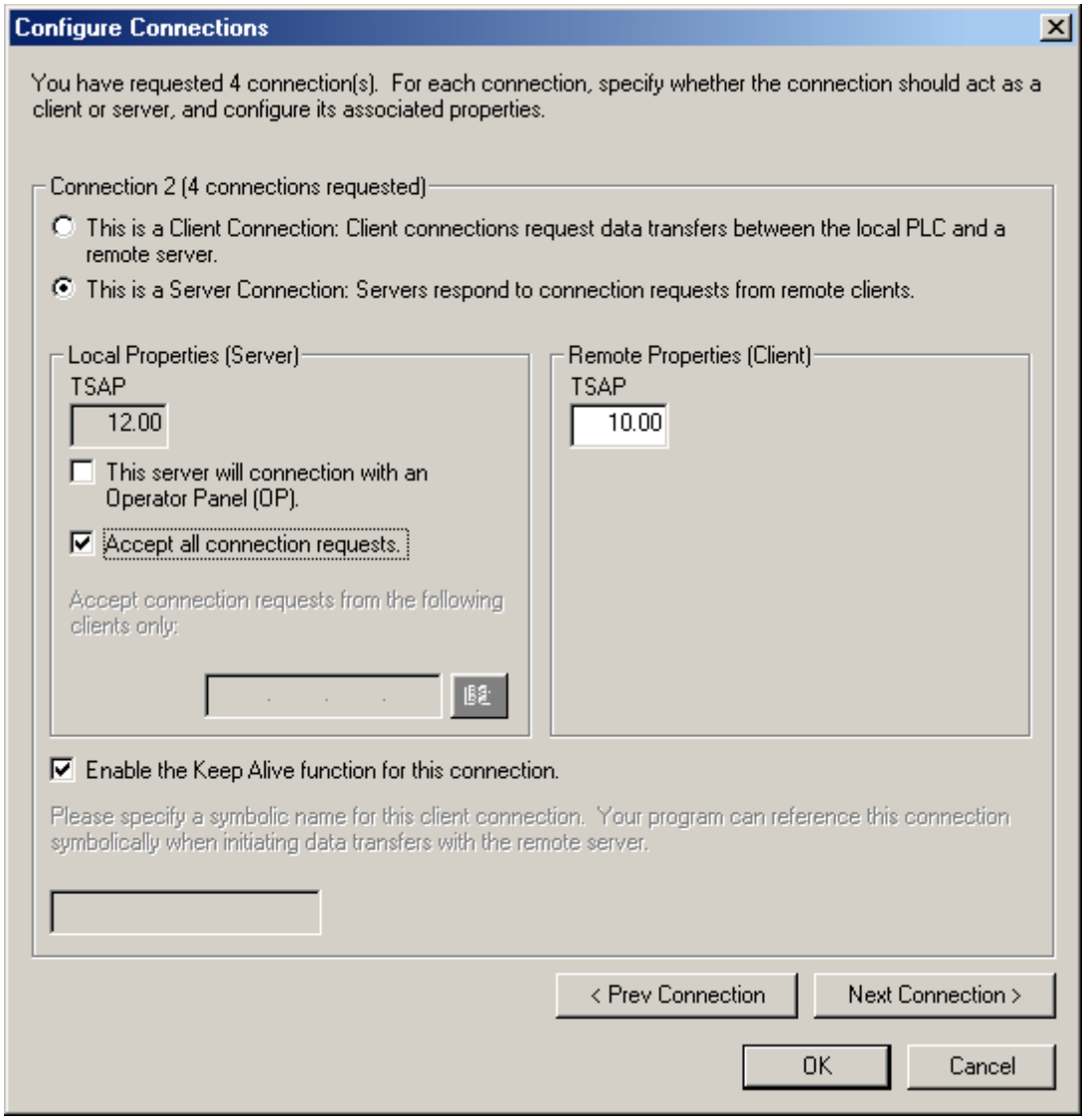
2. Notice the **Local TSAP** automatically incremented to 12.00.

3. Enter a **Remote TSAP** or accept the default. This will be the **Local TSAP** in the **OPC Server**.

4. **Optional: Accept all connection requests**.

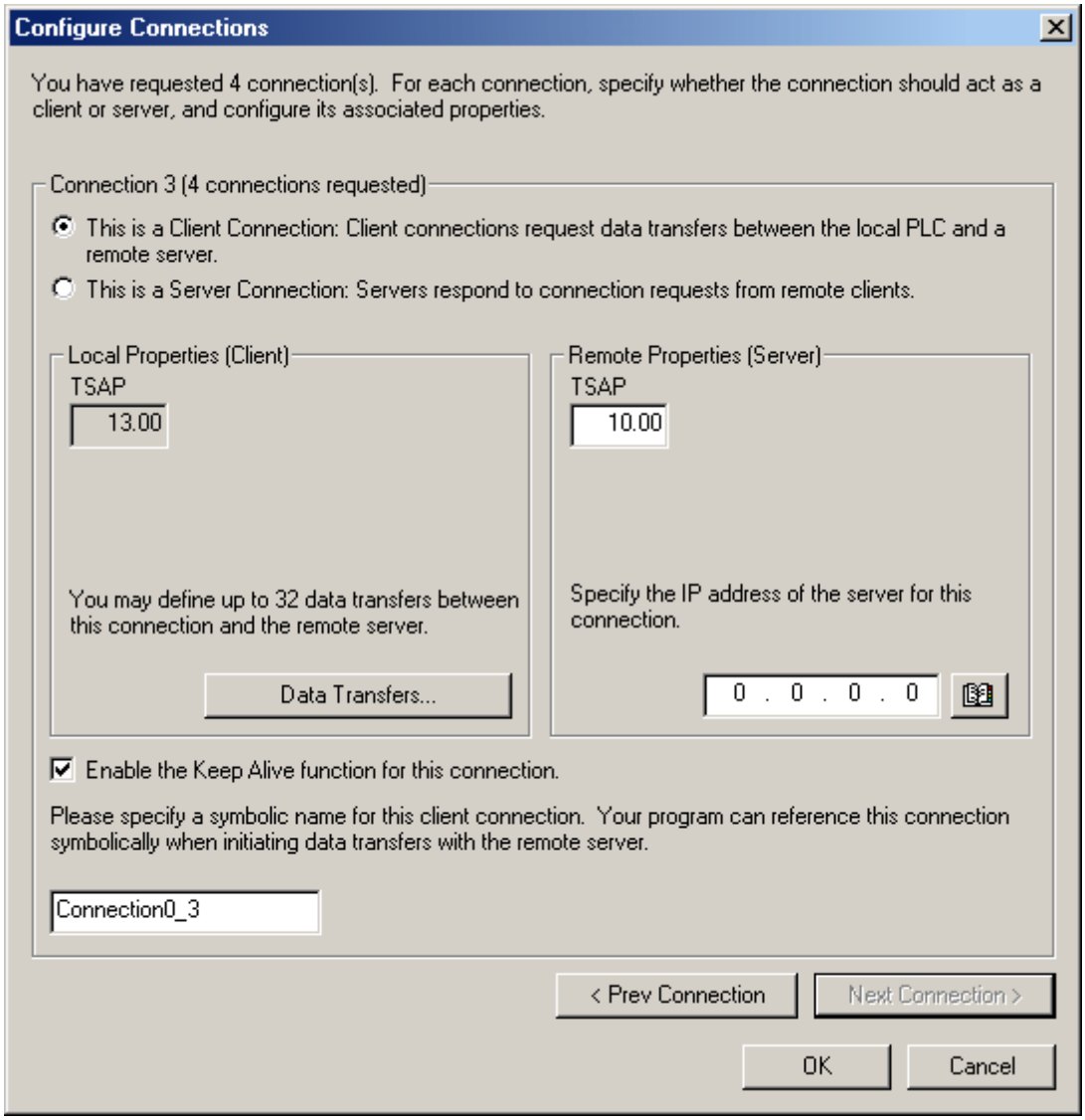
5. Select **Enable the Keep Alive**.

6. Click **Next Connection**.



Step 5d: Connection 3

1. Select **This is a Server Connection...**.



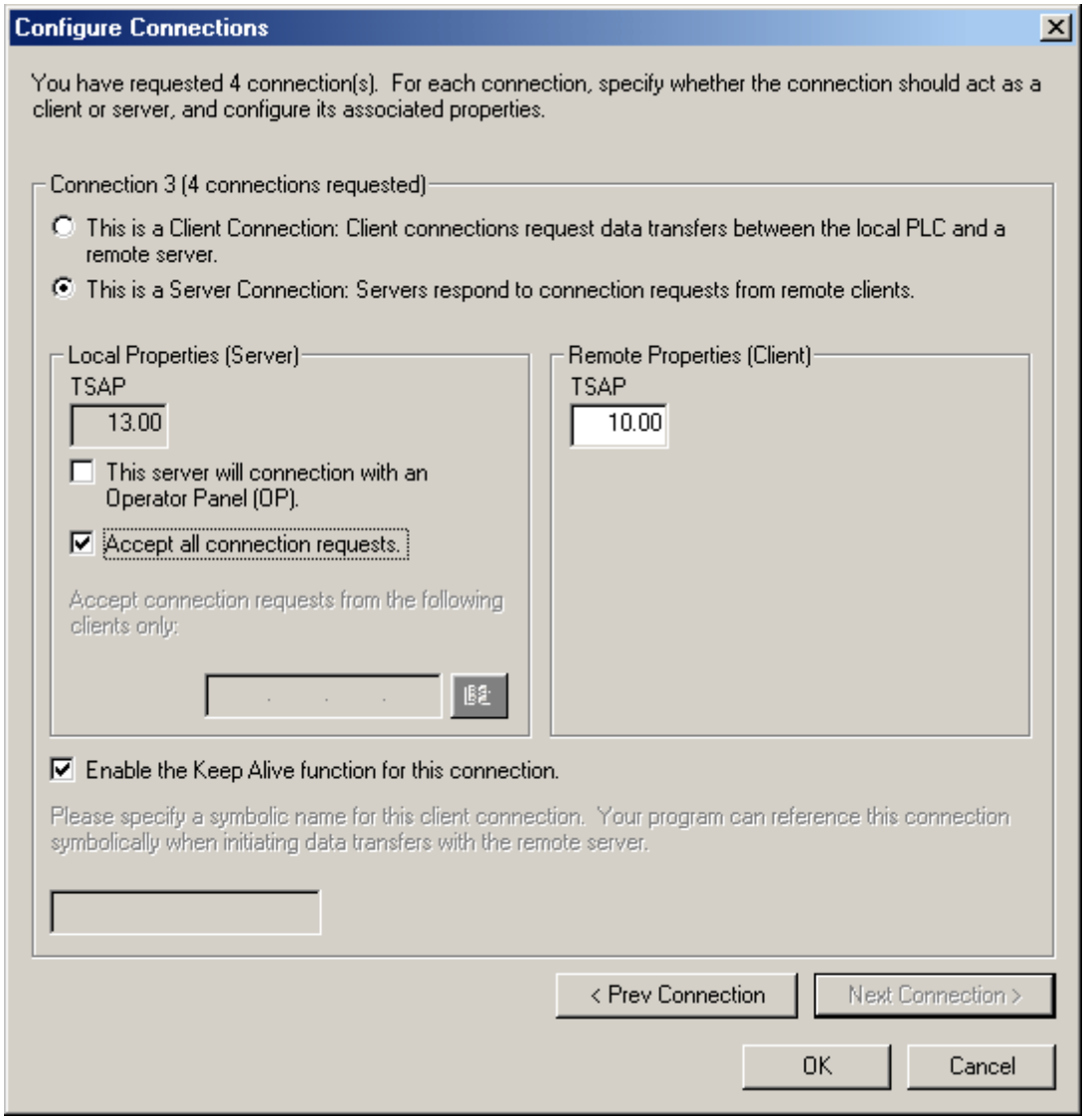
2. Notice the **Local TSAP** automatically incremented to 13.00.

3. Enter a **Remote TSAP** or accept the default. This will be the Local TSAP in the OPC Server.

4. **Optional: Accept all connection requests**.

5. Select **Enable the Keep Alive**.

6. Click **Next Connection**.



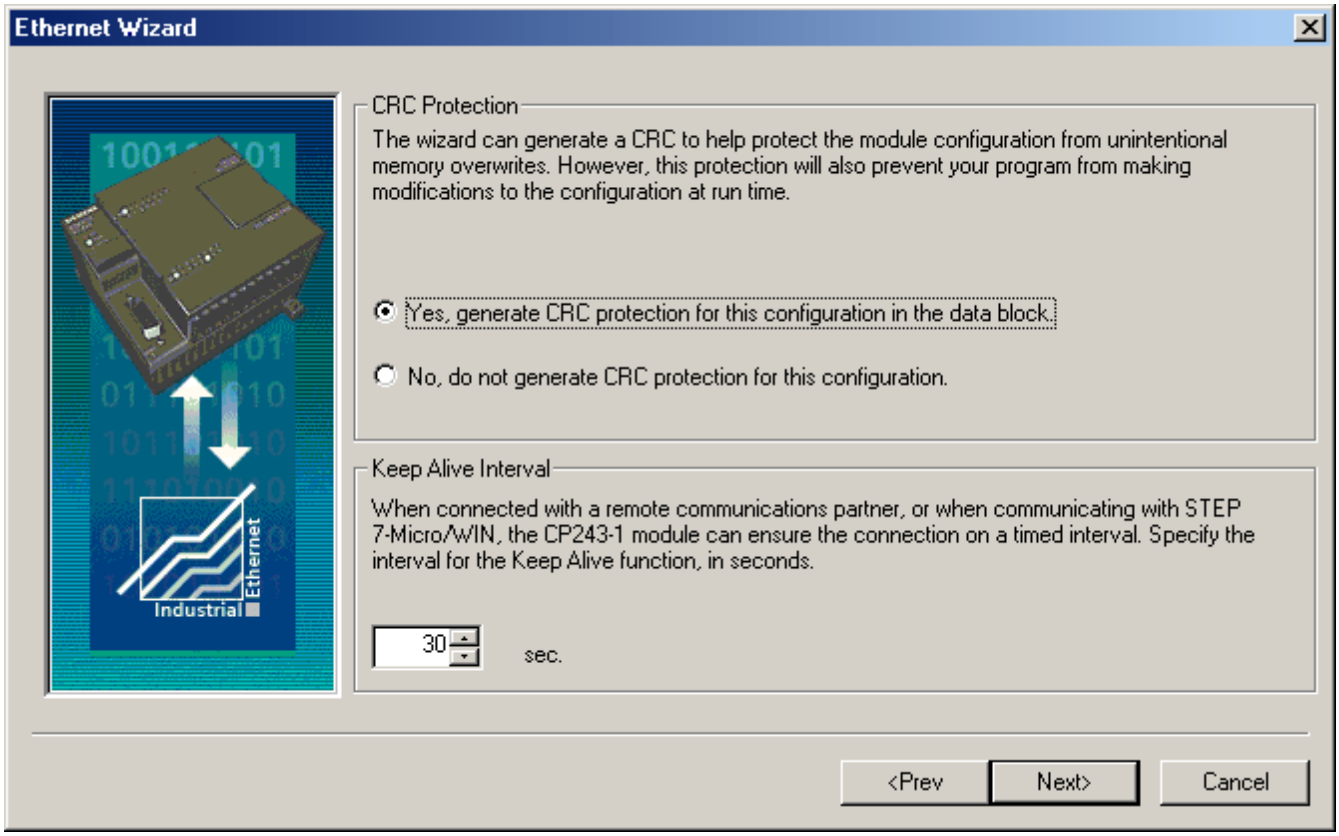
That completes the configuration of the four connections that were selected.

Note: Notice that the **Local TSAP** in the **Connection dialog** was automatically advanced for each connection. This TSAP number will need to be used in the OPC server setup when defining a device as the remote TSAP number.

Step 6: CRC and Keep Alive Interval

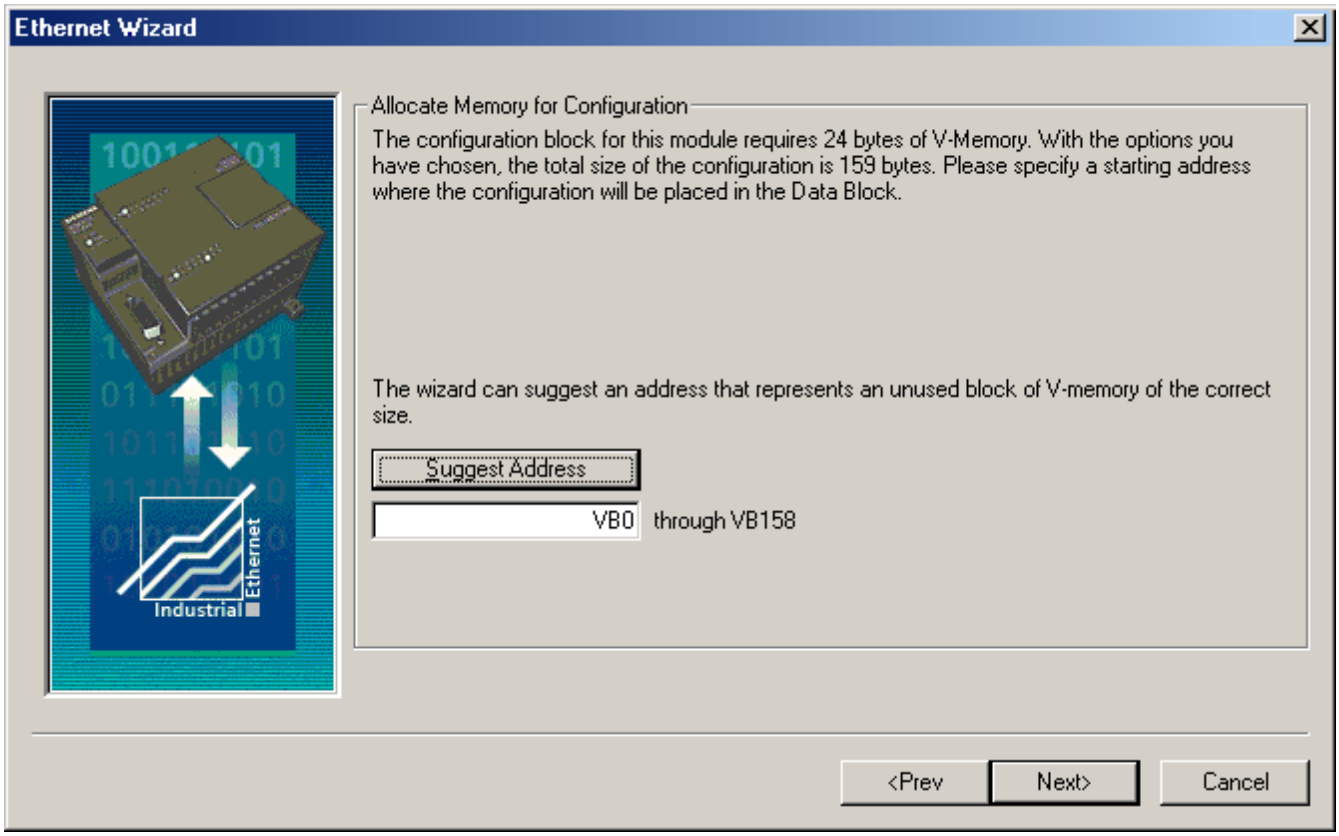
Optional: Enable CRC protection to monitor for accidental configuration corruption.

1. Set the **Keep Alive Interval**. The longer the interval, the longer the connection between the device and the OPC Server will exist during idle time. A long Keep Alive Interval may not be desirable if connections are being shared (nonconcurrent). Each remote client will need to wait this amount of time before it will be able to connect with the device once the last connected remote client is finished communications. The 30 second default is suggested.

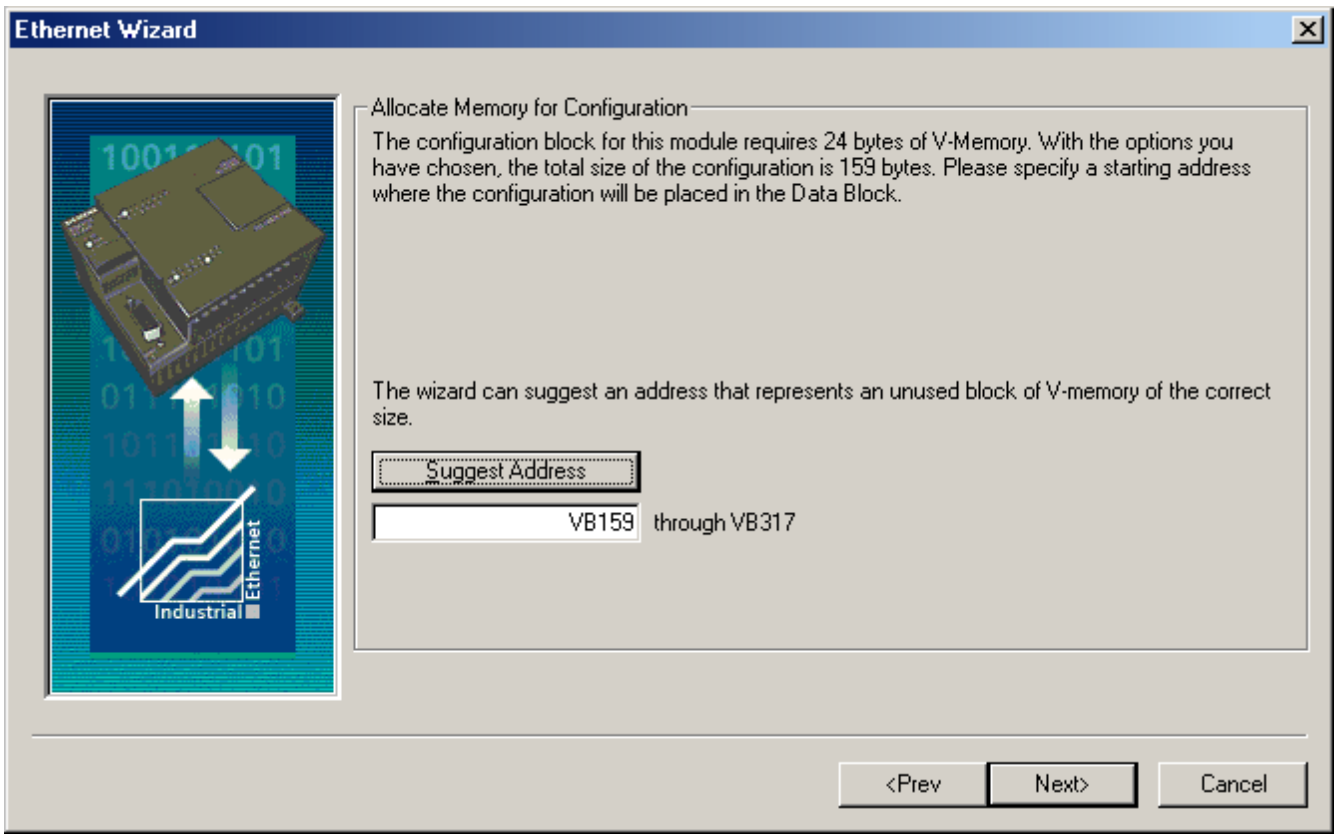


Step 7: Memory for Configuration

1. Click **Suggest Address** to let the wizard find the best available location to store the **Ethernet configuration**.



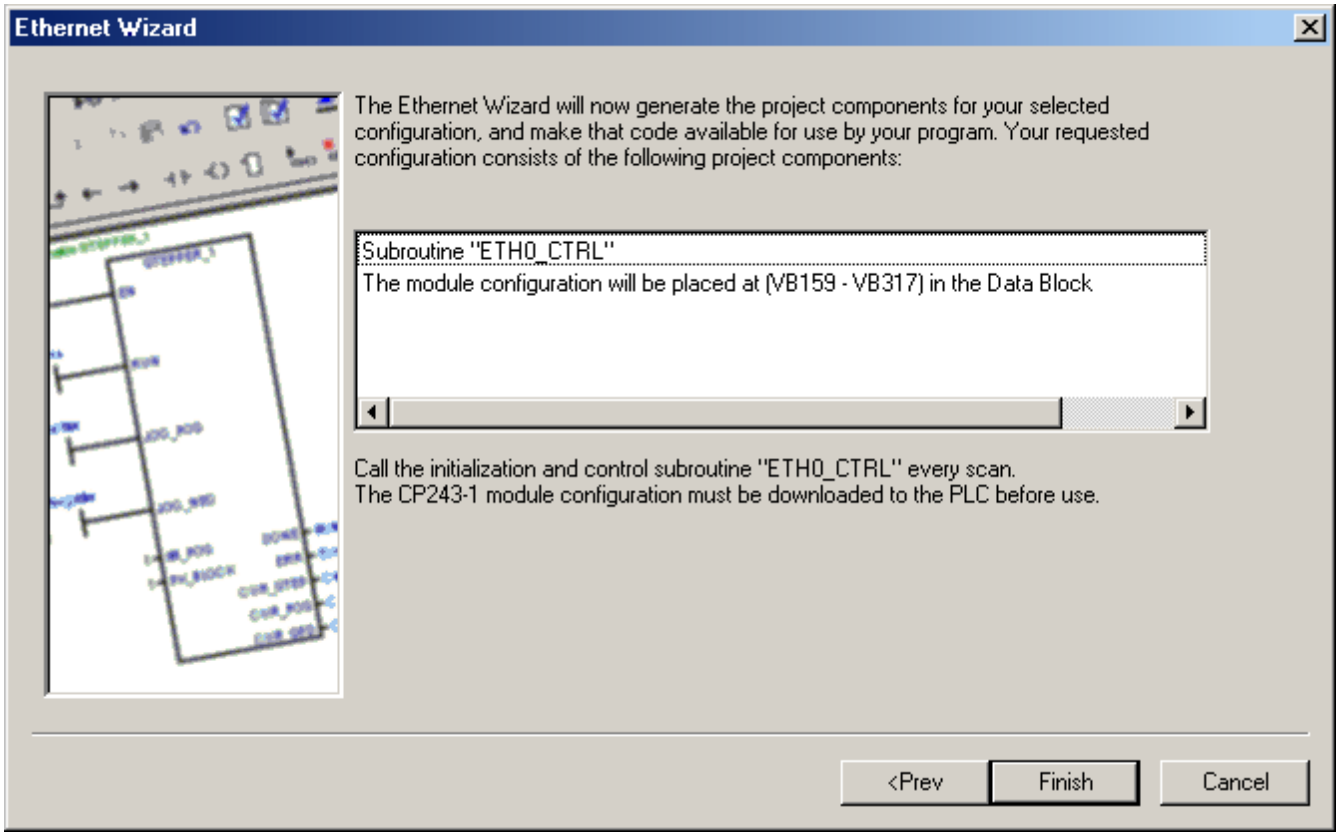
2. The image shown below displays the results.



Note: It is recommended that the Micro/WIN software pick this location for the application. If a CRC was not generated for the configuration data, please take steps to ensure that no other aspect of the PLC program will overwrite this area of memory.

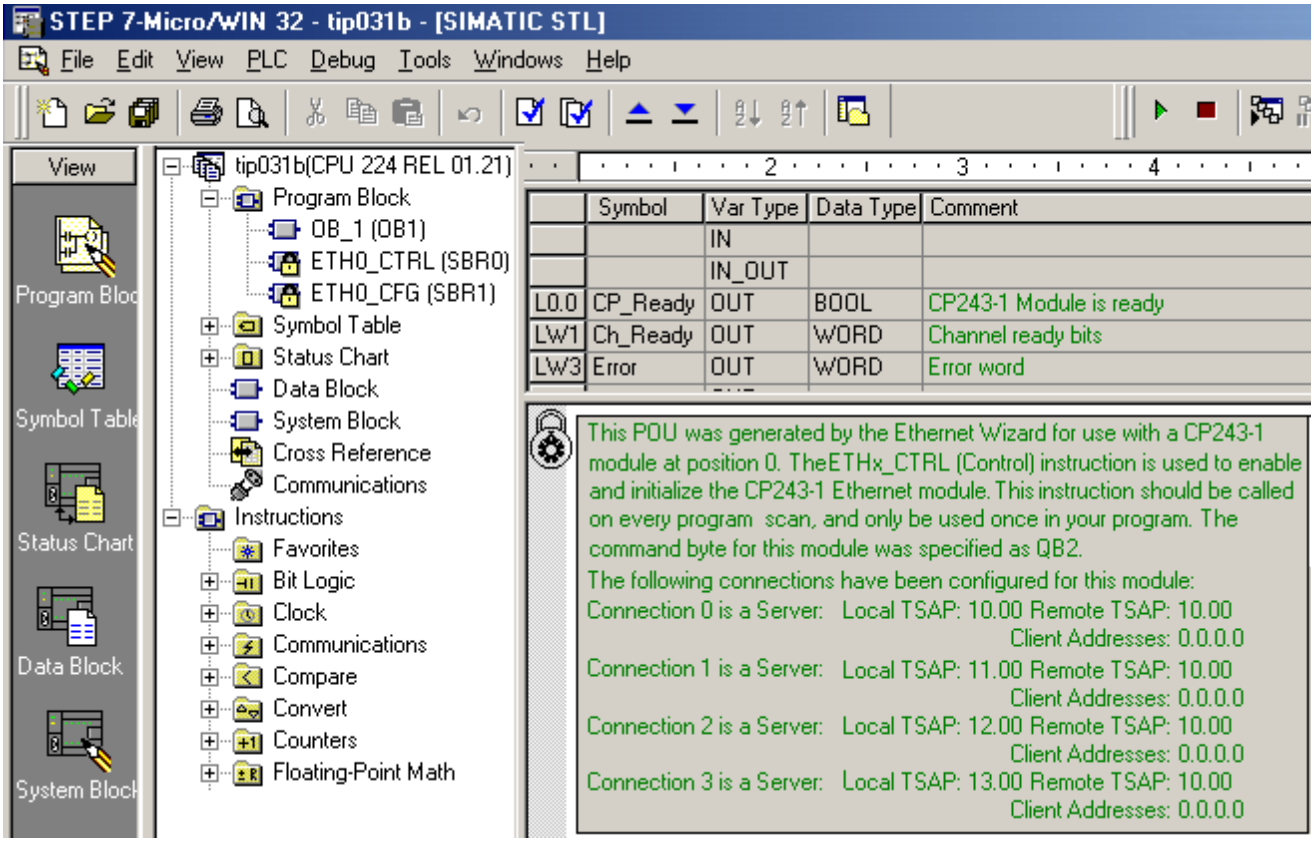
Step 8: Ethernet Wizard Summary

1. Click **Finish** or **Prev** in order to modify the **Configured Connections**.

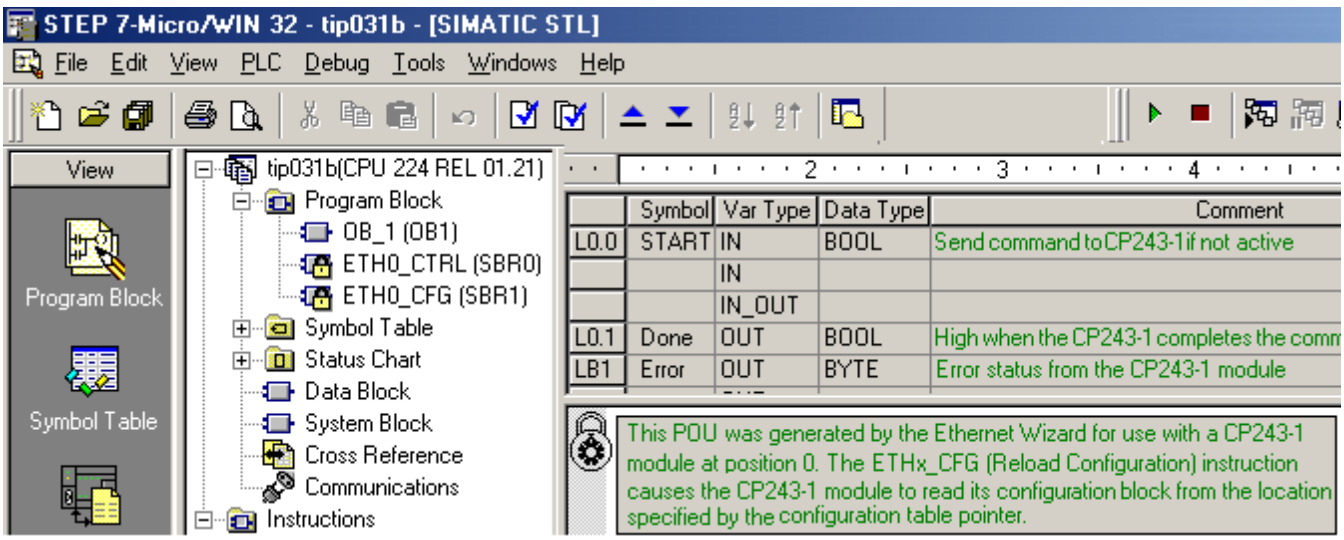


2. To review what the Ethernet Wizard produced, double-click **ETH0_CTRL** under the **Program Block**. All **TSAPs** configured are listed for future reference. Remember, the **Local TSAP** below is the **Remote TSAP** in the OPC Server and the Remote TSAP below is the Local TSAP in the OPC Server.

3. The image below shows **ETH0_CTRL**.



4. The image below shows **ETH0_CFG**.

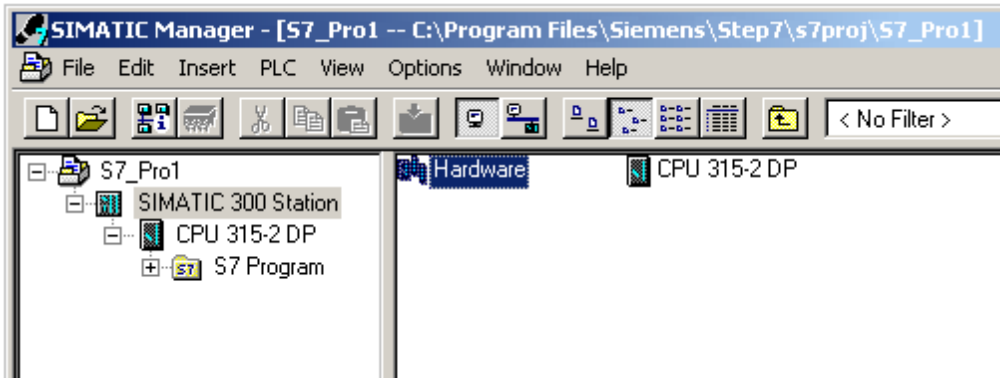


5. Now that the results of the Ethernet Wizard have been confirmed, a connection can be made using the OPC Server.

How To Configure S7-300/400 Connections in STEP 7

In order to configure the S7-300/400 for communications with the Siemens TCP/IP Ethernet Driver, both the CPU and the Ethernet module will need to be configured as well. To do so, follow the directions below.

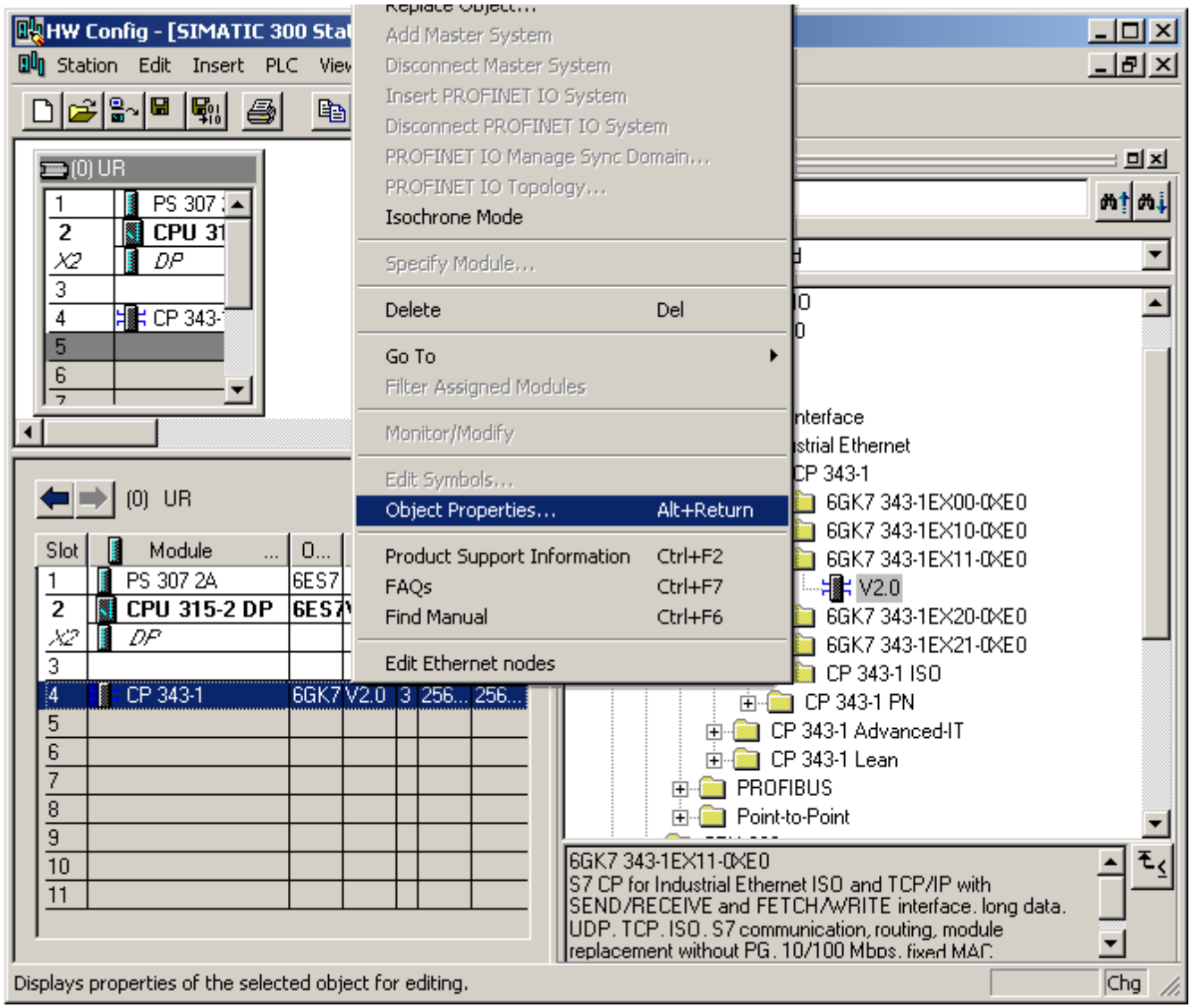
1. From the **Simatic Manager**, launch **HW Config** by double-clicking **Hardware** under the **SIMATIC Station**.



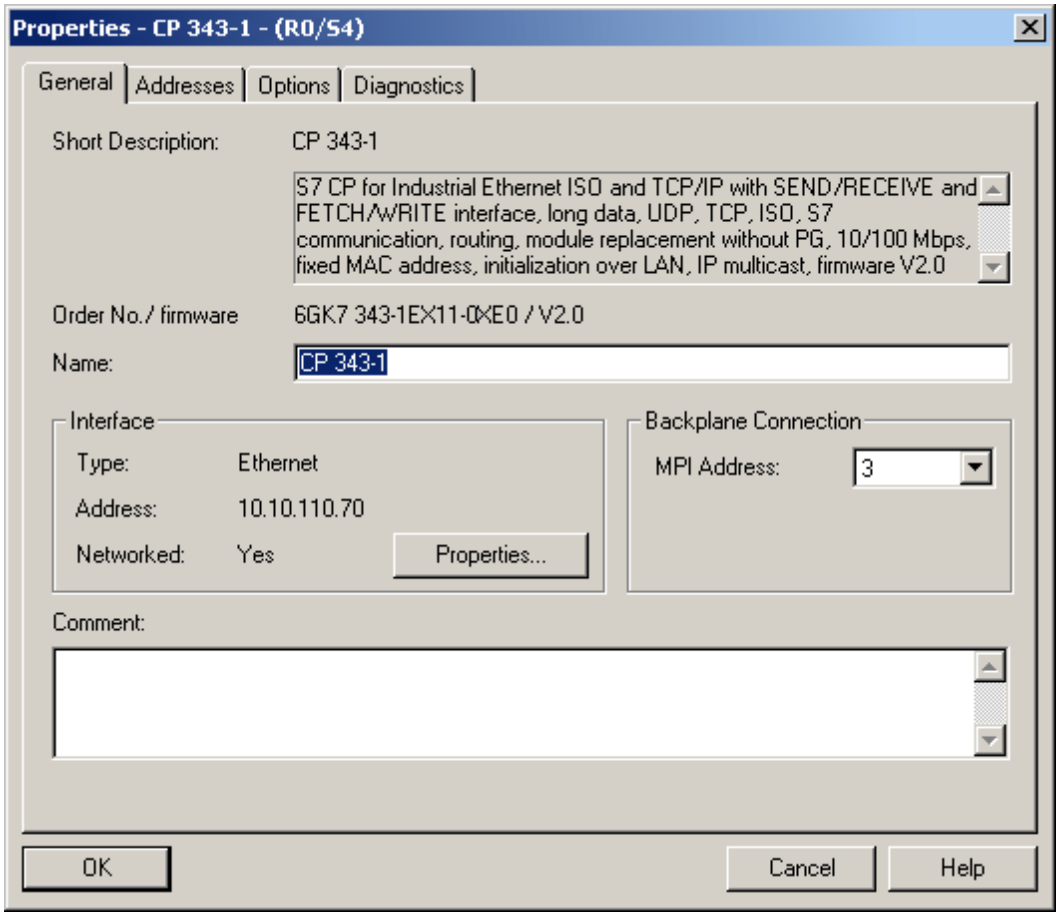
2. If this is a new Simatic project, add the necessary modules to the **Rack** in HW Config. For the Siemens TCP/IP Ethernet Driver to communicate with the CPU, there will need to be at least one Ethernet module capable of **S7 Communications**. This may be built into the CPU.

Configuring an Ethernet Module

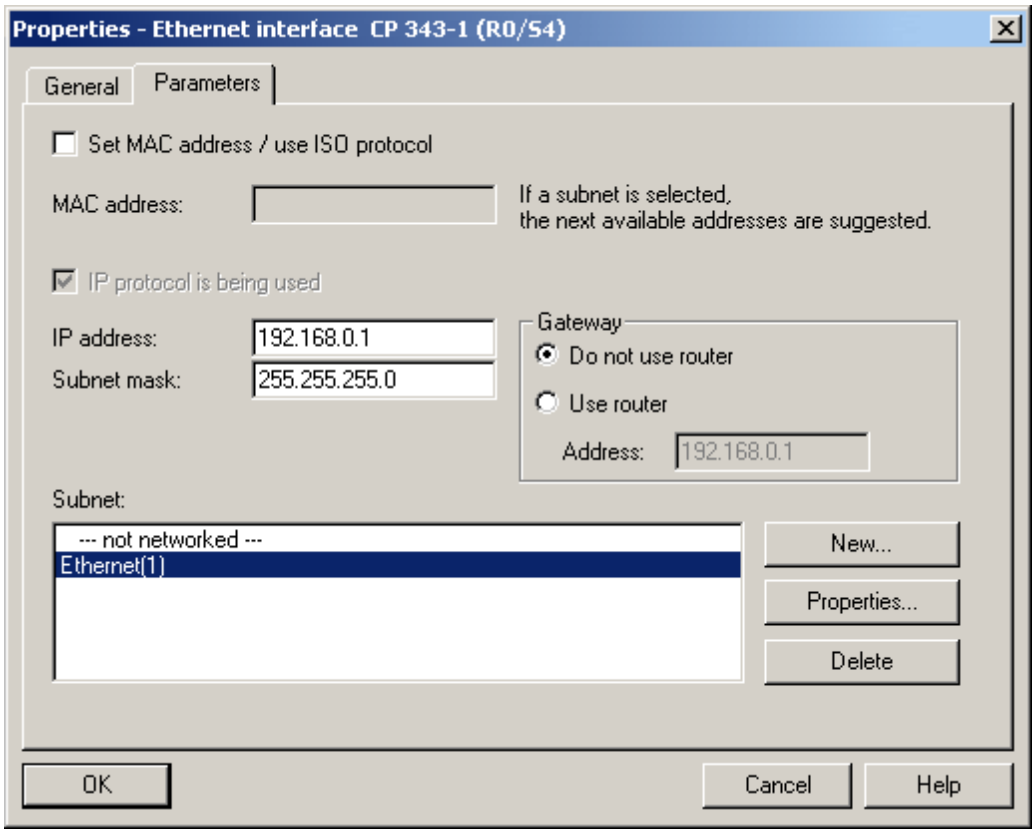
1. Right-click on the particular module in the rack and then select **Object Properties**.



2. The dialog should appear as shown below.



3. From the **General** tab, click the **Interface** | **Properties** button.



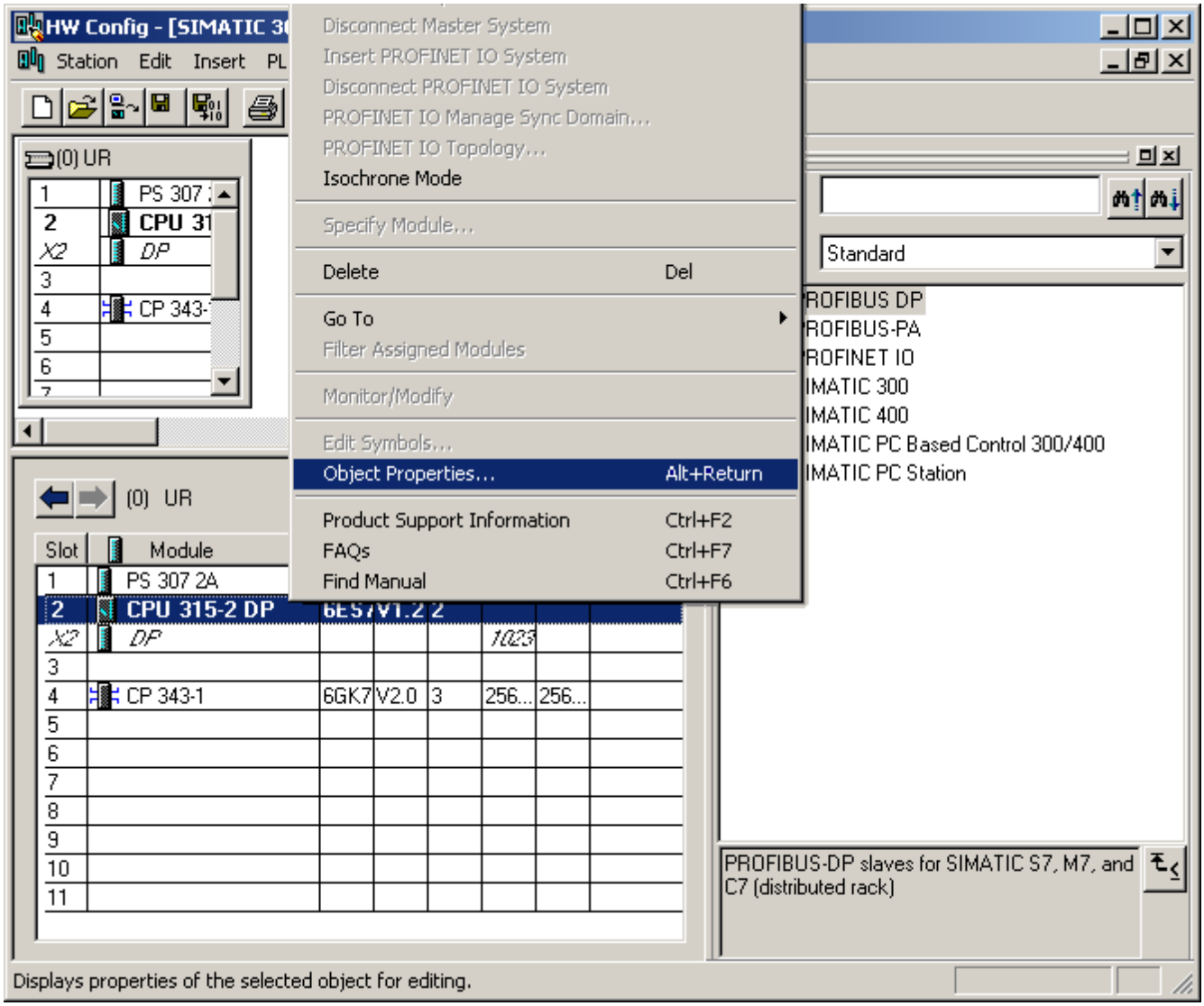
4. Specify the **IP** and **Subnet Mask** for this module.

5. To network this module, click **New** under **Subnet**. Next, select the network created and the click **OK**.

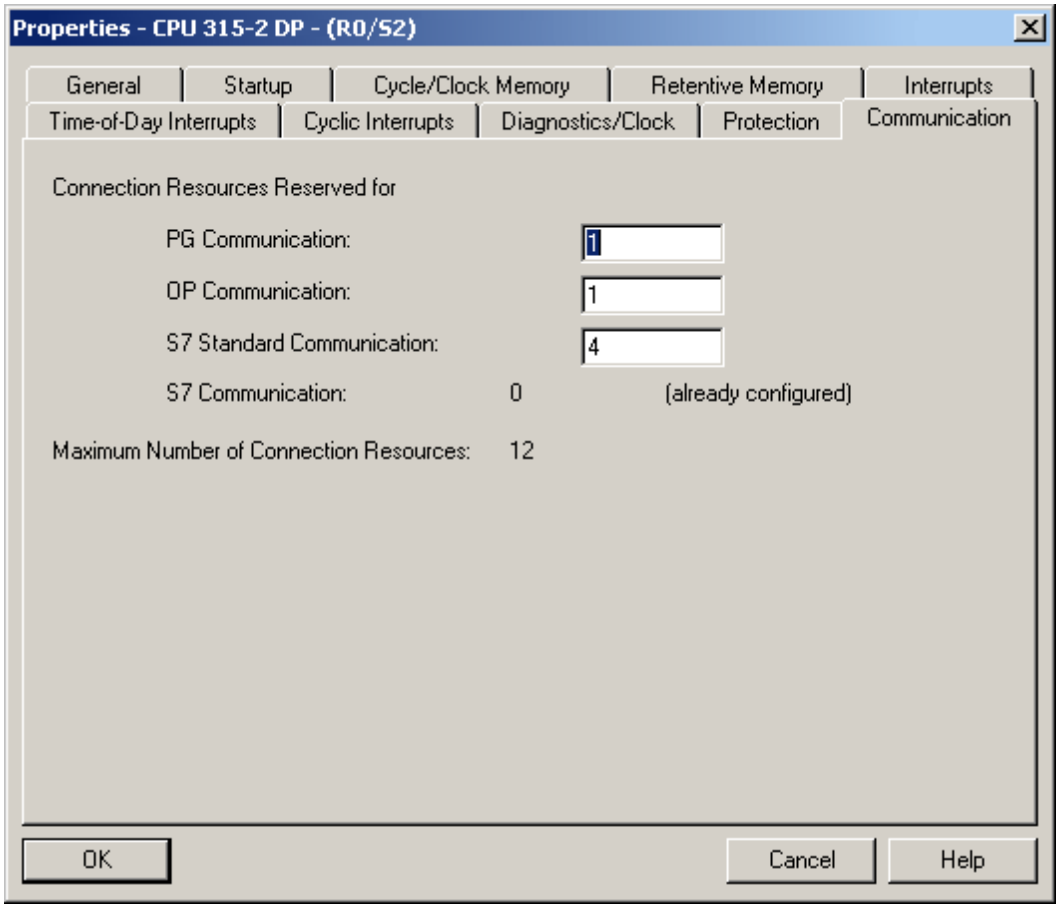
6. Return to the HW Config main window.

Configuring Connections

1. Right-click on the CPU module in the rack and select **Object Properties**.



2. The dialog should appear as shown below.



3. Configure the desired number of **PG/OP** and **PC (S7 Communication)** connections.

Type	Description
PG Communication	Used for program loading, diagnostics
OP Communication	Used for operator control and monitoring
S7 Standard Communication	Communication connections not configured, MPI communications with PUT/GET function blocks
S7 Communication (PC)	Configured connections, data communications

Note: The maximum number of PC connections for the CPU equals the Maximum Number of Connection Resources **minus** the S7 Standard Communication resources **minus** the OP Communication resources **minus** the PG Communication resources. Note that the Maximum Number of Connection Resources is based on the CPU/version/firmware.

In the example shown above, there are six S7 Communication (PC) connections available (12-4-1-1=6). Likewise, the number of PG and OP connections can be increased using the same concept.

If the **Device returned protocol [Class=0x83, Code=0x04]** error is encountered, increase the number of S7 Standard Communication connections, thereby decreasing the number of S7 Communication connections.

4. After the connections have been configured, click **OK**. Next, in the main HW Config window click **Station** | **Save and Compile**.

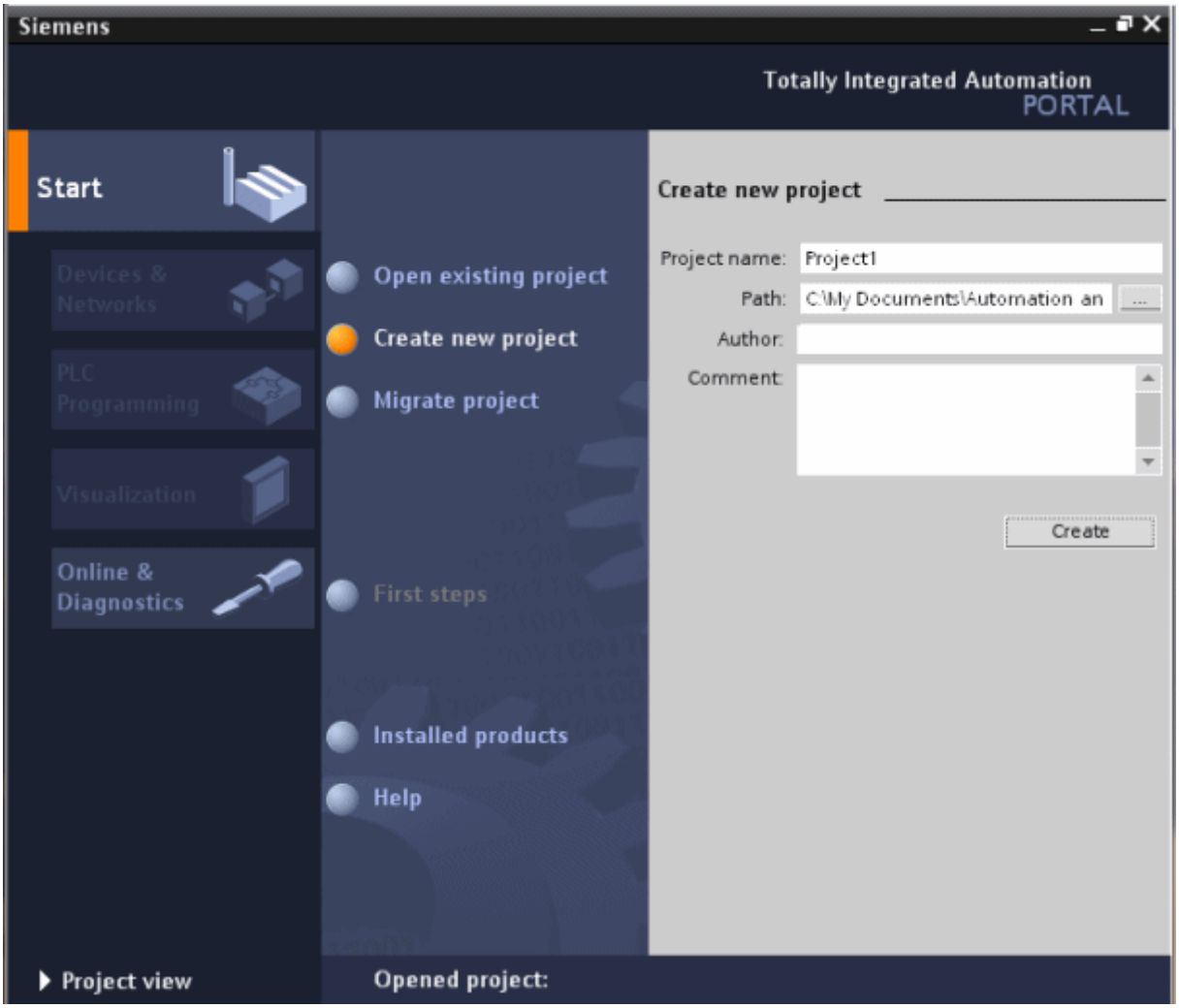
5. Click **PLC** | **Download** to commit to the changes.

How to Configure S7-1200 Connections with the Totally Integrated Automation (TIA) Portal

In order to configure the S7-1200 for communications with the Siemens TCP/IP Ethernet Driver, an online connection is required between the programming device and the target system. Users may have to configure the programming device to talk to the target system. For more information, follow the instructions below.

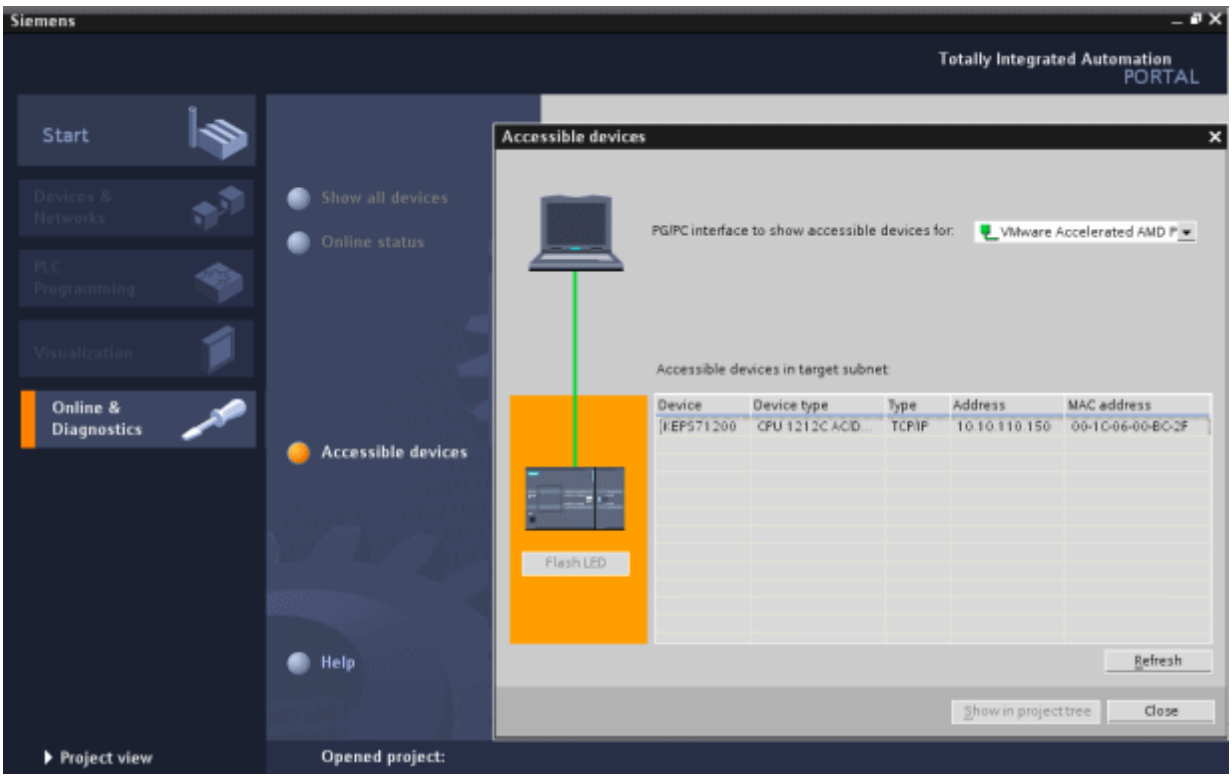
Note: For new Simatic projects, refer to the PLC's documentation for information on the default IP address settings.

1. Start the TIA Portal. In the Portal View, click **Create new project**.



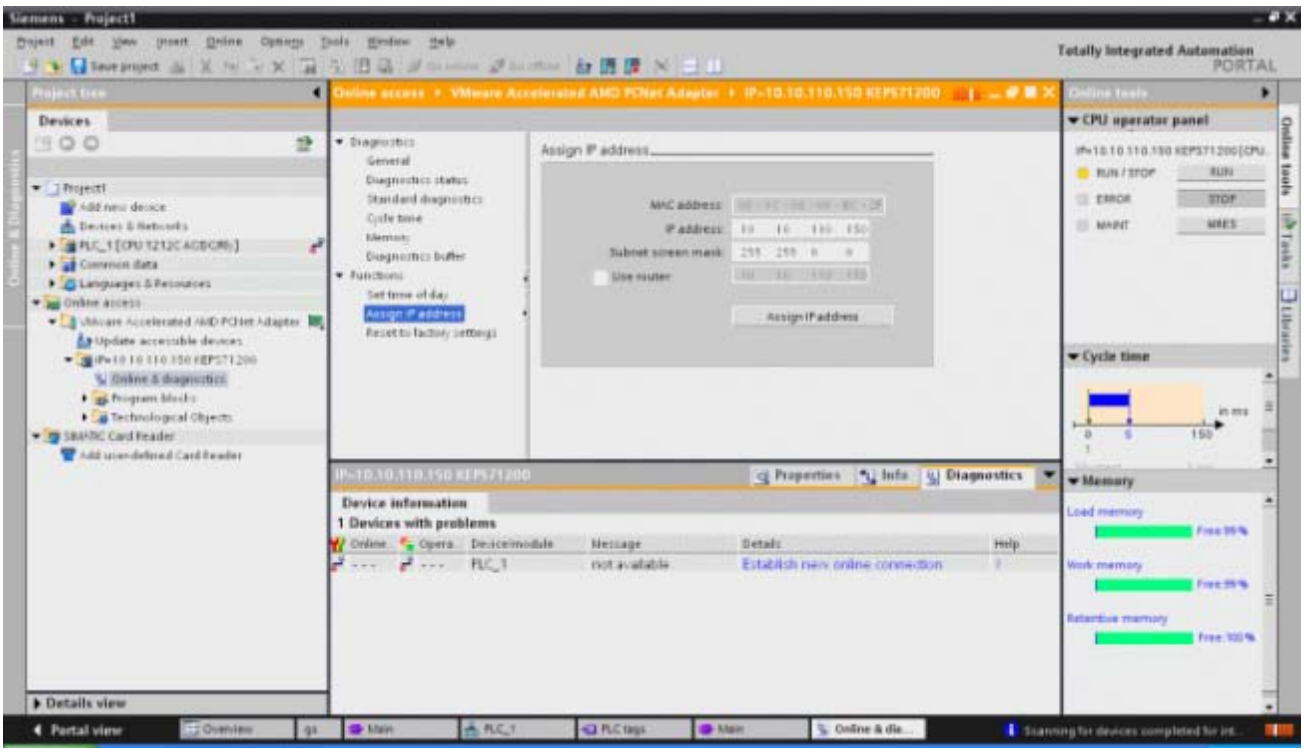
2. Next, select the **Online & Diagnostics** tab and then click **Accessible Devices**.

3. Select the appropriate PG/PC interface. This will prompt the TIA to scan the network for the device.



4. Once the scan is complete, select the device and then click **Show**. This will invoke the Project View.
5. In the project tree, locate the IP address and then open **Online & Diagnostics**.
6. Next, double-click **Online & Diagnostics** to invoke **Online Access**.

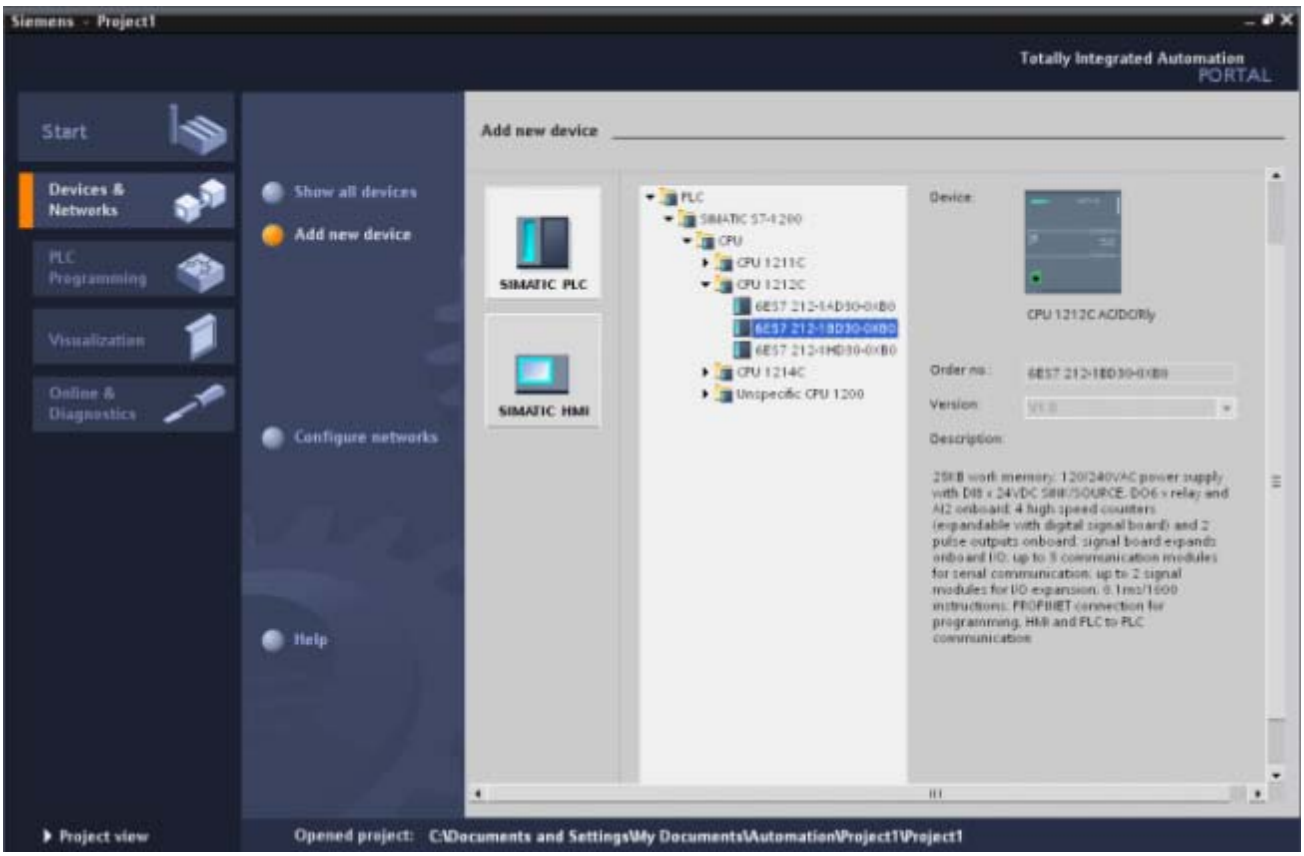
7. Select **Functions** and then click **Assign IP Address**.



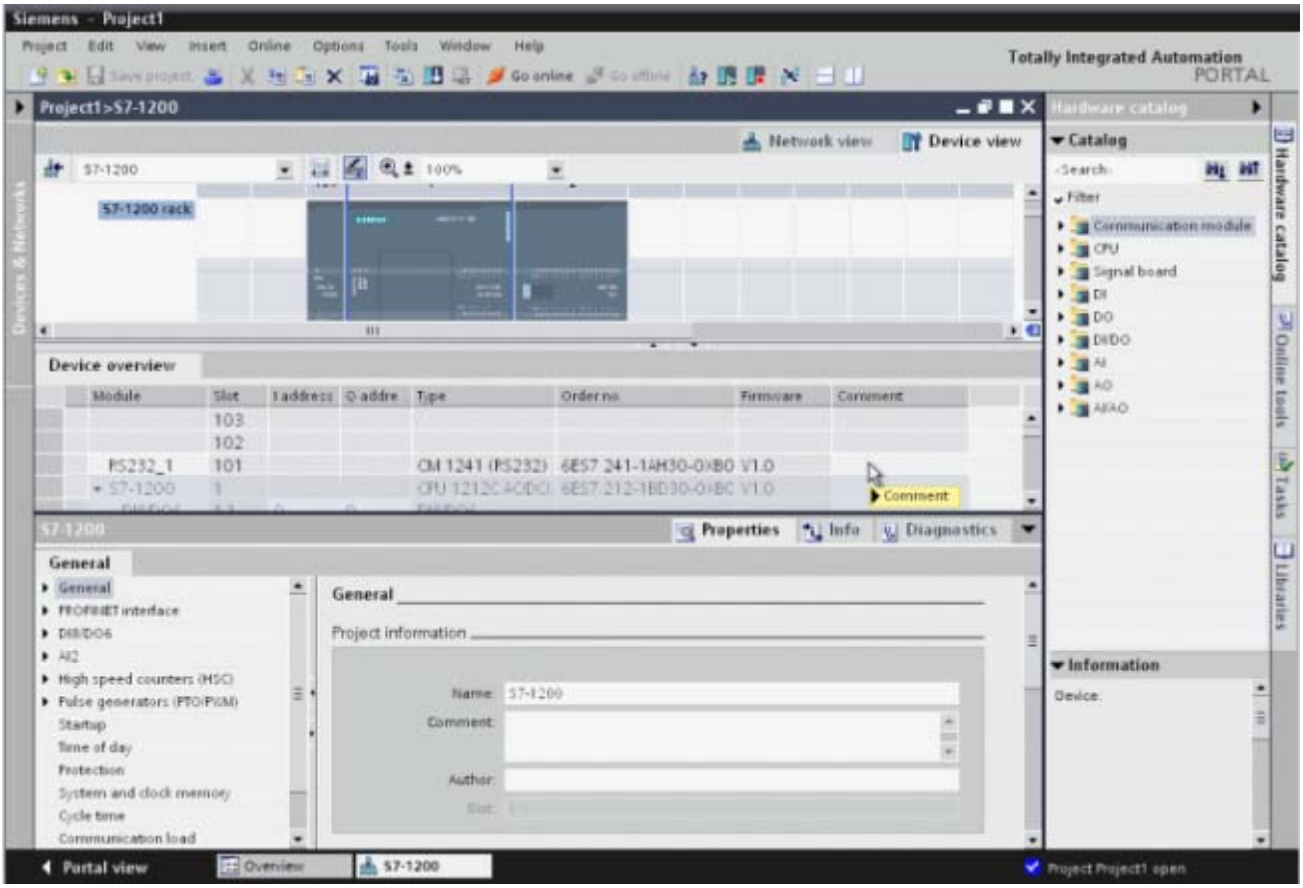
8. Enter the communication settings and click **Assign IP Address**.

Note: The device is now ready to be configured.

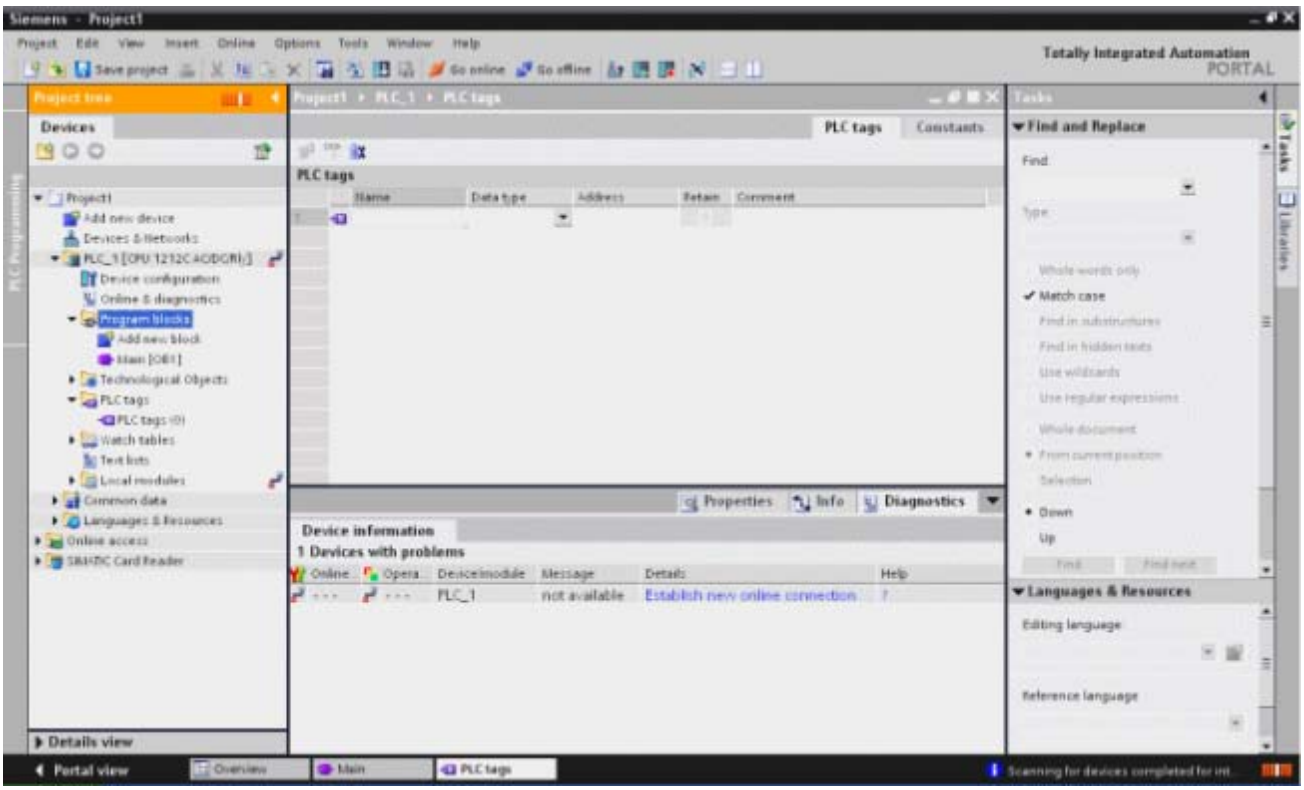
9. Return to the Portal View and then select the **Device & Networks** tab. Then, click **Add new device**.



10. Next, select the device's configuration and then click **Add device**. This will invoke the Project View, where the device's hardware can be further configured.



11. Once finished, view the project tree. Locate **Program Blocks** and **PLC Tags** and then configure the addresses that will be used in the PLC project.



Note: The device is now configured and can be placed in Run Mode for communications.

Cable Diagrams

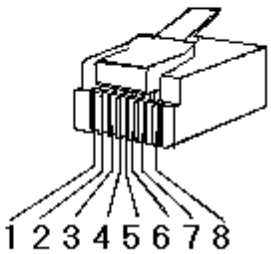
Patch Cable (Straight Through)

TD + 1	OR/WHT	OR/WHT	1	TD +
TD - 2	OR	OR	2	TD -
RD + 3	GRN/WHT	GRN/WHT	3	RD +
4	BLU	BLU	4	
5	BLU/WHT	BLU/WHT	5	
RD - 6	GRN	GRN	6	RD -
7	BRN/WHT	BRN/WHT	7	
8	BRN	BRN	8	
RJ45			RJ45	

Crossover Cable

TD + 1	OR/WHT	GRN/WHT	1	TD +
TD - 2	OR	GRN	2	TD -
RD + 3	GRN/WHT	OR/WHT	3	RD +
4	BLU	BLU	4	
5	BLU/WHT	BLU/WHT	5	
RD - 6	GRN	OR	6	RD -
7	BRN/WHT	BRN/WHT	7	
8	BRN	BRN	8	
RJ45			RJ45	

10 BaseT

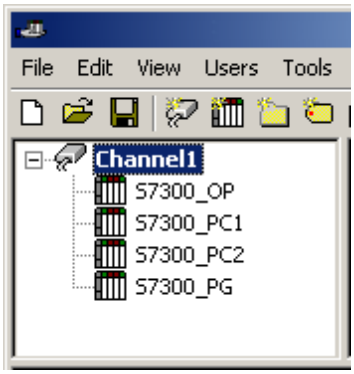


8-pin RJ45

Optimizing Siemens TCP/IP Ethernet Communications

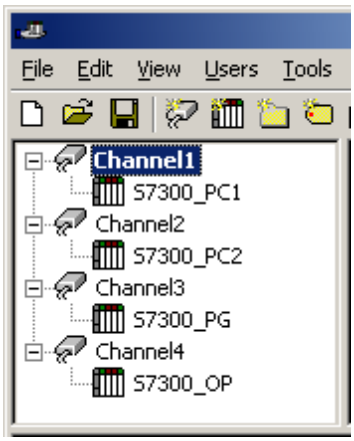
The Siemens TCP/IP Ethernet driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the Siemens TCP/IP Ethernet driver is fast, there are a couple of guidelines that can be used in order to control and optimize the application and gain maximum performance.

Our server refers to communications protocols like Siemens TCP/IP Ethernet as a channel. Each channel defined in the application represents a separate path of execution in the server. Once a channel has been defined, a series of devices must then be defined under that channel. Each of these devices represents a single Siemens TCP/IP Ethernet controller from which data will be collected. While this approach to defining the application will provide a high level of performance, it won't take full advantage of the Siemens TCP/IP Ethernet driver or the network. An example of how the application may appear when configured using a single channel is shown below.



Each device appears under a single Siemens TCP/IP Ethernet channel. In this configuration, the driver must move from one device to the next as quickly as possible in order to gather information at an effective rate. As more devices are added or more information is requested from a single device, the overall update rate begins to suffer.

If the Siemens TCP/IP Ethernet driver could only define one single channel, then the example shown above would be the only option available; however, the Siemens TCP/IP Ethernet driver can define up to 16 channels. Using multiple channels distributes the data collection workload by simultaneously issuing multiple requests to the network. An example of how the same application may appear when configured using multiple channels to improve performance is shown below.



Each device has now been defined under its own channel. In this new configuration, a single path of execution is dedicated to the task of gathering data from each device. If the application has X or fewer devices, it can be optimized exactly how it is shown here.

The performance will improve even if the application has more than 16 devices. While 16 or fewer devices may be ideal, the application will still benefit from additional channels. Although by spreading the device load across all 16 channels will cause the server to move from device to device again, it can now do so with far less devices to process on a single channel.

Important: Although the OPC Server limits the number of channels to 16, the device ultimately determines the number of allowed connections. This constraint comes from the fact that some devices cannot support 16 connections. For these devices, the maximum number of channels defined should equal the maximum number of connections allowed. For devices that support more than 16 connections, the maximum 16 channels should be defined, with devices spread evenly over these 16 channels. For more information on device connections, refer to **Link Settings**.

Data Types Description

Data Type	Description
Boolean	Single bit
Byte	Unsigned 8 bit value
Char	Signed 8 bit value
Word	Unsigned 16 bit value bit 0 is the low bit bit 15 is the high bit
Short	Signed 16 bit value bit 0 is the low bit bit 14 is the high bit bit 15 is the sign bit
BCD	Two byte packed BCD Value range is 0-9999. Behavior is undefined for values beyond this range
DWord	Unsigned 32 bit value bit 0 is the low bit bit 31 is the high bit
Long	Signed 32 bit value bit 0 is the low bit bit 30 is the high bit bit 31 is the sign bit
LBCD	Four byte packed BCD Value range is 0-99999999. Behavior is undefined for values beyond this range
Float	32 bit floating point value The driver interprets two consecutive registers as a floating-point value by making the second register the high word and the first register the low word.
String	Null terminated ASCII string*

*The Data Block subtype, String, is a NULL padded ASCII string.

Address Descriptions

Address specifications vary depending on the model in use. Select a link from the following list to obtain specific address information for the model of interest.

S7-200 Address Descriptions

The default data types for dynamically defined tags are shown in **bold**.

Address Type	Range	Type	Access
Discrete Inputs (IEC)	I0.b-I65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	IB0-IB65535	**Byte**, Char, String**	Read/Write
	IW0-IW65534	**Word**, Short, BCD	Read/Write
	ID0-ID65532	**DWord**, Long, LBCD, Float	Read/Write
Discrete Inputs (SIMATIC)	E0.b-E65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	EB0-EB65535**	**Byte**, Char, String**	Read/Write
	EW0-EW65534	**Word**, Short, BCD	Read/Write
	ED0-ED65532	**DWord**, Long, LBCD, Float	Read/Write
Note: I and E access the same memory area.			
Discrete Outputs (IEC)	Q0.b-Q65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	QB0-QB65535	**Byte**, Char, String**	Read/Write
	QW0-QW65534	**Word**, Short, BCD	Read/Write
	QD0-QD65532	**DWord**, Long, LBCD, Float	Read/Write
Discrete Outputs (SIMATIC)	A0.b-A65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	AB0-AB65535	**Byte**, Char, String**	Read/Write
	AW0-AW65534	**Word**, Short, BCD	Read/Write
	AD0-AD65532	**DWord**, Long, LBCD, Float	Read/Write
Note: Q and A access the same memory area.			
Analog Inputs (IEC)	AI0-AI65534*** AIW0-AIW65534	**Word**, Short	Read Only
Analog Inputs (SIMATIC)	AE0-AE65534*** AEW0-AEW65534	**Word**, Short	Read Only
Note: AI and AE access the same memory area.			
Analog Outputs (IEC)	AQ0-AQ65534*** AQW0-AQW65534	**Word**, Short	Read/Write
Analog Outputs (SIMATIC)	AA0-AA65534*** AAW0-AAW65534	**Word**, Short	Read/Write
Note: AQ and AA access the same memory area.			
Internal Memory	M0.b-M65535.b*	**Boolean**	Read/Write

	.b is Bit Number 0-7		
	MB0-MB65535	**Byte**, Char, String**	Read/Write
	MW0-MW65534	**Word**, Short, BCD	Read/Write
	MD0-MD65532	**DWord**, Long, LBCD, Float	Read/Write
Special Memory (Bytes 0-29 are Read Only)	SM0.b-SM65535.b* .b is Bit Number 0-7	Boolean	Read/Write
	SMB0-SMB65535	**Byte**, Char, String**	Read/Write
	SMW0-SMW65534	**Word**, Short, BCD	Read/Write
	SMD0-SMD65532	**DWord**, Long, LBCD, Float	Read/Write
Sequence Control Relay (SCR)	S0.b-S65535.b* .b is Bit Number 0-7	Boolean	Read/Write
	SB0-SB65535	**Byte**, Char, String**	Read/Write
	SW0-SW65534	**Word**, Short, BCD	Read/Write
	SD0-SD65532	**DWord**, Long, LBCD, Float	Read/Write
Variable Memory	V0.b-V65535.b* .b is Bit Number 0-7	Boolean	Read/Write
	VB0-VB65535	**Byte**, Char, String**	Read/Write
	VW0-VW65535	**Word**, Short, BCD	Read/Write
	VD0-VD65535	**DWord**, Long, LBCD, Float	Read/Write
Timer Current Values	T0-T65535*	DWord, **Long**	Read/Write
Timer Status Bit	T0-T65535*	Boolean	Read Only
Counter Current Values (IEC)	C0-C65535*	**Word**, Short	Read/Write
Counter Status Bit (IEC)	C0-C65535*	Boolean	Read Only
Counter Current Values (SIMATIC)	Z0-Z65535*	**Word**, Short	Read/Write
Counter Status Bit (SIMATIC)	Z0-Z65535*	Boolean	Read Only
Note: C and Z access the same memory area.			
High-Speed Counter	HC0-HC65535*	DWord, **Long**	Read Only

*These memory types/subtypes do not support arrays

**Byte memory types (i.e. MB) support Strings. The syntax for strings is <address>.<length> where 0 < length <= 212.

***For Analog Inputs and Outputs the address must be even (AI0, AI2, AI4...).

Note 1: All offsets for memory types I, Q, M, S and SM represent a byte starting location within the specified memory type.

Note 2: Use caution when modifying Word, Short, DWord, and Long types. For I, Q, and F each address starts at a byte offset within the device. Therefore, Words MW0 and MW1 overlap at byte 1. Writing to MW0 will also modify the value held in MW1. Similarly, DWord, and Long types can also overlap. It is recommended that these memory types be used so that overlapping does not occur. As an example, with DWord MD0, MD4, MD8 ... and so on can be used to prevent overlapping bytes.

Arrays

All memory types/subtypes with the exception of those marked with an asterisk (*), support arrays.
Below are valid syntax for declaring an array. If no rows are specified, row count of 1 is assumed.

<address>[rows][cols]
<address>.rows.cols
<address>,rows,cols
<address>_rows_cols

For Word, Short, and BCD arrays, the base address + (rows * cols * 2) cannot exceed 65536. Keep in mind that the elements of the array are words, located on a word boundary. For example, IW0[4] would return IW0, IW2, IW4, and IW6.

For Float, DWord, Long and Long BCD arrays, the base address + (rows * cols * 4) cannot exceed 65536. Keep in mind that the elements of the array are DWord, located on a DWord boundary. For example, ID0[4] will return ID0, ID4, ID8, ID12.

For all arrays, the total number of bytes being requested cannot exceed the internal block size of 218 bytes.

S7-300 Address Descriptions

Standard Support
S7-300/400/1200 Item Syntax
Internal Tags

Third-Party Support
For users familiar with the following applications, limited addressing support is available.

Applicom Direct-Link SW1000 Item Syntax
INAT OPC-Server TCPIPH1 Item Syntax
Siemens Simatic Net Item Syntax
Siemens STEP 7 Item Syntax
Softing S7/S5 OPC Server Item Syntax

Legacy Support
Legacy S7-300/400 Item Syntax

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

S7-400 Address Descriptions

Standard Support
S7-300/400/1200 Item Syntax
Internal Tags

Third-Party Support
For users familiar with the following applications, limited addressing support is available.

Applicom Direct-Link SW1000 Item Syntax
INAT OPC-Server TCPIPH1 Item Syntax
Siemens Simatic Net Item Syntax
Siemens STEP 7 Item Syntax
Softing S7/S5 OPC Server Item Syntax

Legacy Support
Legacy S7-300/400 Item Syntax

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

S7-1200 Address Descriptions

Standard Support
S7-300/400/1200 Item Syntax
Internal Tags

Third-Party Support
For users familiar with the following applications, limited addressing support is available.

Applicom Direct-Link SW1000 Item Syntax
INAT OPC-Server TCPIPH1 Item Syntax
Siemens Simatic Net Item Syntax
Siemens STEP 7 Item Syntax
Softing S7/S5 OPC Server Item Syntax

Legacy Support
Legacy S7-300/400 Item Syntax

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

NetLink: S7-300 Address Descriptions

Standard Support
S7-300/400/1200 Item Syntax

Third-Party Support
For users familiar with the following applications, limited addressing support is available.

Applicom Direct-Link SW1000 Item Syntax
INAT OPC-Server TCPIPH1 Item Syntax
Siemens Simatic Net Item Syntax
Siemens STEP 7 Item Syntax
Softing S7/S5 OPC Server Item Syntax

Legacy Support
Legacy S7-300/400 Item Syntax

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders

NetLink: S7-400 Address Descriptions

Standard Support
S7-300/400/1200 Item Syntax

Third-Party Support
For users familiar with the following applications, limited addressing support is available.

Applicom Direct-Link SW1000 Item Syntax
INAT OPC-Server TCPIPH1 Item Syntax
Siemens Simatic Net Item Syntax
Siemens STEP 7 Item Syntax
Softing S7/S5 OPC Server Item Syntax

Legacy Support
Legacy S7-300/400 Item Syntax

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders

Internal Tags

Although the following internal tags are not visible in the server configuration, they can be browsed by the OPC client. They can be found under the **<Channel Name>.<Device Name>._InternalTags** group. If the OPC client does not support browsing, or if a non-OPC client is being used, the tags can be created both dynamically and statically by using the addresses given below.

The tags listed in the following table are valid only for the S7-300 and S7-400 device models. The default data types are listed in **bold**.

Device Address	Description	Range	Data Type	Access
_RACK	Number of the rack in which the CPU of interest resides. On changing this device property, the connection with the CPU is re-established.	0-7	**Byte**, Short	Read/Write
_SLOT	Number of the slot in which the CPU of interest resides. On changing this device property, the connection with the CPU is re-established.	2-31	**Byte**, Short	Read/Write

Standard S7-300/400/1200 Item Syntax

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>
<memory type><S7 data type><address><.bit>
<memory type><S7 data type><address><.string length>*
<memory type><S7 data type><address><[row][>col]>

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>,<S7 data type><address>
DB<num>,<S7 data type><address><.bit>
DB<num>,<S7 data type><address><.string length>*
DB<num>,<S7 data type><address><[row][col]>

where <num> ranges from 1 to 65535.

*Applies to S7 Data Types that support String. String length can vary from 0<n<= 212 with the exception of S7 Data Type String which can vary from 0<n<= 210.

See Also: **Examples** and **String Support**.

Memory Types

Memory Type	Description	Address Range	Data Type	Access
I E	Inputs	Depends on the S7 Data Type. For more information, refer to the table below.		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	**Word**, Short	Read/Write

See Also: **Examples**

S7 Data Types

The S7 Data Type is used to coerce the data type for a tag. It does not apply to Timers and Counters. The default data types are shown in **bold**.

S7 Data Type	Description	Address Range	Data Type
X	Bit	X0.b-X65534.b .b is Bit Number 0-15	**Boolean**
B Byte	Unsigned Byte	B0-B65535 BYTE0-BYTE65535 B0.b-B65535.b BYTE0.b-BYTE65535.b .b is Bit Number 0-7 B0.n-B65535.n BYTE0.n-BYTE65535.n .n is string length. 0 < n <= 212.	**Byte**, Char Boolean String*
C Char	Signed Byte	C0-C65535 CHAR0-CHAR65535 C0.b-C65535.b CHAR0.b-CHAR65535.b .b is Bit Number 0-7 C0.n-C65535.n CHAR0.n-CHAR65535.n .n is string length. 0<n<= 212.	Byte, **Char** Boolean String*
W	Unsigned Word	W0-W65534	**Word**, Short, BCD

Word		WORD0-WORD65534 W0.b-W65534.b WORD0.b-WORD65534.b .b is Bit Number 0-15	 Boolean
I INT	Signed Word	I0-I65534 INT0-INT65534 I0.b-I65534.b INT0.b-INT65534.b .b is Bit Number 0-15	Word, **Short**, BCD Boolean
D DWORD	Unsigned Double Word	D0-D65532 DWORD0-DWORD65532 D0.b-D65532.b DWORD0.b-DWORD65532.b .b is Bit Number 0-31	**DWord**, Long, LBCD, Float Boolean
DI DINT	Signed Double Word	DI0-DI65532 DINT0-DINT65532 DI0.b-DI65532.b DINT0.b-DINT65532.b .b is Bit Number 0-31	DWord, **Long**, LBCD, Float Boolean
DT	S7 Date_And_Time. Complex data type stored with 8 bytes as follows: 0 year, 1 month, 2 days, 3 hours, 4 minutes, 5 seconds, 6 two most significant digits of MSEC, 7 (4MSB) two least significant digits of MSEC, 7 (4LSB) day of week (1=Sunday). Displayed as string format "m/d/y h:mm:ss <AM/PM>" with range "1/1/1990 0:00:00 AM" to "12/31/2089 23:59:59 PM". Read Only.	DT0-DT65528	**String**
REAL	IEEE Float	REAL0-REAL65532	**Float**
String	S7 String	STRING0.n-STRING65532.n .n is string length. 0<n<= 210.	**String**
TOD	S7 Time_Of_Day. Stored as DWORD, representing milliseconds since midnight. Displayed as String format "h:m:s.mmm" with range "0:0:0.0" to "23:59:59.999". Read Only.	TOD0-TOD65532	**String**

*These are Raw Strings that differ in structure and usage from the STEP 7 String data type.

Note: Use caution when modifying Word, Short, DWord, and Long type as each address starts at a byte offset within the device. Therefore, Words MW0 and MW1 overlap at byte 1. Writing to MW0 will also modify the value held in MW1. Similarly, DWord, and Long types can also overlap. It is recommended that these memory types be used so that overlapping does not occur. As an example, with DWord MD0, MD4, MD8 ... and so on can be used to prevent overlapping bytes.

See Also: Examples

String Support

Raw Strings
For an address DBx,By.n @ String, String values read and written are stored at Byte offset y.

y	y+1	y+2	...	y+n-1
''	''	''	...	''

Raw strings are null terminated. If the maximum string length is 10 and 3 characters are written, the fourth character is set to NULL, while characters 5-10 are left untouched.

String Support
The String subtype follows the STEP 7 String data type definition. The syntax for the String S7 Data Type is STRINGy.n where y is the Byte offset, and n is the maximum String length. If n is not specified, the maximum String length will be 210 characters. String values read and written are stored at Byte offset y+2 in Data Block x. The "actual string length" gets updated with every write based on the string length of the string being written.

y	y+1	y+2	y+3	y+4	...	y+2+n-1
max string length (n)	actual string length	''	''	''	...	''

Note: String Strings are NULL padded. If the maximum string length is 10 and 3 characters are written, characters 4-10 are set to NULL.

Array Support
The [rows][cols] notation is appended to an address to specify an array (e.g. MW0[2][5]). If no rows are specified, row count of 1 is assumed. Boolean Arrays and String Arrays are not supported.

For Word, Short and BCD arrays, the base address + (rows * cols * 2) cannot exceed 65536. Keep in mind that the elements of the array are words, located on a word boundary. For example, IW0[4] would return IW0, IW2, IW4, and IW6.

For Float, DWord, Long and Long BCD arrays, the base address + (rows * cols * 4) cannot exceed 65536. Keep in mind that the elements of the array are DWord, located on a DWord boundary. For example, ID0[4] will return ID0, ID4, ID8, ID12.

For all arrays, the total number of bytes being requested cannot exceed the internal block size of 212 bytes.

Timers
The Siemens TCP/IP Ethernet driver automatically scales T values based on the Siemens S5 time format. Timer data is stored as a Word in the PLC but scaled to a DWord in the driver. The value returned will already be scaled using the appropriate Siemens time base. As a result, the values are always returned as a count of milliseconds. When writing to T memory the Siemens time base will also be applied. To write a value to a timer in the controller, simply write the desired value as a count of milliseconds to the appropriate timer.

Counters
The value returned for C memory will automatically be converted to a BCD value.

Examples

S7 Data Type	Data Type	Input	Flags	DB
X	Boolean	IX0.7	MX0.7	DB1,X0.7
B Byte	Byte	IB0 IBYTE0	MB0 MBYTE0	DB1,B0 DB1,BYTE0
	Boolean	IB0.7 IBYTE0.7	MB0.7 MBYTE0.7	DB1,B0.7 DB1,BYTE0.7
	String	IB0.64 IBYTE0.64	MB0.64 MBYTE0.64	DB1,B0.64 DB1,BYTE0.64
	Array	IB0[2][5] IBYTE0[2][5]	MB0[2][5] MBYTE0[2][5]	DB1,B0[2][5] DB1,BYTE0[2][5]
C Char	Char	IC0 ICHAR0	MC0 MCHAR0	DB1,C0 DB1,CHAR0
	Boolean	IC0.7 ICHAR0.7	MC0.7 MCHAR0.7	DB1,C0.7 DB1,CHAR0.7

	String Array	IC0.64 ICHAR0.64 IC0[10] ICHAR0[10]	MC0.64 MCHAR0.64 MC0[10] MCHAR0[10]	DB1,C0.64 DB1,CHAR0.64 DB1,C0[10] DB1,CHAR0[10]
W Word	Word Boolean Array	IW0 IWORD0 IW0.15 IWORD0.15 IW0[10] IWORD0[10]	MW0 MWORD0 MW0.15 MWORD0.15 MW0[10] MWORD0[10]	DB1,W0 DB1,WORD0 DB1,W0.15 DB1,WORD0.15 DB1,W0[10] DB1,WORD0[10]
I INT	Short Boolean Array	II0 IINT0 II0.15 IINT0.15 II0[5][2] IINT0[5][2]	MI0 MINT0 MI0.15 MINT0.15 MI0[5][2] MINT0[5][2]	DB1,I0 DB1,INT0 DB1,I0.15 DB1,INT0.15 DB1,I0[5][2] DB1,INT0[5][2]
D DWORD	DWord Boolean Array	ID0 IDWORD0 ID0.31 IDWORD0.31 ID0[10] IDWORD0[10]	MD0 MDWORD0 MD0.31 MDWORD0.31 MD0[10] MDWORD0[10]	DB1,D0 DB1,DWORD0 DB1,D0.31 DB1,DWORD0.31 DB1,D0[10] DB1,DWORD0[10]
DI DINT	Long Boolean Array	IDI0 IDINT0 IDI0.31 IDINT0.31 IDI0[4][3] IDINT0[4][3]	MDI0 MDINT0 MDI0.31 MDINT0.31 MDI0[4][3] MDINT0[4][3]	DB1,DI0 DB1,DINT0 DB1,DI0.31 DB1,DINT0.31 DB1,DI0[4][3] DB1,DINT0[4][3]
DT	String	N/A.	N/A.	DB1,DT0
REAL	Float Array	IREAL0 IREAL0[10]	MREAL0 MREAL0[10]	DB1,REAL0 DB1,REAL0[10]
String	String	ISTRING0.10	MSTRING0.10	DB1,STRING0.10
TOD	String	N/A.	N/A.	DB1,TOD0

Applicom Direct-Link SW1000 Item Syntax

The following support for the Applicom Direct-Link SW1000 OPC Server is considered to be limited. Care must be taken as the data type for a given S7 data type/suffix may differ from the data type for the same S7 data type/suffix in the specified product. Applicom ASCII Strings are not supported by this driver. The following is intended to be a guideline for those already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>
<memory type><S7 data type><address><_row_col>

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>.<S7 data type><address>[<suffix>]
DB<num>.<S7 data type><address><_row_col>

Where <num> ranges from 1 to 65535.

See Also: Examples

Memory Types

Memory Type	Description	Address Range	Data Type	Access
I E	Inputs	Dependent on S7 Data Type. (See table below)		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	**Word**, Short	Read/Write

See Also: Examples

S7 Data Types

The S7 data type is used to coerce the data type for a tag. It does not apply to Timers and Counters. The default data types are shown in **bold**. Suffixes are not required.

Data Type	Description	Address Range	Data Type	Suffix	Data Type w/ Suffix
None* DBX**	Bit	0.b-65534.b DBX0.b-DBX65534.b .b is Bit Number 0-15	**Boolean**		
B DBB**	Unsigned Byte	B0-B65535 DBB0-DBB65535	**Byte**, Char		
W DBW**	Unsigned Word	W0-W65534 DBW0-DBW65534	**Word**, Short, BCD		
D DBD**	Unsigned Double Word	D0-D65532 DBD0-DBD65532	**DWord**, Long, LBCD, Float	F	Float

*No S7 data type specified. Applies to non-DB Memory Types Only.
**Applies to DB Memory Types Only.

See Also: Examples

Suffixes

Suffix	Description	Data Type
F	32 bit IEEE floating point value	Float

Array Support

The <.array size> notation is appended to an address to specify an array (e.g. MW0.10). Boolean Arrays and String Arrays are not supported.

Examples

S7 Data Type	Data Type	Input	Flags	DB
None DBX	Boolean Boolean	I0.7 ----	M0.7 ----	---- DB1.DBX0.7
B DBB	Byte Array	IB0 ---- IB0_2_5 ----	MB0 ---- MB0_2_5 ----	---- DB1.DBB0 ---- DB1.DBB0_2_5

W DBW	Word Array	IW0 ---- IW0_10 ----	MW0 ---- MW0_10 ----	---- DB1.DBW0 ---- DB1.DBW0_10
D DBD	DWord Float (F) Array	ID0 ---- ---- ---- ID0_4_3 ----	MD0 ---- ---- ---- MD0_4_3 ----	---- DB1.DBD0 ---- DB1.DBD0F ---- DB1.DBD0F_4_3

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

INAT OPC Server TCPIPH1 Item Syntax

Important: The following support for the INAT OPC Server TCPIPH1 (V1.22 and up) is considered to be limited. Care must be taken as the data type for a given S7 data type/suffix may differ from the data type for the same S7 data type/suffix in the specified product. S7 data type and suffixes not included below are not supported by this driver. The following is intended to be a guideline for those already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>[<suffix>]
<memory type><S7 data type><address><.string length>*
<memory type><S7 data type><address><.array size>[<suffix>]

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>.<S7 data type><address>[<suffix>]
DB<num>.<S7 data type><address><**.**string length>*
DB<num>.<S7 data type><address><**.**array size>[<suffix>]

Where <num> ranges from 1 to 65535.

*Applies to S7 data types that support String.

See Also: Examples

Memory Types

Memory Type	Description	Address Range	Data Type	Access
I E	Inputs	Dependent on S7 Data Type. (See table below)		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	**Word**, Short	Read/Write

See Also: Examples

S7 Data Types

The S7 data type is used to coerce the data type for a tag. It does not apply to Timers and Counters. Default data types are shown in **bold**. A suffix is not required.

Data Type	Description	Address Range	Data Type	Suffix	Data Type w/ Suffix
X	Bit	X0.b-X65534.b .b is Bit Number 0-15	**Boolean**		
B Byte	Unsigned Byte	B0-B65535 BYTE0-BYTE65535	**Byte**, Char	KF	Char
W Word	Unsigned Word	W0-W65534 WORD0-WORD65534	**Word**, Short, BCD	BCD KF	BCD Short
I INT	Signed Word	I0-I65534 INT0-INT65534	Word, **Short**, BCD	BCD	BCD
D DWORD	Unsigned Double Word	D0-D65532 DWORD0-DWORD65532	**DWord**, Long, LBCD, Float	BCD IEEE KF	LBCD Float Long
DI DINT	Signed Double Word	DI0-DI65532 DINT0-DINT65532	DWord, **Long**, LBCD, Float	BCD IEEE	LBCD Float
R REAL	IEEE Float	R0-R65532 REAL0-REAL65532	**Float**		
G String	S7 String	G0.n-G65532.n STRING0.n-STRING65532.n .n is string length. 0<n<= 210.	**String**		

See Also: Examples

Suffixes

Suffix	Description	Data Type
BCD	Two byte packed BCD for Word references Value range is0-9999 Four byte packed BCD for DWord references Value range is 0-99999999	BCD LBCD
IEEE	32 bit IEEE floating point value	Float
KF	Signed	Char Short Long

Array Support

The <.array size> notation is appended to an address to specify an array (e.g. MW0.10). Boolean Arrays and String Arrays are not supported.

Examples

S7 Data Type	Data Type	Input	Flags	DB
X	Boolean	IX0.7	MX0.7	DB1.X0.7
B Byte	Byte Char (KF) Array	IB0 IBYTE0 IB0KF IBYTE0KF IB0KF.10 IBYTE0KF.10	MB0 MBYTE0 MB0KF MBYTE0KF MB0KF.10 MBYTE0KF.10	DB1.B0 DB1.BYTE0 DB1.B0KF DB1.BYTE0KF DB1.B0KF.10 DB1.BYTE0KF.10
W Word	Word BCD (BCD) Short (KF)	IW0 IWORD0 IW0BCD IWORD0BCD IW0KF IWORD0KF	MW0 MWORD0 MW0BCD MWORD0BCD MW0KF MWORD0KF	DB1.W0 DB1.WORD0 DB1.W0BCD DB1.WORD0BCD DB1.W0KF DB1.WORD0KF

	Array	IW0BCD.10 IWORD0BCD.10	MW0BCD.10 MWORD0BCD.10	DB1.W0BCD.10 DB1.WORD0BCD.10
I INT	Short	II0 IINT0	MI0 MINT0	DB1.I0 DB1.INT0
	BCD (BCD)	II0BCD IINT0BCD	MI0BCD MINT0BCD	DB1.I0BCD DB1.INT0BCD
	Array	II0.10 IINT0.10	MI0.10 MINT0.10	DB1.I0.10 DB1.INT0.10
D DWORD	DWord	ID0 IDWORD0	MD0 MDWORD0	DB1.D0 DB1.DWORD0
	LBCD (BCD)	ID0BCD IDWORD0BCD	MD0BCD MDWORD0BCD	DB1.D0BCD DB1.DWORD0BCD
	Float (IEEE)	ID0IEEE IDWORD0IEEE	MD0IEEE MDWORD0IEEE	DB1.D0IEEE DB1.DWORD0IEEE
	Long (KF)	ID0KF IDWORD0KF	MD0KF MDWORD0KF	DB1.D0KF DB1.DWORD0KF
	Array	ID0IEEE.10 IDWORD0IEEE.10	MD0IEEE.10 MDWORD0IEEE.10	DB1.D0IEEE.10 DB1.DWORD0IEEE.10
DI DINT	Long	IDI0 IDINT0	MDI0 MDINT0	DB1.DI0 DB1.DINT0
	LBCD (BCD)	IDI0BCD IDINT0BCD	MDI0BCD MDINT0BCD	DB1.DI0BCD DB1.DINT0BCD
	Float (IEEE)	IDI0IEEE IDINT0IEEE	MDI0IEEE MDINT0IEEE	DB1.DI0IEEE DB1.DINT0IEEE
	Array	IDI0BCD.10 IDINT0BCD.10	MDI0BCD.10 MDINT0BCD.10	DB1.DI0BCD.10 DB1.DINT0BCD.10
R REAL	Float	IR0 IREAL0	MR0 MREAL0	DB1.R0 DB1.REAL0
	Array	IR0.10 IREAL0.10	MR0.10 MREAL0.10	DB1.R0.10 DB1.REAL0.10
G String	String	IG0.10 ISTRING0.10	MG0.10 MSTRING0.10	DB1.G0.10 DB1.STRING0.10

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

Siemens Simatic Net Item Syntax

Important: The following support for the Siemens Simatic Net OPC Server is considered to be limited. Care must be taken as the data type for a given S7 data type may differ from the data type for the same S7 data type in the specified product. S7 data types not included below are not supported by this driver. The following is intended to be a guideline for those already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>
<memory type><S7 data type><address><.string length>
<memory type><S7 data type><address><,array size>

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>,<S7 data type><address>
DB<num>,<S7 data type><address><.string length>*
DB<num>,<S7 data type><address><,array size>

Where <num> ranges from 1 to 65535.

*Applies to S7 data types that support String.

See Also: Examples

Memory Types

Memory Type	Description	Address Range	Data Type	Access
I E	Inputs	Dependent on S7 Data Type. (See table below)		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	**Word**, Short	Read/Write

See Also: Examples

S7 Data Types

The S7 data type is used to coerce the data type for a tag. It does not apply to Timers and Counters. The default data types are shown in **bold**.

Data Type	Description	Address Range	Data Type
X	Bit	X0.b-X65534.b .b is Bit Number 0-15	**Boolean**
B Byte	Unsigned Byte	B0-B65535 BYTE0-BYTE65535	**Byte**, Char
Char	Signed Byte	CHAR0-CHAR65535	Byte, **Char**
W Word	Unsigned Word	W0-W65534 WORD0-WORD65534	**Word**, Short, BCD
INT	Signed Word	INT0-INT65534	Word, **Short**, BCD
D DWORD	Unsigned Double Word	D0-D65532 DWORD0-DWORD65532	**DWord**, Long, LBCD, Float
DINT	Signed Double Word	DINT0-DINT65532	DWord, **Long**, LBCD, Float
REAL	IEEE Float	REAL0-REAL65532	**Float**
String	S7 String	STRING0.n-STRING65532.n .n is string length. 0<n<= 210.	**String**

See Also: Examples

Array Support

The <.array size> notation is appended to an address to specify an array (e.g. MW0.10). Boolean Arrays and String Arrays are not supported.

Examples

S7 Data Type	Data Type	Input	Flags	DB
X	Boolean	IX0.7	MX0.7	DB1,X0.7
B	Byte	IB0	MB0	DB1,B0

Byte	Array	IBYTE0 IB0,10 IBYTE0,10	MBYTE0 MB0,10 MBYTE0,10	DB1,BYTE0 DB1,B0,10 DB1,BYTE0,10
Char	Char Array	ICHAR0 ICHAR0,10	MCHAR0 MCHAR0,10	DB1,CHAR0 DB1,CHAR0,10
W Word	Word Array	IW0 IWORD0 IW0,10 IWORD0,10	MW0 MWORD0 MW0,10 MWORD0,10	DB1,W0 DB1,WORD0 DB1,W0,10 DB1,WORD0,10
INT	Short Array	IINT0 IINT0,10	MINT0 MINT0,10	DB1,INT0 DB1,INT0,10
D DWORD	DWord Array	ID0 IDWORD0 ID0,10 IDWORD0,10	MD0 MDWORD0 MD0,10 MDWORD0,10	DB1,D0 DB1,DWORD0 DB1,D0,10 DB1,DWORD0,10
DINT	Long Array	IDINT0 IDINT0,10	MDINT0 MDINT0,10	DB1,DINT0 DB1,DINT0,10
REAL	Float Array	IREAL0 IREAL0,10	MREAL0 MREAL0,10	DB1,REAL0 DB1,REAL0,10
String	String	ISTRING0.10	MSTRING0.10	DB1,STRING0.10

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

Siemens STEP 7 Item Syntax

Important: The following support for Siemens STEP 7 Variable Table (VAT) syntax is considered to be limited. Care must be taken as the data type for a given S7 data type/suffix may differ from the data type for the same S7 data type/suffix in the specified product. S7 data types not included below are not supported by this driver. The following is intended to be a guideline for those already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>.<S7 data type><address>

Where <num> ranges from 1 to 65535.

See Also: Examples

Memory Types

Memory Type	Description	Address Range	Data Type	Access

I E	Inputs	Dependent on S7 Data Type. (See table below)		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	**Word**, Short	Read/Write

See Also: Examples

Accessing Structured Elements in STEP 7

For the Siemens S7-1200 model, STEP 7 accesses the Counter and Timer structured elements as complete whole structures instead of individual tags. For more information on the element offset and its server address equivalent, refer to the tables below.

Counters

Element	Data Type	Offset	Server Address Equivalent
Count_UP	Boolean	0.0	DB1,C00.0
Count_Down	Boolean	0.1	DB1,C00.1
Reset	Boolean	0.2	DB1,C00.2
Load	Boolean	0.3	DB1,C00.3
Q_UP	Boolean	0.4	DB1,C00.4
Q_Down	Boolean	0.5	DB1,C00.5
PAD	Byte	1.0	DB1,B1
Preset_Value	Short	2.0	DB1,I2
Count_Value	Short	4.0	DB1,I4

Timers

Element	Data Type	Offset	Server Address Equivalent
Start	DWord	0.0	DB1,D0
Preset	DWord	4.0	DB1,D4
Elapsed	DWord	8.0	DB1,D8
Running	Bool	12.0	DB1,DBX12.0
IN	Bool	12.1	DB1,DBX12.1
Q	Bool	12.2	DB1,DBX12.2
PAD	Byte	13.0	DB1,DBB13
PAD_2	Byte	14.0	DB1,DBB14
PAD_3	Byte	15.0	DB1,DBB15

Note: For more information, refer to **Standard S7-300/400/1200 Item Syntax**.

S7 Data Types

The S7 data type is used to coerce the data type for a tag. It does not apply to Counters and Timers. The default data types are shown in **bold**.

Data Type	Description	Address Range	Data Type	Suffix	Data Type w/ Suffix
None* DBX**	Bit	0.b-65534.b DBX0.b-DBX65534.b .b is Bit Number 0-15	**Boolean**		

B DBB**	Unsigned Byte	B0-B65535 DBB0-DBB65535	**Byte**, Char		
W DBW**	Unsigned Word	W0-W65534 DBW0-DBW65534	**Word**, Short, BCD		
D DBD**	Unsigned Double Word	D0-D65532 DBD0-DBD65532	**DWord**, Long, LBCD, Float	F	Float

*No S7 data type specified. Applies to non-DB Memory Types Only.
**Applies to DB Memory Types Only.

See Also: Examples

Examples

S7 Data Type	Data Type	Input	Flags	DB
None DBX	Boolean	I0.7 ----	M0.7 ----	---- DB1.DBX0.7
B DBB	Byte	IB0 ----	MB0 ----	---- DB1.DBB0
W DBW	Word	IW0 ----	MW0 ----	---- DB1.DBW0
D DBD	DWord	ID0 ----	MD0 ----	---- DB1.DBD0

Note: All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

Softing S7/S5 OPC Server Item Syntax

Important: The following support for the Softing S7/S5 OPC Server is considered to be limited. Care must be taken as the data type for a given S7 data type/suffix may differ from the data type for the same S7 data type/suffix in the specified product. The following is intended to be a guideline for those already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Syntax

Input, Output, Peripheral, Flag Memory Types
<memory type><S7 data type><address>:[<suffix>]

Timer and Counter Memory Types
<memory type><address>

DB Memory Type

DB<num>.<S7 data type><address>:[<suffix>]

Where <num> ranges from 1 to 65535.

See Also: Examples

Memory Types

Memory Type	Description	Address Range	Data Type	Access
I E	Inputs	Dependent on S7 Data Type. (See table below)		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	DWord, **Long**	Read/Write
C	Counters	C0-C65535	**Word**, Short	Read/Write

Z		Z0-Z65535		

See Also: Examples

S7 Data Types

The S7 data type is used to coerce the data type for a tag. It does not apply to Timers and Counters. The default data types are shown in **bold**. Suffix is not required.

Data Type	Description	Address Range	Data Type	Suffix	Data Type w/ Suffix
None* DBX**	Bit	0.b-65534.b DBX0.b-DBX65534.b .b is Bit Number 0-15	**Boolean**		
B DBB**	Unsigned Byte	B0-B65535 DBB0-DBB65535	**Byte**, Char	Byte Char String	Byte Char String
W DBW**	Unsigned Word	W0-W65534 DBW0-DBW65534	**Word**, Short, BCD	Word INT BCD	Word INT BCD
D DBD**	Unsigned Double Word	D0-D65532 DBD0-DBD65532	**DWord**, Long, LBCD, Float	DWord DINT BCD REAL	DWord DINT BCD REAL

*No S7 data type specified. Applies to non-DB Memory Types Only.
**Applies to DB Memory Types Only.

See Also: Examples

Suffixes

Suffix	Description	Data Type
Byte	Unsigned Byte	Byte
Char	Signed Byte	Char
Word	Unsigned Word	Word
INT	Signed Word	Short
DWORD	Unsigned DWord	DWord
DINT	Signed DWord	Long
BCD	Two byte packed BCD for Word references Value range is 0-9999 Four byte packed BCD for DWord references Value range is 0-99999999	BCD LBCD
REAL	32 bit IEEE floating point value	Float
String	S7 String	String

Examples

S7 Data Type	Data Type	Input	Flags	DB
None DBX	Boolean	I0.7 ----	M0.7 ----	---- DB1.DBX0.7
B DBB	Byte String (String)	IB0 ---- IB0:String ----	MB0 ---- MB0:String ----	---- DB1.DBB0 ---- DB1.DBB0:String
W DBW	Word BCD (BCD)	IW0 ---- IW0:BCD ----	MW0 ---- MW0:BCD ----	---- DB1.DBW0 ---- DB1.DBW0:BCD
D DBD	DWord	ID0 ----	MD0 ----	---- DB1.DBD0

	LBCD (BCD) Float (REAL)	ID0:BCD ---- ID0:REAL ----	MD0:BCD ---- MD0:REAL ----	---- DB1.DBD0:BCD ---- DB1.DBD0:REAL

Legacy S7-300/400 Item Syntax

The default data types for dynamically defined tags are shown in **bold**. For preferred item syntax, refer to **Standard S7-300/400/1200 Item Syntax**.

Address Type	Range	Type	Access
Discrete Inputs	I0.b-I65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	IB0-IB65535	**Byte**, Char, String**	Read/Write
	IW0-IW65534	**Word**, Short, BCD	Read/Write
	IW:KT0-IW:KT65534	DWord, **Long**	Read/Write
	IW:KC0-IW:KC65534	**Word**, Short	Read/Write
	ID0-ID65532	**DWord**, Long, LBCD, Float	Read/Write
Discrete Inputs	E0.b-E65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	EB0-EB65535**	**Byte**, Char, String**	Read/Write
	EW0-EW65534	**Word**, Short, BCD	Read/Write
	EW:KT0-EW:KT65534	DWord, **Long**	Read/Write
	EW:KC0-EW:KC65534	**Word**, Short	Read/Write
	ED0-ED65532	**DWord**, Long, LBCD, Float	Read/Write
Note: I and E access the same memory area.			
Discrete Outputs	Q0.b-Q65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	QB0-QB65535	**Byte**, Char, String**	Read/Write
	QW0-QW65534	**Word**, Short, BCD	Read/Write
	QW:KT0-QW:KT65534	DWord, **Long**	Read/Write
	QW:KC0-QW:KC65534	**Word**, Short	Read/Write
	QD0-QD65532	**DWord**, Long, LBCD, Float	Read/Write
Discrete Outputs	A0.b-A65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	AB0-AB65535	**Byte**, Char, String**	Read/Write
	AW0-AW65534	**Word**, Short, BCD	Read/Write
	AW:KT0-AW:KT65534	DWord, **Long**	Read/Write
	AW:KC0-AW:KC65534	**Word**, Short	Read/Write
	AD0-AD65532	**DWord**, Long, LBCD, Float	Read/Write

Note: Q and A access the same memory area.			
Peripheral Inputs	PI0.b-PI65535.b* .b is Bit Number 0-7	**Boolean**	Read Only
	PIB0-PIB65535	**Byte**, Char, String**	Read Only
	PIW0-PIW65534	**Word**, Short, BCD	Read Only
	PIW:KT0-PIW:KT65534	DWord, **Long**	Read Only
	PIW:KC0-PIW:KC65534	**Word**, Short	Read Only
	PID0-PID65532	**DWord**, Long, LBCD, Float	Read Only
Peripheral Inputs	PE0.b-PE65535.b* .b is Bit Number 0-7	**Boolean**	Read Only
	PEB0-PEB65535**	**Byte**, Char, String**	Read Only
	PEW0-PEW65534	**Word**, Short, BCD	Read Only
	PEW:KT0-PEW:KT65534	DWord, **Long**	Read Only
	PEW:KC0-PEW:KC65534	**Word**, Short	Read Only
	PED0-PED65532	**DWord**, Long, LBCD, Float	Read Only
Note: PI and PE access the same memory area.			
Peripheral Outputs	PQ0.b-PQ65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	PQB0-PQB65535	**Byte**, Char, String**	Read/Write
	PQW0-PQW65534	**Word**, Short, BCD	Read/Write
	PQW:KT0-PQW:KT65534	DWord, **Long**	Read/Write
	PQW:KC0-PQW:KC65534	**Word**, Short	Read/Write
	PQD0-PQD65532	**DWord**, Long, LBCD, Float	Read/Write
Peripheral Outputs	PA0.b-PA65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	PAB0-PAB65535	**Byte**, Char, String**	Read/Write
	PAW0-PAW65534	**Word**, Short, BCD	Read/Write
	PAW:KT0-PAW:KT65534	DWord, **Long**	Read/Write
	PAW:KC0-PAW:KC65534	**Word**, Short	Read/Write
	PAD0-PAD65532	**DWord**, Long, LBCD, Float	Read/Write
Note: PQ and PA access the same memory area.			
Internal Memory	F0.b-F65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	FB0-FB65535	**Byte**, Char, String**	Read/Write
	FW0-FW65534	**Word**, Short, BCD	Read/Write
	FW:KT0-FW:KT65534	DWord, **Long**	Read/Write
	FW:KC0-FW:KC65534	**Word**, Short	Read/Write
	FD0-FD65532	**DWord**, Long, LBCD, Float	Read/Write

Internal Memory	M0.b-M65535.b* .b is Bit Number 0-7	**Boolean**	Read/Write
	MB0-MB65535	**Byte**, Char, String**	Read/Write
	MW0-MW65534	**Word**, Short, BCD	Read/Write
	MW:KT0-MW:KT65534	DWord, **Long**	Read/Write
	MW:KC0-MW:KC65534	**Word**, Short	Read/Write
	MD0-MD65532	**DWord**, Long, LBCD, Float	Read/Write
Note: F and M access the same memory area.			
Data Block Boolean	DB1-N**:**KM0.b-KM65534.b* 1-N is Block Number .b is Bit Number 0-15	**Boolean**	Read/Write
	Alternates		
	DB1DBX0.b-DBNDBX65534.b* 1-N is Block Number .b is Bit Number 0-15	**Boolean**	Read/Write
	DB1D0.b-DBND65534.b* 1-N is Block Number .b is Bit Number 0-15	**Boolean**	Read/Write
Data Block Left Byte	DB1-N**:**KL0-KL65535 1-N is Block Number	**Byte**, Char, String**	Read/Write
	*Alternate*s		
	DB1DBB0-DBNDBB65535 1-N is Block Number	**Byte**, Char, String**	Read/Write
	DB1DL0-DBNDL65535 1-N is Block Number	**Byte**, Char, String**	Read/Write
Data Block Right Byte	DB1-N**:**KR0-KR65534 1-N is Block Number	**Byte**, Char, String**	Read/Write
	Alternate		
	DB1DR0-DBNDR65534 1-N is Block Number	**Byte**, Char, String**	Read/Write
Data Block Unsigned Word	DB1-N**:**KH0-KH65534 1-N is Block Number	**Word**, Short, BCD	Read/Write
Data Block Signed Word	DB1-N**:**KF0-KF65534 1-N is Block Number	Word, **Short**, BCD	Read/Write
	Alternates		
	DB1DBW0-DBNDBW65534 1-N is Block Number	Word, **Short**, BCD	Read/Write
	DB1DW0-DBNDW65534 1-N is Block Number	Word, **Short**, BCD	Read/Write
Data Block Signed Long	DB1-N**:**KD0-KD65532 1-N is Block Number	DWord, **Long**, LBCD, Float	Read/Write
	Alternates		
	DB1DBD0-DB1DBD65532 1-N is Block Number	DWord, **Long**, LBCD, Float	Read/Write
	DB1DD0-DB1DD65532	DWord, **Long**, LBCD, Float	Read/Write

	1-N is Block Number		
Data Block Float	DB1-N:KG0-KG65532 1-N is Block Number	**Float**	Read/Write
Data Block BCD	DB1-N:BCD0-BCD65534 1-N is Block Number	**Word**, Short, BCD	Read/Write
Data Block S5 Timer as DB	DB1-N:KT0-KT65534 1-N is Block Number	DWord, **Long**	Read/Write
Data Block S5 Counter as DB	DB1-N:KC0-KC65534 1-N is Block Number	**Word**, Short	Read/Write
Data Block String***	DB1S0.n-DB1S65535.n* .n is string length. 0<n<= 212.	**String**	Read/Write
Data Block String***	DB1STRING0.n-DB1STRING65535.n* .n is string length. 0<n<= 210.	String	Read/Write
Timer Current Values****	T0-T65535*	DWord, **Long**	Read/Write
Counter Current Values*****	C0-C65535*	**Word**, Short	Read/Write
Counter Current Values*****	Z0-Z65535*	**Word**, Short	Read/Write

*These memory types/subtypes do not support arrays
**Byte memory types (i.e. MB) support Strings. The syntax for strings is <address>.<length> where 0 < length <= 212.
***For more information, refer to **Data Block** Strings.
****For more information, refer to **Timers**.
*****For more information, refer to **Counters**.

Note 1: All offsets for memory types I, Q, and F represent a byte starting location within the specified memory type.

Note 2: Use caution when modifying Word, Short, DWord, and Long types. For I, Q, and F each address starts at a byte offset within the device. Therefore, Words FW0 and FW1 overlap at byte 1. Writing to FW0 will also modify the value held in FW1. Similarly, DWord, and Long types can also overlap. It is recommended that these memory types be used so that overlapping does not occur. For example, with DWord, FD0, FD4, FD8 ... and so on can be used to prevent overlapping bytes.

Data Block Strings

Data Block Strings can be referenced by using S subtypes or String subtypes.

S Subtype

The syntax for the S subtype is DBxSy.n where x is the Data Block, y is the Byte offset, and n is the maximum String length. String values read and written are stored at Byte offset y in Data Block x.

y	y+1	y+2	...	y+n-1
''	''	''	...	''

S Strings are null terminated. If the maximum string length is 10 and 3 characters are written, the fourth character is set to NULL, while characters 5-10 are left untouched.

String Subtype

The String subtype follows the STEP 7 String data type definition. The syntax for the String subtype is DBxSTRINGy.n where x is the Data Block, y is the Byte offset, and n is the maximum String length. If n is not specified, the maximum String length will be 210 characters. String values read and written are stored at Byte offset y+2 in Data Block x. The first two bytes contain the **maximum string length (n)** and the **actual string length**. The **actual string length** gets updated with every write based on the string length of the string being written.

y	y+1	y+2	y+3	y+4	...	y+2+n-1
max string length (n)	actual string length	''	''	''	...	''

String Strings are NULL padded. If the maximum string length is 10 and 3 characters are written, characters 4-10 are set to NULL.

Arrays

All memory types/subtypes with the exception of those marked with an asterisk (*), support arrays. The syntax below are valid for declaring an array. If no rows are specified, a row count of 1 is assumed.

<address>[rows][cols]
<address>.rows.cols
<address>,rows,cols
<address>_rows_cols

For Word, Short, BCD and "KT" arrays, the base address + (rows * cols * 2) cannot exceed 65536. Keep in mind that the elements of the array are words, located on a word boundary. For example, IW0[4] would return IW0, IW2, IW4, and IW6. "KT" subtypes fall into the 16-bit category because the data stored in the PLC is contained within a Word. For more information, refer to **Timers**.

For Float, DWord, Long and Long BCD arrays (excluding "KT" subtypes), the base address + (rows * cols * 4) cannot exceed 65536. Keep in mind that the elements of the array are DWord, located on a DWord boundary. For example, ID0[4] will return ID0, ID4, ID8, ID12.

For all arrays, the total number of bytes being requested cannot exceed the internal block size of 212 bytes.

KL vs. KR vs. DBB

KL and KR determine whether the left byte or right byte of the data block word is returned.

Value	8	9	A	B	C
Byte	0	1	2	3	4

The following examples are from the table above.

Example 1
DB1:KH0=0x89.
DB1:KL0=0x8
DB1:KR0=0x9
DB1DBB0=0x8

Example 2
DB1:KH1=0x9A
DB1:KL1=0x9
DB1:KR1=0xA
DB1DBB1=0x9

Timers

The Siemens TCP/IP Ethernet driver automatically scales T and KT values based on the Siemens S5 time format. Timer data is stored as a Word in the PLC but scaled to a DWord in the driver. The value returned for either a T or KT memory type will already be scaled using the appropriate Siemens time base. As a result, the values are always returned as a count of milliseconds. When writing to T or KT memory types, the Siemens time base will also be applied. To write a value to a timer in the controller, simply write the desired value as a count of milliseconds to the appropriate timer.

Counters

The value returned for either C or KC memory type will automatically be converted to a BCD value. DB1:KH0 @ BCD=DB1:KC0 @ Word.

Examples
1. To access bit 3 of Internal Memory F20, declare an address as follows:
F20.3

2. To access Data Block 5 as word memory at byte 30, declare an address as follows:
DB5:KH30

3. To access Data Block 2 byte 20 and bit 7, declare an address as follows:
DB2:KM20.7

4. To access Data Block 1 as left byte memory at byte 10, declare an address as follows:
DB1:KL10

5. To access Internal Memory F20 as a DWORD, declare an address as follows:
FD20

6. To access Input Memory I10 as a Word, declare an address as follows:

IW10

Error Descriptions

The following error/warning messages may be generated. Click on the link for a description of the message.

Address Validation

Missing address
Device address '<address>' contains a syntax error
Address '<address>' is out of range for the specified device or register
Data Type '<type>' is not valid for device address '<address>'
Device address '<address>' is Read Only
Array size is out of range for address '<address>'
Array support is not available for the specified address: '<address>'

Driver Error Messages

Winsock initialization failed (OS Error=n)
Winsock V1.1 or higher must be installed to use the Siemens TCP/IP Ethernet device driver

Device Status Messages

Device '<device name>' is not responding
Unable to connect to device '<device name>'
Unable to establish association with device '<device name>'
Unable to read <block size> bytes starting at address <address> on device '<device name>'
Unable to write to '<address>' on device '<device name>'

Error Codes

NetLink Errors

Error Code	Source	Description
0x00		Service could be executed without an error.
0x01	Remote Station	Timeout from remote station.
0x02	Remote Station	Resource unavailable.
0x03	Remote Station	Requested function of master is not activated within the remote station.
0x11	Remote Station	No response of the remote station.
0x12	Network	Master not into the logical token ring.
0x14	Host	Resource of the local FDL controller not available or not sufficient.
0x15	Host	The specified msg.data_cnt parameter is invalid.
0x30	Remote Station	Timeout. The requested message was accepted but no indication was sent back by the remote station.
0x39	Remote Station	Sequence fault, internal state machine error.
0x85	Host	Specified offset address out of limits or not known in the remote station.
0x86	Device	Wrong PDU coding in the MPI response of the remote station.
0x87	Host	Specified length to write or to read results in an access outside of limits.

Transport Errors

Error Code	Description
0x00	Error reason not specified.
0x01	Invalid parameter code.
0x02	Invalid TPDU type.
0x03	Invalid parameter value.

Protocol Errors

Note: Links contain the error codes for the given class.

Error Class	Description
0x00	No error.
0x81	Error in the application ID of the request.
0x82	Error in the object definition (e.g. bad data type).
0x83	No resources available.
0x84	Error in the structure of the service request.

0x85	Error in the communication equipment.
0x87	Access error.
0xD2	OVS error.
0xD4	Diagnostic error.
0xD6	Protection system error.
0xD8	BuB error.
0xEF	Layer 2 specific error.

Data Access Errors

Error Code	Description
0xFF	No error.
0x01	Hardware fault.
0x03	Illegal object access.
0x05	Invalid address (incorrect variable address).
0x06	Data type is not supported.
0x07	Invalid data size/too much data.
0x0A	Object does not exist or length error.

Address Validation

The following error/warning messages may be generated. Click on the link for a description of the message.

Address Validation

Missing address
Device address '<address>' contains a syntax error
Address '<address>' is out of range for the specified device or register
Data Type '<type>' is not valid for device address '<address>'
Device address '<address>' is Read Only
Array size is out of range for address '<address>'
Array support is not available for the specified address: '<address>'

Missing address

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically has no length.

Solution:
Re-enter the address in the client application.

Device address '<address>' contains a syntax error

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically contains one or more invalid characters.

Solution:
Re-enter the address in the client application.

Address <address>' is out of range for the specified device or register

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically references a location that is beyond the range of supported locations for the device.

Solution:
Verify the address is correct; if it is not, re-enter it in the client application.

Data Type '<type>' is not valid for device address '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically has been assigned an invalid data type.

Solution:
Modify the requested data type in the client application.

Device address '<address>' is Read Only

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically has a requested access mode that is not compatible with what the device supports for that address.

Solution:
Change the access mode in the client application.

Array size is out of range for address '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically is requesting an array size that is too large for the address type or block size of the driver.

Solution:
Re-enter the address in the client application to specify a smaller value for the array or a different starting point.

Array Support is not available for the specified address: '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically contains an array reference for an address type that doesn't support arrays.

Solution:
Re-enter the address in the client application to remove the array reference or correct the address type.

Driver Error Messages

The following error/warning messages may be generated. Click on the link for a description of the message.

Driver Error Messages
Winsock initialization failed (OS Error= n)
Winsock V1.1 or higher must be installed to use the Siemens TCP/IP Ethernet device driver

Winsock initialization failed (OS Error=n)

Error Type:
Fatal

OS Error	Indication	Possible Solution
10091	Indicates that the underlying network subsystem is	Wait a few seconds and restart the driver.

	not ready for network communication.	
10067	Limit on the number of tasks supported by the Windows Sockets implementation has been reached.	Close one or more applications that may be using Winsock and restart the driver.

Winsock V1.1 or higher must be installed to use the Siemens TCP/IP Ethernet device driver

Error Type:
Fatal

Possible Cause:
The version number of the Winsock DLL found on the system is less than 1.1.

Solution:
Upgrade Winsock to version 1.1 or higher.

Device Status Messages

The following error/warning messages may be generated. Click on the link for a description of the message.

Device Status Messages
Device '<device name>' is not responding
Unable to connect to device '<device name>'
Unable to establish association with device '<device name>'
Unable to read <block size> bytes starting at address <address> on device '<device name>'
Unable to write to '<address>' on device '<device name>'

'Device <Device name>' is not responding

Error Type:
Warning

Result
If tag was being read:

- If tag is a block tag, the entire block will be invalidated. All tags within that block will be invalidated.
- If tag is an array tag or string tag, just this tag is invalidated.

If tag was being written:

- Write operation for the given tag will not take place.

Possible Cause:
1. The connection between the device and the Host PC is broken.
2. The response from the device took longer to receive than the amount of time specified in the "Request Timeout" device setting.
3. The named device may have been assigned an incorrect IP address.
4. Device CPU work load is too high.

Solution:
1. Verify the cabling between the PC and the PLC device.
2. Increase the Request Timeout setting so that the entire response can be handled.
3. Verify the IP address given to the named device matches that of the actual device.
4. If this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
5. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.

Unable to connect to device '<device name>'

Error Type:
Warning

Result:
1. If tag is to be read in the process of connecting and device error (transport) occurred:

- If tag is a block tag, the entire block will be deactivated. All tags within that block will be deactivated. This is signified by the postfix message "...Block Deactivated."
- If tag is an array tag or string tag, just this tag is deactivated. This is signified by the postfix message "...Tag Deactivated."

2. If tag is to be read in the process of connecting and no device errors occurred:

- If tag is a block tag, the entire block will be invalidated. All tags within that block will be invalidated.
- If tag is an array tag or string tag, just this tag is invalidated.

3. If tag is to be written in the process of connecting:

- Write operation for the given tag will not take place.

Possible Causes/Solutions:

"Frame contains errors:"

1. Incorrect TPDU response size.

2. Unexpected frame received.
- Incorrect response code.

3. Frame sequence is out of order.

4. Device CPU work load is too high.

Solution:

1. Cable noise may cause distortion in the frame, resulting in erroneous data. It may also cause for dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic.
3. If this error occurs frequently, increase the Request Timeout and/or Fail After attempt count.
4. If this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
5. Increase the "Scan Cycle Load from Communication" and "Scan Cycle Monitoring Time".

"Device returned transport error [Code=<code>]"

An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.

Solution:

Contact Technical Support.

Note:

No protocol or data access errors can occur for this operation.

See Also:

Error Codes

Unable to establish association with device '<device name>'

Error Type:

Warning

Result:

1. If tag is to be read in the process of establishing an association and a device error (i.e. transport, protocol) occurred:

- If tag is a block tag, the entire block will be deactivated. All tags within that block will be deactivated. This is signified by the postfix message "...Block Deactivated."
- If tag is an array tag or string tag, just this tag is deactivated. This is signified by the postfix message "...Tag Deactivated."

2. If tag is to be read in the process of establishing an association and no device errors occurred.

- If tag is a block tag, the entire block will be invalidated. All tags within that block will be invalidated.
- If tag is an array tag or string tag, just this tag is invalidated.

3. If tag is to be written in the process of connecting:

- Write operation for the given tag will not take place.

Possible Causes/Solutions:
"Frame contains errors"
1. Incorrect TPDU response size.

2. Unexpected frame received.
- Incorrect response code.

3. Frame sequence is out of order.

4. Device CPU work load is too high.

Solution:
1. Cable noise may cause distortion in the frame, resulting in erroneous data. It may also cause for dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic.
3. If this error occurs frequently, increase the Request Timeout and/or Fail After attempt count.
4. If this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
5. Increase the "Scan Cycle Load from Communication" and "Scan Cycle Monitoring Time".

"Device returned transport error [Code=<code>]"
An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.

Solution:
Contact Technical Support.

"Device returned protocol error [Class=<class>, Code=<code>]"
An S7 Messaging error occurred. This will occur if this portion is malformed or contains incorrect packet lengths.

Solution:
Contact Technical Support.

Note:
No data access errors can occur for this operation.

See Also:
Error Codes

Unable to read <block size> bytes starting at address <address> on device '<device name>'

Error Type:
Warning

Result:
1. If device error (i.e. transport, protocol or access) occurred.

- If tag is a block tag, the entire block (address -> address + block size) will be deactivated. All tags within that block will be deactivated. This is signified by the postfix message "...Block Deactivated."
- If tag is an array tag or string tag, just this tag is deactivated. This is signified by the postfix message "...Tag Deactivated."

2. If no device errors occurred.

- If tag is a block tag, the entire block will be invalidated. All tags within that block will be invalidated.
- If tag is an array tag or string tag, just this tag is invalidated.

Possible Causes/Solutions:
"Frame contains errors"
1. Incorrect TPDU response size.

2. Unexpected frame received.
- Incorrect response code.

3. Frame sequence is out of order.

4. Device CPU work load is too high.

Solution:
1. Cable noise may cause distortion in the frame, resulting in erroneous data. It may also cause for dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic.
3. If this error occurs frequently, increase the Request Timeout and/or Fail After attempt count.
4. Also if this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
5. Increase the "Scan Cycle Load from Communication" and "Scan Cycle Monitoring Time".

"NetLink returned error [Code=<code>]"
An error was returned from the PLC or NetLink adapter.

Solution:
1. If error code=0x11, users may have an incorrect MPI ID set. Determine the ID of the MPI through which communications is occurring and re-enter it in the MPI ID Device Property field.
2. If error code=0x87, users may be accessing data out of range in the device. Verify the address limits of the device and make corrections to the tag references causing the error.
3. For all other errors, contact Technical Support.

"Device returned transport error [Code=<code>]"
An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.

Solution:
Contact Technical Support.

"Device returned protocol error [Class=<class>, Code=<code>]"
An S7 Messaging error occurred. This will occur if this portion is malformed or contains incorrect packet lengths.

Solution:
Contact Technical Support.

"Device returned data access error [Code=<code>]"
A data access error occurred. This will occur if, for instance, a requested address is out of range or is being referenced incorrectly.

Solution:
Contact Technical Support.

See Also:
Error Codes

Unable to write to '<address>' on device '<device name>'

Error Type:
Warning

Result:
The write operation to address <address> failed.

Possible Causes/Solutions:
"Device not responding"
1. The connection between the device and the Host PC is broken.
2. The named device may have been assigned an incorrect IP address.
3. Device CPU work load is too high.

Solution:
1. Verify the cabling between the PC and the PLC device.
2. Verify the IP address given to the named device matches that of the actual device.

3. If this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
4. Increase the "Scan Cycle Load from Communication" and "Scan Cycle Monitoring Time".

"Frame contains errors"

1. Incorrect TPDU response size.

2. Unexpected frame received.
- Incorrect response code.

3. Frame sequence is out of order.

4. Device CPU work load is too high.

Solution:

1. Cable noise may cause distortion in the frame, resulting in erroneous data. It may also cause for dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic.
3. If this error occurs frequently, increase the Request Timeout and/or Fail After attempt count.
4. If this error occurs frequently, decrease the tag group scan rate to reduce the work load on the PLC CPU.
5. Increase the "Scan Cycle Load from Communication" and "Scan Cycle Monitoring Time".

"NetLink returned error [Code=<code>]"

An error was returned from the PLC or NetLink adapter.

Solution:

1. If error code=0x11, users may have an incorrect MPI ID set. Determine the ID of the MPI through which communications is occurring and re-enter it in the MPI ID Device Property field.
2. If error code=0x87, users may be accessing data out of range in the device. Verify the address limits of the device and make corrections to the tag references causing the error.
3. For all other errors, contact Technical Support.

"Device returned transport error [Code=<code>]"

An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.

Solution:

Contact Technical Support.

"Device returned protocol error [Class=<class>, Code=<code>]"

An S7 Messaging error occurred. This will occur if this portion is malformed or contains incorrect packet lengths.

Solution:

Contact Technical Support.

"Device returned data access error [Code=<code>]"

A data access error occurred. This will occur if for instance, a requested address is out of range or is being referenced incorrectly.

Solution:

Contact Technical Support.

See Also:

Error Codes

Index

A

B

C

D

E

F

G

H

I

L

M

N

O

S

T

U

W