

# Siemens TCP/IP Ethernet Driver

© 2016 PTC Inc. All Rights Reserved.



# Table of Contents

<b>Siemens TCP/IP Ethernet Driver</b> .....	<b>1</b>
<b>Table of Contents</b> .....	<b>2</b>
Siemens TCP/IP Ethernet Driver .....	5
Overview .....	5
<b>Setup</b> .....	<b>6</b>
Channel Properties .....	6
Channel Properties - General .....	6
Channel Properties - Ethernet Communications .....	7
Channel Properties - Write Optimizations .....	7
Channel Properties - Advanced .....	8
Driver Device Properties .....	9
Device Properties - Identification .....	9
Device Properties - Operating Mode .....	10
Device Properties - Scan Mode .....	10
Device Properties - Timing .....	11
Device Properties - Auto-Demotion .....	12
Device Properties - Tag Generation .....	12
Device Properties - Communications Parameters .....	15
Device Properties - S7 200 .....	15
Device Properties - S7-300/400/1200/1500 .....	15
Device Properties - Addressing Options .....	16
Device Properties - Tag Import .....	17
Device Properties - Redundancy .....	17
<b>Optimizing Communications</b> .....	<b>18</b>
<b>Data Types Description</b> .....	<b>19</b>
<b>Address Descriptions</b> .....	<b>20</b>
S7-200 Address Descriptions .....	20
S7-300 Address Descriptions .....	22
S7-400 Address Descriptions .....	22
S7-1200 Address Descriptions .....	22
S7-1500 Address Descriptions .....	23
NetLink: S7-300 Address Descriptions .....	23
NetLink: S7-400 Address Descriptions .....	23
Internal Tags .....	23
Standard S7-300/400/1200/1500 Item Syntax .....	24
Legacy S7-300/400 Item Syntax .....	29
<b>Event Log Messages</b> .....	<b>35</b>
Reason = 'Frame contains errors'. .....	35
Reason = 'Device returned transport error'. Error code = <error>. .....	35
Reason = 'Device returned protocol error'. Error class = <class>, Error code = <error>. .....	35

Reason = 'Device returned data access error'. Error code = <error>.	36
Reason = 'Device is not responding'.	36
Reason = 'Unknown error occurred'.	37
Reason = NetLink returned error. Error code = <error>.	37
Failed to resolve host.   Host = '<host name>'.	37
Auto-generated tag names and descriptions may not appear as expected due to string conversion error.	37
A required code page is unavailable on this machine. Tag generation may fail or tag names and descriptions may not appear as expected.   Required code page = <page>.	38
Unable to load the Step 7 language file.	38
Memory exception reading the Step 7 language file.	38
Step 7 language file failed to open.   OS error = '<error>'.	38
Tag generation failure.   Data block name = '<block name>', data block number = <block number>.	39
Created tag in group due to internal block size.   Tag address = '<address>', tag name = '<name>', group name = '<name>'.	39
Tag not created because arrays are not supported with specified data type.   Tag name = '<name>', group name = '<name>', data type = '<type>'.	39
Unable to connect to device.	40
Unable to establish association with device.	40
Unable to read from address on device.   Address = '<address>',	41
Unable to read from address on device. Tag deactivated.   Address = '<address>',	41
Unable to read data from device.   Data block = '<block>', block start = <address>, block size = <size>.	42
Unable to read data from device. Block deactivated.   Data block = '<block>', block start = <address>, block size = <size>.	43
Unable to read data from device.   Memory type = '<type>', block start = <address>, block size = <size> (bytes).	44
Unable to read data from device. Block deactivated.   Memory type = '<type>', block start = <address>, block size = <size> (bytes).	44
Unable to write to address on device.   Address = '<address>',	45
Unable to write to address on device. HEXSTRING length is different from tag length.   Address = '<address>', HEXSTRING length = <length> (bytes), tag length = <length> (bytes).	46
Unable to write to address on device. HEXSTRING contains a non-hexadecimal character.   Address = '<address>'.	46
Unable to write to address on device. HEXSTRING length must be an even number of characters.   Address = '<address>'.	46
Unable to write to address on device. Time of Day string contains a syntax error. Expected 'hh:mm:ss.hhh' format.   Address = '<address>', Time of Day string = '<string>'.	46
Error Codes	47
<b>Appendix: Configuring Siemens Connections</b>	<b>49</b>
How To Configure S7-200 Connections in Micro/WIN	49
How To Configure S7-300/400 Connections in STEP 7	64
How To Configure S7-1200 Connections with the Totally Integrated Automation (TIA) Portal	69
How To Configure S7-1500 Connections	72
<b>Appendix: Alternate Syntax Support</b>	<b>74</b>
Applicom Direct-Link Item Syntax	74
INAT OPC Server TCPIPH1 Item Syntax	76

Siemens Simatic Net Item Syntax .....	79
Siemens STEP 7 Item Syntax .....	81
Softing S7/S5 OPC Server Item Syntax .....	83
<b>Index .....</b>	<b>86</b>

---

## Siemens TCP/IP Ethernet Driver

---

Help version 1.076

### CONTENTS

#### [Overview](#)

What is the Siemens TCP/IP Ethernet Driver?

#### [Device Setup](#)

How do I configure a device for use with this driver?

#### [Optimizing Communications](#)

How do I get the best performance from the driver?

#### [Data Types Description](#)

What data types does this driver support?

#### [Address Descriptions](#)

How do I address a data location on a Siemens TCP/IP device?

#### [Event Log Messages](#)

What messages does the Siemens TCP/IP Ethernet Driver produce?

### Overview

---

The Siemens TCP/IP Ethernet Driver provides a 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.

## Setup

A maximum of 1024 devices may be defined on a channel.

### Supported Devices

S7-200 via CP243  
 S7-300 via CP343  
 S7-400 via CP443  
 S7-1200\*  
 S7-1500\*  
 S7-300 via NetLink  
 S7-400 via NetLink

\*This device has a built-in Ethernet module.

### Supported NetLink Cables and Gateways

NT 50-MPI  
 NL 50-MPI  
 NL-MPI

**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.

**See Also:**

[Channel Properties](#)  
[Device Properties](#)

## Channel Properties

This server supports the use of simultaneous multiple communications drivers. Each protocol or driver used in a server project is called a channel. A server project may consist of many channels with the same communications driver or with unique communications drivers. A channel acts as the basic building block of an OPC link.

The properties associated with a channel are broken in to logical groupings. While some groups are specific to a given driver or protocol, the following are the common groups:

### [General](#)

### [Ethernet or Serial Communications](#)

### [Write Optimization](#)

### [Advanced](#)

## Channel Properties - General

This server supports the use of simultaneous multiple communications drivers. Each protocol or driver used in a server project is called a channel. A server project may consist of many channels with the same communications driver or with unique communications drivers. A channel acts as the basic building block of an OPC link. This group is used to specify general channel properties, such as the identification attributes and operating mode.

<table border="1"> <tr><td>Property Groups</td></tr> <tr><td><b>General</b></td></tr> <tr><td>Ethernet Communications</td></tr> <tr><td>Write Optimizations</td></tr> <tr><td>Advanced</td></tr> </table>	Property Groups	<b>General</b>	Ethernet Communications	Write Optimizations	Advanced	<table border="1"> <tr><td><input type="checkbox"/> <b>Identification</b></td></tr> <tr><td>Name</td><td></td></tr> <tr><td>Description</td><td></td></tr> <tr><td>Driver</td><td></td></tr> <tr><td><input type="checkbox"/> <b>Diagnostics</b></td></tr> <tr><td>Diagnostics Capture</td><td>Disable</td></tr> </table>	<input type="checkbox"/> <b>Identification</b>	Name		Description		Driver		<input type="checkbox"/> <b>Diagnostics</b>	Diagnostics Capture	Disable
Property Groups																
<b>General</b>																
Ethernet Communications																
Write Optimizations																
Advanced																
<input type="checkbox"/> <b>Identification</b>																
Name																
Description																
Driver																
<input type="checkbox"/> <b>Diagnostics</b>																
Diagnostics Capture	Disable															

### Identification

**Name:** User-defined identity of this channel. In each server project, each channel name must be unique. Although names can be up to 256 characters, some client applications have a limited display window when browsing the OPC server's tag space. The channel name is part of the OPC browser information.

• For information on reserved characters, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in the server help.

**Description:** User-defined information about this channel.

• Many of these properties, including Description, have an associated system tag.

**Driver:** Selected protocol / driver for this channel. This property specifies the device driver that was selected during channel creation. It is a disabled setting in the channel properties.

• **Note:** With the server's online full-time operation, these properties can be changed at any time. This includes changing the channel name to prevent clients from registering data with the server. If a client has already acquired an item from the server before the channel name is changed, the items are unaffected. If, after the channel name has been changed, the client application releases the item and attempts to re-acquire using the old channel name, the item is not accepted. With this in mind, changes to the properties should not be made once a large client application has been developed. Utilize the User Manager to prevent operators from changing properties and restrict access rights to server features.

## Diagnostics

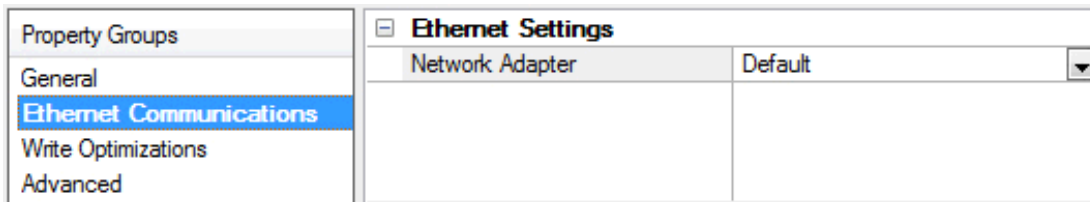
**Diagnostics Capture:** When enabled, this option makes the channel's diagnostic information available to OPC applications. Because the server's diagnostic features require a minimal amount of overhead processing, it is recommended that they be utilized when needed and disabled when not. The default is disabled.

• For more information, refer to "Communication Diagnostics" in the server help.

Not all drivers support diagnostics. To determine whether diagnostics are available for a particular driver, open the driver information and locate the "Supports device level diagnostics" statement.

## Channel Properties - Ethernet Communications

Ethernet Communication can be used to communicate with devices.

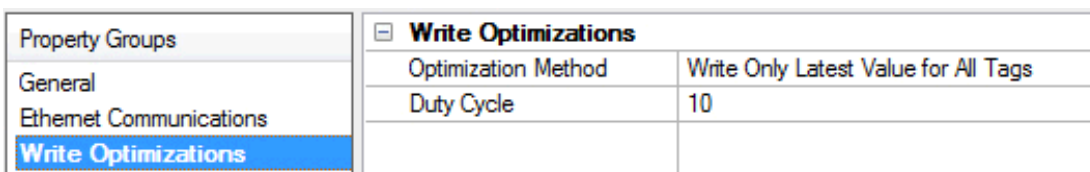


### Ethernet Settings

**Network Adapter:** Specify the network adapter to bind. When Default is selected, the operating system selects the default adapter.

## Channel Properties - Write Optimizations

As with any OPC server, writing data to the device may be the application's most important aspect. The server intends to ensure that the data written from the client application gets to the device on time. Given this goal, the server provides optimization properties that can be used to meet specific needs or improve application responsiveness.



### Write Optimizations

**Optimization Method:** controls how write data is passed to the underlying communications driver. The options are:

- **Write All Values for All Tags:** This option forces the server to attempt to write every value to the controller. In this mode, the server continues to gather write requests and add them to the server's internal write queue. The server processes the write queue and attempts to empty it by writing data to the device as quickly as possible. This mode ensures that everything written from the client applications is sent to the target device. This mode should be selected if the write operation order or the write item's content must uniquely be seen at the target device.
- **Write Only Latest Value for Non-Boolean Tags:** Many consecutive writes to the same value can accumulate in the write queue due to the time required to actually send the data to the device. If the server updates a write value that has already been placed in the write queue, far fewer writes are needed to reach the same final output value. In this way, no extra writes accumulate in the server's queue. When the user stops moving the slide switch, the value in the device is at the correct value at virtually the same time. As the mode states, any value that is not a Boolean value is updated in the server's internal write queue and sent to the device at the next possible opportunity. This can greatly improve the application performance.
  - **Note:** This option does not attempt to optimize writes to Boolean values. It allows users to optimize the operation of HMI data without causing problems with Boolean operations, such as a momentary push button.
- **Write Only Latest Value for All Tags:** This option takes the theory behind the second optimization mode and applies it to all tags. It is especially useful if the application only needs to send the latest value to the device. This mode optimizes all writes by updating the tags currently in the write queue before they are sent. This is the default mode.

**Duty Cycle:** is used to control the ratio of write to read operations. The ratio is always based on one read for every one to ten writes. The duty cycle is set to ten by default, meaning that ten writes occur for each read operation. Although the application is performing a large number of continuous writes, it must be ensured that read data is still given time to process. A setting of one results in one read operation for every write operation. If there are no write operations to perform, reads are processed continuously. This allows optimization for applications with continuous writes versus a more balanced back and forth data flow.

● **Note:** It is recommended that the application be characterized for compatibility with the write optimization enhancements before being used in a production environment.

## Channel Properties - Advanced

This group is used to specify advanced channel properties. Not all drivers support all properties; so the Advanced group does not appear for those devices.

Property Groups	[-] <b>Non-Normalized Float Handling</b>	
General	Floating-Point Values	Replace with Zero
Write Optimizations	[-] <b>Inter-Device Delay</b>	
<b>Advanced</b>	Inter-Device Delay (ms)	0

**Non-Normalized Float Handling:** Non-normalized float handling allows users to specify how a driver handles non-normalized IEEE-754 floating point data. A non-normalized value is defined as Infinity, Not-a-Number (NaN), or as a Denormalized Number. The default is Replace with Zero. Drivers that have native float handling may default to Unmodified. Descriptions of the options are as follows:

- **Replace with Zero:** This option allows a driver to replace non-normalized IEEE-754 floating point values with zero before being transferred to clients.
- **Unmodified:** This option allows a driver to transfer IEEE-754 denormalized, normalized, non-number, and infinity values to clients without any conversion or changes.

● **Note:** This property is disabled if the driver does not support floating point values or if it only supports the option that is displayed. According to the channel's float normalization setting, only real-time driver tags (such as values and arrays) are subject to float normalization. For example, EFM data is not affected by this setting.lin



For more information on the floating point values, refer to "How To ... Work with Non-Normalized Floating Point Values" in the server help.

**Inter-Device Delay:** Specify the amount of time the communications channel waits to send new requests to the next device after data is received from the current device on the same channel. Zero (0) disables the delay.

**Note:** This property is not available for all drivers, models, and dependent settings.

## Driver Device Properties

Device properties are organized into the following groups. Click on a link below for details about the settings in that group.

[Identification](#)

[Operating Mode](#)

[Scan Mode](#)

[Communication Timeouts](#)

[Timing](#)

[Auto-Demotion](#)

[Tag Generation](#)

[Communication Parameters](#)

[S7-200](#)

[S7-300/400/1200/1500](#)

[Addressing Options](#)

[Tag Import](#)

[Redundancy](#)

## Device Properties - Identification

Property Groups	Identification	
<b>General</b>	Name	Device1
Scan Mode	Description	
Timing	Channel Assignment	Channel1
Auto-Demotion	Driver	Siemens TCP/IP Ethernet
Tag Generation	Model	S7-200
Communication Parameters	ID	255.255.255.25
S7 Comm. Parameters	<b>Operating Mode</b>	
Addressing Options	Data Collection	Enable
Redundancy	Simulated	No

**Name:** User-defined identity of this device.

**Description:** User-defined information about this device.

**Channel Assignment:** User-defined name of the channel to which this device currently belongs.

**Driver:** Selected protocol driver for this device.

**Model:** Select the specific version of the device.

**ID:** the unique identity of the device for communication with the driver. The device ID is formatted as `YYY.YYY.YYY.YYY`, where `YYY` designates the device's 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.

## Device Properties - Operating Mode

Property Groups		
General	[-] <b>Identification</b>	
Scan Mode	Name	Device1
Timing	Description	
Auto-Demotion	Channel Assignment	Channel1
Tag Generation	Driver	Siemens TCP/IP Ethernet
Communication Parameters	Model	S7-200
S7 Comm. Parameters	ID	255.255.255.25
Addressing Options	[-] <b>Operating Mode</b>	
Redundancy	Data Collection	Enable
	Simulated	No

**Data Collection:** This property controls the device's active state. Although device communications are enabled by default, this property can be used to disable a physical device. Communications are not attempted when a device is disabled. From a client standpoint, the data is marked as invalid and write operations are not accepted. This property can be changed at any time through this property or the device system tags.

**Simulated:** This option places the device into Simulation Mode. In this mode, the driver does not attempt to communicate with the physical device, but the server continues to return valid OPC data. Simulated stops physical communications with the device, but allows OPC data to be returned to the OPC client as valid data. While in Simulation Mode, the server treats all device data as reflective: whatever is written to the simulated device is read back and each OPC item is treated individually. The item's memory map is based on the group Update Rate. The data is not saved if the server removes the item (such as when the server is reinitialized). The default is No.

### Notes:

1. This System tag (`_Simulated`) is read only and cannot be written to for runtime protection. The System tag allows this property to be monitored from the client.
2. In Simulation mode, the item's memory map is based on client update rate(s) (Group Update Rate for OPC clients or Scan Rate for native and DDE interfaces). This means that two clients that reference the same item with different update rates return different data.

Simulation Mode is for test and simulation purposes only. It should never be used in a production environment.

## Device Properties - Scan Mode

The Scan Mode specifies the subscribed-client requested scan rate for tags that require device communications. Synchronous and asynchronous device reads and writes are processed as soon as possible; unaffected by the Scan Mode properties.

Property Groups		
General	[-] <b>Scan Mode</b>	
Scan Mode	Scan Mode	Respect Client-Specified Scan Rate ▾
	Initial Updates from Cache	Disable

**Scan Mode:** specifies how tags in the device are scanned for updates sent to subscribed clients. Descriptions of the options are:

- **Respect Client-Specified Scan Rate:** This mode uses the scan rate requested by the client.
- **Request Data No Faster than Scan Rate:** This mode specifies the maximum scan rate to be used. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
  - **Note:** When the server has an active client and items for the device and the scan rate value is increased, the changes take effect immediately. When the scan rate value is decreased, the changes do not take effect until all client applications have been disconnected.

- **Request All Data at Scan Rate:** This mode forces tags to be scanned at the specified rate for subscribed clients. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
- **Do Not Scan, Demand Poll Only:** This mode does not periodically poll tags that belong to the device nor perform a read to get an item's initial value once it becomes active. It is the client's responsibility to poll for updates, either by writing to the `_DemandPoll` tag or by issuing explicit device reads for individual items. *For more information, refer to "Device Demand Poll" in server help.*
- **Respect Tag-Specified Scan Rate:** This mode forces static tags to be scanned at the rate specified in their static configuration tag properties. Dynamic tags are scanned at the client-specified scan rate.

**Initial Updates from Cache:** When enabled, this option allows the server to provide the first updates for newly activated tag references from stored (cached) data. Cache updates can only be provided when the new item reference shares the same address, scan rate, data type, client access, and scaling properties. A device read is used for the initial update for the first client reference only. The default is disabled; any time a client activates a tag reference the server attempts to read the initial value from the device.

## Device Properties - Timing

The device Communications Timeouts properties allow the driver's response to error conditions to be tailored to fit the application's needs. In many cases, the environment requires changes to these properties for optimum performance. Factors such as electrically generated noise, modem delays, and poor physical connections can influence how many errors or timeouts a communications driver encounters. Communications Timeouts properties are specific to each configured device.

Property Groups	<input type="checkbox"/> <b>Communication Timeouts</b>	
General	Connect Timeout (s)	3
Scan Mode	Request Timeout (ms)	5000
Ethernet Encapsulation	Retry Attempts	3
<b>Timing</b>	<input type="checkbox"/> <b>Timing</b>	
Auto-Demotion	Inter-Request Delay (ms)	0

## Communications Timeouts

**Connect Timeout:** This property (which is used primarily by Ethernet based drivers) controls the amount of time required to establish a socket connection to a remote device. The device's connection time often takes longer than normal communications requests to that same device. The valid range is 1 to 30 seconds. The default is typically 3 seconds, but can vary depending on the driver's specific nature. If this setting is not supported by the driver, it is disabled.

● **Note:** Due to the nature of UDP connections, the connection timeout setting is not applicable when communicating via UDP.

**Request Timeout:** This property specifies an interval used by all drivers to determine how long the driver waits for a response from the target device to complete. The valid range is 50 to 9,999,999 milliseconds (167.6667 minutes). The default is usually 1000 milliseconds, but can vary depending on the driver. The default timeout for most serial drivers is based on a baud rate of 9600 baud or better. When using a driver at lower baud rates, increase the timeout to compensate for the increased time required to acquire data.

**Retry Attempts:** This property specifies how many times the driver retries a communications request before considering the request to have failed and the device to be in error. The valid range is 1 to 10. The default is typically 3, but can vary depending on the driver's specific nature. The number of retries configured for an application depends largely on the communications environment.

## Timing

**Inter-Request Delay:** This property specifies how long the driver waits before sending the next request to the target device. It overrides the normal polling frequency of tags associated with the device, as well as one-time reads and writes. This delay can be useful when dealing with devices with slow turnaround times and in cases where network load is a concern. Configuring a delay for a device affects communications with all other devices on the channel. It is recommended that users separate any device that requires an inter-request delay to a

separate channel if possible. Other communications properties (such as communication serialization) can extend this delay. The valid range is 0 to 300,000 milliseconds; however, some drivers may limit the maximum value due to a function of their particular design. The default is 0, which indicates no delay between requests with the target device.

● **Note:** Not all drivers support Inter-Request Delay. This setting does not appear if it is not supported by the driver.

## Device Properties - Auto-Demotion

The Auto-Demotion properties can temporarily place a device off-scan in the event that a device is not responding. By placing a non-responsive device offline for a specific time period, the driver can continue to optimize its communications with other devices on the same channel. After the time period has been reached, the driver re-attempts to communicate with the non-responsive device. If the device is responsive, the device is placed on-scan; otherwise, it restarts its off-scan time period.

Property Groups	<input type="checkbox"/> <b>Auto-Demotion</b>	
General	Demote on Failure	Enable <input type="button" value="v"/>
Scan Mode	Timeouts to Demote	3
Timing	Demotion Period (ms)	10000
<b>Auto-Demotion</b>	Discard Requests when Demoted	Disable

**Demote on Failure:** When enabled, the device is automatically taken off-scan until it is responding again.

● **Tip:** Determine when a device is off-scan by monitoring its demoted state using the `_AutoDemoted` system tag.

**Timeouts to Demote:** Specify how many successive cycles of request timeouts and retries occur before the device is placed off-scan. The valid range is 1 to 30 successive failures. The default is 3.

**Demotion Period:** Indicate how long the device should be placed off-scan when the timeouts value is reached. During this period, no read requests are sent to the device and all data associated with the read requests are set to bad quality. When this period expires, the driver places the device on-scan and allows for another attempt at communications. The valid range is 100 to 3600000 milliseconds. The default is 10000 milliseconds.

**Discard Requests when Demoted:** Select whether or not write requests should be attempted during the off-scan period. Disable to always send write requests regardless of the demotion period. Enable to discard writes; the server automatically fails any write request received from a client and does not post a message to the Event Log.

## Device Properties - Tag Generation

The automatic tag database generation features make setting up the an application a plug-and-play operation. Select communications drivers can be configured to automatically build a list of tags that correspond to device-specific data. These automatically generated tags (which depend on the nature of the supporting driver) can be browsed from the clients.

If the target device supports its own local tag database, the driver reads the device's tag information and uses the data to generate tags within the server. If the device does not natively support named tags, the driver creates a list of tags based on driver-specific information. An example of these two conditions is as follows:

1. If a data acquisition system supports its own local tag database, the communications driver uses the tag names found in the device to build the server's tags.
2. If an Ethernet I/O system supports detection of its own available I/O module types, the communications driver automatically generates tags in the server that are based on the types of I/O modules plugged into the Ethernet I/O rack.

● **Note:** Automatic tag database generation's mode of operation is completely configurable. For more information, refer to the property descriptions below.

Property Groups	<input checked="" type="checkbox"/> <b>Tag Generation</b>	
General	On Device Startup	Do Not Generate on Startup
Scan Mode	On Duplicate Tag	Delete on Create
Timing	Parent Group	
Auto-Demotion	Allow Automatically Generated Subgroups	Enable
<b>Tag Generation</b>		

### On Device Startup

This property specifies when OPC tags are automatically generated. Descriptions of the options are as follows:

- **Do Not Generate on Startup:** This option prevents the driver from adding any OPC tags to the tag space of the server. This is the default setting.
- **Always Generate on Startup:** This option causes the driver to evaluate the device for tag information. It also adds tags to the tag space of the server every time the server is launched.
- **Generate on First Startup:** This option causes the driver to evaluate the target device for tag information the first time the project is run. It also adds any OPC tags to the server tag space as needed.

● **Note:** When the option to automatically generate OPC tags is selected, any tags that are added to the server's tag space must be saved with the project. Users can configure the project to automatically save from the **Tools | Options** menu.

### On Duplicate Tag

When automatic tag database generation is enabled, the server needs to know what to do with the tags that it may have previously added or with tags that have been added or modified after the communications driver since their original creation. This setting controls how the server handles OPC tags that were automatically generated and currently exist in the project. It also prevents automatically generated tags from accumulating in the server.

For example, if a user changes the I/O modules in the rack with the server configured to **Always Generate on Startup**, new tags would be added to the server every time the communications driver detected a new I/O module. If the old tags were not removed, many unused tags could accumulate in the server's tag space. The options are:

- **Delete on Create:** This option deletes any tags that were previously added to the tag space before any new tags are added. This is the default setting.
- **Overwrite as Necessary:** This option instructs the server to only remove the tags that the communications driver is replacing with new tags. Any tags that are not being overwritten remain in the server's tag space.
- **Do not Overwrite:** This option prevents the server from removing any tags that were previously generated or already existed in the server. The communications driver can only add tags that are completely new.
- **Do not Overwrite, Log Error:** This option has the same effect as the prior option, and also posts an error message to the server's Event Log when a tag overwrite would have occurred.

● **Note:** Removing OPC tags affects tags that have been automatically generated by the communications driver as well as any tags that have been added using names that match generated tags. Users should avoid adding tags to the server using names that may match tags that are automatically generated by the driver.

**Parent Group:** This property keeps automatically generated tags from mixing with tags that have been entered manually by specifying a group to be used for automatically generated tags. The name of the group can be up to 256 characters. This parent group provides a root branch to which all automatically generated tags are added.

**Allow Automatically Generated Subgroups:** This property controls whether the server automatically creates subgroups for the automatically generated tags. This is the default setting. If disabled, the server generates the device's tags in a flat list without any grouping. In the server project, the resulting tags are named with the address value. For example, the tag names are not retained during the generation process.

● **Note:** If, as the server is generating tags, a tag is assigned the same name as an existing tag, the system automatically increments to the next highest number so that the tag name is not duplicated. For example, if the generation process creates a tag named "AI22" that already exists, it creates the tag as "AI23" instead.

**Create:** Initiates the creation of automatically generated OPC tags. If the device's configuration has been modified, **Create tags** forces the driver to reevaluate the device for possible tag changes. Its ability to be accessed from the System tags allows a client application to initiate tag database creation.

● **Note:** **Create tags** is disabled if the Configuration edits a project offline.

## Device Properties - Communications Parameters

**Port Number:** This parameter specifies the port number that the remote CP is configured to use. The default setting for IE TCP/IP is 102 (TSAP). The default setting for NetLink is 1099.

● **Note:** It is recommended that the default port be used for most applications, where the server and the PLC exist on the same network. For an application 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 only accepts a connection on port 102/1099 and may require router forwarding.

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

## Device Properties - S7 200

S7-200 enable communication with S7-200 devices on an Ethernet network. There are two options:

- PG connection (such as, a connection utilized by Micro/WIN). One connection is available.
- Configured connection (such as, a connection configured in Micro/WIN via the Ethernet wizard). Eight 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 is 1000 hex or 4096 decimal. The values entered for Local TSAP must be in hexadecimal notation; in this example, the value 1000 would be entered.

● **Tip:** Local TSAP==Micro/WIN remote TSAP, Remote TSAP==Micro/WIN local TSAP.

● For information on using the CP243-1 module, refer to [How to Configure S7-200 Connections in Micro/WIN](#).

## Device Properties - S7-300/400/1200/1500

**Link Type:** Defines the communication connection between the driver and the CP. 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 server (identical device properties). The devices can be defined within the same channel or under separate channels. For more information, refer to [Optimizing 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

**Example:**

Given an S7-400 CPU 412 device, 14 simultaneous requests can be achieved by defining 14 identical devices in the 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.

☀ 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.

🔗 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 Rack:** The number of the rack in which the CPU of interest resides.

**CPU Slot:** The number of the slot in the rack in which the CPU of interest resides.

🔗 For information on how to read or write the rack number or slot number using an internal tag, refer to [Internal Tags](#).

### Device Properties - Addressing Options

**Byte Order:** establishes the order for 16-bit and 32-bit values. Options include Big Endian (S7 Default) or Little Endian, explained below.

**Big Endian**

DWord 1																															
-	-	-	-	-	-	-	-	1-	1-	1-	1-	1-	1-	-	-	2-	2-	2-	2-	1-	1-	1-	1-	3-	3-	2-	2-	2-	2-	2-	2-
7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8	3	2	1	0	9	8	7	6	1	0	9	8	7	6	5	4
Word 1															Word 3																
-	-	-	-	-	-	-	-	1-	1-	1-	1-	1-	1-	-	-	7	6	5	4	3	2	1	0	1-	1-	1-	1-	1-	1-	9	8
7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8
Byte 1								Byte 2								Byte 3								Byte 4							
-	-	-	-	-	-	-	-	7	6	5	4	3	2	-	-	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	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

**Bits**

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

🔗 **Note:** Big Endian uses bytes ordered from highest to lowest. The bit order is never changed.

**Little Endian**

DWord 1																															
3-	3-	2-	2-	2-	2-	2-	2-	2-	2-	2-	2-	1-	1-	1-	1-	1-	1-	1-	1-	1-	-	-	-	-	-	-	-	-	-	-	-
1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
Word 3															Word 1																
1-	1-	1-	1-	1-	1-	9	8	7	6	5	4	3	2	1	0	1-	1-	1-	1-	1-	1-	-	-	-	-	-	-	-	-	-	-
5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
Byte 4								Byte 3								Byte 2								Byte 1							



DWord 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	0				

**Bits**

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

● **Note:** Little Endian uses bytes ordered from lowest to highest. The bit order is never changed.

## Device Properties - Tag Import

The Tag Import parameters allow automatic tag database generation from a Siemens STEP 7 project for Siemens S7-300 and S7-400 devices.

**STEP 7 Project (\*.S7P):** Locate and select the desired STEP 7 project file (\*.S7P) from which to import tags.

**Program Path:** Specify the PLC program within the project for which tags should be generated.

● **Note:** Tag import for the Siemens S7-300 and S7-400 devices have been qualified for use with projects created from Siemens Simatic STEP 7 versions 5.3, 5.4, and 5.5.

**Important:**

Tag import for the Siemens TCP/IP Ethernet Driver supports tag names and comments in the native character set as specified by the Windows code page in the Siemens STEP 7 project's language file. A missing, altered, corrupt, or incorrect Siemens STEP 7 language file may cause tag names and comments to import incorrectly. Utilizing the STEP 7 language-neutral option (which allows text to be entered in a different character set than what is used in the STEP 7 language file) may also cause tag names and comments to import incorrectly. The STEP 7 language file can be located in the Global sub-directory of the STEP 7 project root. Automatic tag generation may result in the display of incorrect characters if the necessary language packs are not installed on the system.

● **See Also:** [Appendix: Configuring Siemens Connections](#)

## Device Properties - Redundancy

Property Groups	<input checked="" type="checkbox"/> <b>Redundancy</b>	
General	Secondary Path	...
Scan Mode	Operating Mode	Switch On Failure
Timing	Monitor Item	
<b>Redundancy</b>	Monitor Interval (s)	300
	Return to Primary ASAP	Yes

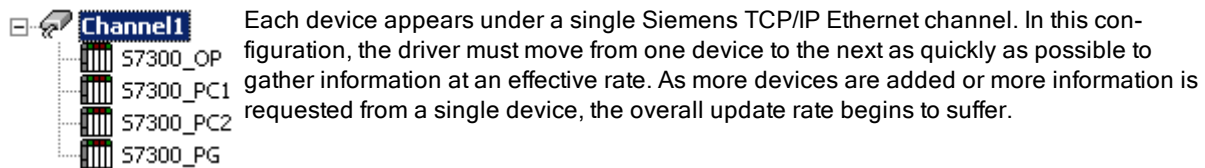
Redundancy is available with the Media-Level Redundancy Plug-in.

● *Consult the website, a sales representative, or the user manual for more information.*

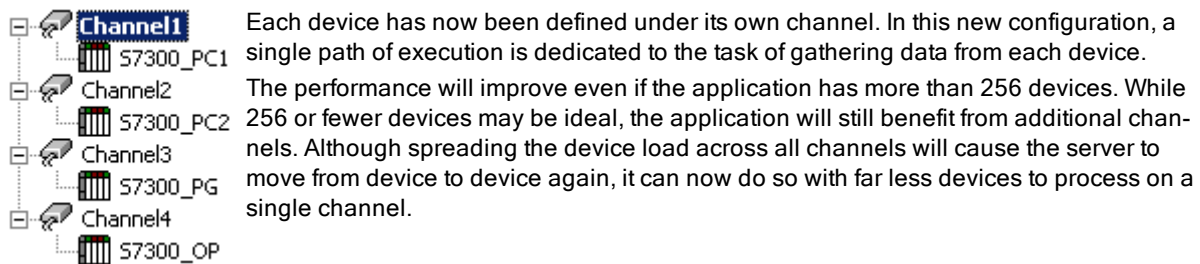
## Optimizing Communications

The Siemens TCP/IP Ethernet Driver was 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 to optimize the application and gain maximum performance.

This 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 can then be defined under that channel. Each of these devices represents a single Siemens TCP/IP Ethernet controller from which data will be collected. Although this approach to defining the application provides a high level of performance, it does not 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.



If the Siemens TCP/IP Ethernet Driver could only define one channel, then the example above would be the only option available; however, the driver can define up to 256 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 is shown below.



Although the server limits the number of channels to 256, the device ultimately determines the number of allowed connections. This constraint comes from the fact that some devices cannot support 256 connections. For these devices, the maximum number of channels defined should equal the maximum number of connections allowed. For devices that support more than 256 connections, the maximum 256 channels should be defined, with devices spread evenly over these 256 channels. For more information on device connections, refer to [Device Properties](#).

## 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.
Date	64-bit floating-point value
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 information for the model of interest.

[S7-200 Address Descriptions](#)

[S7-300 Address Descriptions](#)

[S7-400 Address Descriptions](#)

[S7-1200 Address Descriptions](#)

[S7-1500 Address Descriptions](#)

[NetLink: S7-300 Address Descriptions](#)

[NetLink: S7-400 Address Descriptions](#)

[Internal Tags](#)

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

Address Type	Range	Type	Access
	AQW65534		
Analog Outputs (SIMATIC)	AA0-AA65534*** AAW0- AAW65534	Word, Short	Read/Write
● <b>Note:</b> AQ and AA access the same memory area.			
Internal Memory	M0.b-M65535.b .b is Bit Number 0-7  MB0-MB65535 MW0-MW65534 MD0-MD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write
Special Memory (Bytes 0-29 are Read Only)	SM0.b- SM65535.b .b is Bit Number 0-7  SMB0-SMB65535 SMW0- SMW65534 SMD0- SMD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write
Sequence Control Relay (SCR)	S0.b-S65535.b .b is Bit Number 0-7  SB0-SB65535 SW0-SW65534 SD0-SD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write
Variable Memory	V0.b-V65535.b .b is Bit Number 0-7  VB0-VB65535 VW0-VW65535 VD0-VD65535	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write 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
● <b>Note:</b> 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 (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, and so forth).

● **Notes:**

1. All offsets for memory types I, Q, M, S, and SM represent a byte starting location within the specified memory type.
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. For example, 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. The valid syntax for declaring an array is as follows:

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

### Notes:

1. If no rows are specified, a row count of 1 is assumed.
2. 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.
3. 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, and ID12.
4. For all arrays, the total number of bytes being requested cannot exceed the internal block size of 218 bytes.

● **Note:** The offset for an atomic type tag in a data block is denoted by the column "Address" in Step 7, as shown above. This offset is denoted by the column "Offset" in the Siemens TIA Portal programming environment.

## S7-300 Address Descriptions

---

### Standard Support

[S7-300/400/1200/1500 Item Syntax](#)

[Internal Tags](#)

### Third-Party Support

For users familiar with third-party applications, limited addressing support is available.

### Legacy Support

[Legacy S7-300/400 Item Syntax](#)

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

## S7-400 Address Descriptions

---

### Standard Support

[S7-300/400/1200/1500 Item Syntax](#)

[Internal Tags](#)

### Third-Party Support

For users familiar with third-party applications, limited addressing support is available.

### Legacy Support

[Legacy S7-300/400 Item Syntax](#)

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

## S7-1200 Address Descriptions

---

### Standard Support

## [S7-300/400/1200/1500 Item Syntax](#)

### [Internal Tags](#)

#### [Third-Party Support](#)

For users familiar with third-party applications, limited addressing support is available.

#### **Legacy Support**

### [Legacy S7-300/400 Item Syntax](#)

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

---

## **S7-1500 Address Descriptions**

#### **Standard Support**

### [S7-300/400/1200/1500 Item Syntax](#)

### [Internal Tags](#)

#### [Third-Party Support](#)

For users familiar with third-party applications, limited addressing support is available.

#### **Legacy Support**

### [Legacy S7-300/400 Item Syntax](#)

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

---

## **NetLink: S7-300 Address Descriptions**

#### **Standard Support**

### [S7-300/400/1200/1500 Item Syntax](#)

#### [Third-Party Support](#)

For users familiar with third-party applications, limited addressing support is available.

#### **Legacy Support**

### [Legacy S7-300/400 Item Syntax](#)

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

---

## **NetLink: S7-400 Address Descriptions**

#### **Standard Support**

### [S7-300/400/1200/1500 Item Syntax](#)

#### [Third-Party Support](#)

For users familiar with third-party applications, limited addressing support is available.

#### **Legacy Support**

### [Legacy S7-300/400 Item Syntax](#)

*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 dynamically and statically by using the addresses given below.

● **Note:** The tags listed in the following table are valid for the S7-300, S7-400, S7-1200, and S7-1500 device models. The default data types are shown 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	<b>Byte, Short</b>	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	<b>Byte, Short</b>	Read/Write

## Standard S7-300/400/1200/1500 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, String Support](#).

### Memory Types

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



S7 Data Type	Description	Address Range	Data Type
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*
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
DATE	S7 Date  Stored as WORD in steps of 1 day since January 1, 1990.  Displayed as string format "yyyy-mm-dd" with range "1990-01-01" to "2168-12-31".  Read/Write	DATE0- DATE65534	String
DI DINT	Signed Double Word	DI0-DI65532 DINT0- DINT65532  DI0.b-DI65532.b DINT0.b- DINT65532.b .b is Bit Number	DWord, Long, LBCD, Float  Boolean

S7 Data Type	Description	Address Range	Data Type
		0-31	
DT	<p>S7 Date_And_Time</p> <p>Complex data type stored with 8 bytes as follows:</p> <p>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).</p> <p>Displayed as string format "m/d/y h:mm:ss &lt;AM/PM&gt;" with range "1/1/1990 0:00:00 AM" to "12/31/2089 23:59:59 PM".</p> <p>Displayed as date format "yyyy-mm-ddThh:mm:ss.hhh" with range "1990-01-01T00:00:00.000" to "2089-12-31T23:59:59.998".</p> <p>Read Only.</p>	DT0-DT65528	String, Date
I INT	Signed Word	<p>I0-I65534 INT0-INT65534</p> <p>I0.b-I65534.b INT0.b- INT65534.b .b is Bit Number 0-15</p>	<p>Word, Short, BCD</p> <p>Boolean</p>
REAL	IEEE Float	REAL0- REAL65532	Float
String	S7 String	STRING0.n- STRING65532.n .n is string length. 0<n<= 210.	String
T TIME	<p>S7 TIME.</p> <p>Stored as DWORD in steps of milliseconds.</p> <p>Displayed as string format "+/-ddD_hhH_mmM_ssS_hhhMS" with range "-24D_20H_31M_23S_648MS" to "24D_20H_31M_23S_647MS".</p> <p>Read/Write.</p>	T0-T65532 TIME0- TIME65532	String
TOD	<p>S7 Time_Of_Day.</p> <p>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".</p> <p>Read/Write.</p>	TOD0- TOD65532	String
W Word	Unsigned Word	<p>W0-W65534 WORD0- WORD65534</p> <p>W0.b-W65534.b WORD0.b- WORD65534.b .b is Bit Number</p>	<p>Word, Short, BCD</p> <p>Boolean</p>

S7 Data Type	Description	Address Range	Data Type
		0-15	
X	Bit	X0.b-X65534.b .b is Bit Number 0-15	Boolean

\*These are raw strings that differ in structure and usage from the STEP 7 string data type.

⚠ 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. For example, 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
maximum 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.

## Hex Strings

The HEXSTRING subtype is specific to the Siemens TCP/IP Ethernet Driver. The syntax for the HEXSTRING subtype is *HEXSTRINGy.n*, where *y* is the byte offset and *n* is the length. The *n* value must be specified in the range of 1 through 212. String is the only valid data type for a HEXSTRING tag.

The value assigned to a HEXSTRING must be an even number of characters. There is no padding, so the entire string must be specified. For example, tag HexStr defined as DB1,STRING0.10 uses 10 bytes of storage and has a display length of 20. To assign a value, the string must be 20 characters long and contain only valid hexadecimal characters. An example valid hex string for this tag is "56657273696f6E353137".

## Array Support

The [rows][cols] notation is appended to an address to specify an array (such as 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 assign a value to a timer in the controller, 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	Data Blocks
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	IC0.64 ICHAR0.64	MC0.64 MCHAR0.64	DB1,C0.64 DB1,CHAR0.64
	Array	IC0[10] ICHAR0[10]	MC0[10] MCHAR0[10]	DB1,C0[10] DB1,CHAR0[10]
D DWORD	DWord	ID0 IDWORD0	MD0 MDWORD0	DB1,D0 DB1,DWORD0
	Boolean	ID0.31 IDWORD0.31	MD0.31 MDWORD0.31	DB1,D0.31 DB1,DWORD0.31
	Array	ID0[10] IDWORD0[10]	MD0[10] MDWORD0[10]	DB1,D0[10] DB1,DWORD0[10]
DATE	String	IDATE0	MDATE0	DB1,DATE0
DI DINT	Long	IDIO IDINT0	MDIO MDINT0	DB1,DI0 DB1,DINT0
	Boolean	IDIO.31 IDINT0.31	MDIO.31 MDINT0.31	DB1,DI0.31 DB1,DINT0.31
	Array	IDIO[4][3] IDINT0[4][3]	MDIO[4][3] MDINT0[4][3]	DB1,DI0[4][3] DB1,DINT0[4][3]
DT	String	IDT0	MDT0	DB1,DT0
	Date	IDT8	MDT8	DB1,DT8
I INT	Short	IIO	MIO	DB1,I0
		IINT0	MINT0	DB1,INT0

S7 Data Type	Data Type	Input	Flags	Data Blocks
	Boolean	I0.15 IINT0.15	MI0.15 MINT0.15	DB1,I0.15 DB1,INT0.15
	Array	I0[5][2] IINT0[5][2]	MI0[5][2] MINT0[5][2]	DB1,I0[5][2] DB1,INT0[5][2]
REAL	Float	IREAL0	MREAL0	DB1,REAL0
	Array	IREAL0[10]	MREAL0[10]	DB1,REAL0[10]
String	String	ISTRING0.10	MSTRING0.10	DB1,STRING0.10
TOD	String	ITOD0	MTOD0	DB1,TOD0
T TIME	String	IT0 ITIME4	MT0 MTIME4	DB1,T0 DB1,TIME4
W Word	Word	IW0 IWORD0	MW0 MWORD0	DB1,W0 DB1,WORD0
	Boolean	IW0.15 IWORD0.15	MW0.15 MWORD0.15	DB1,W0.15 DB1,WORD0.15
	Array	IW0[10] IWORD0[10]	MW0[10] MWORD0[10]	DB1,W0[10] DB1,WORD0[10]
X	Boolean	IX0.7 IX0[10]	MX0.7 MX0[10]	DB1,X0.7 DB1,X0[10]

● **Note:** The offset for an atomic type tag in a data block is denoted by the column "Address" in Step 7, as shown above. This offset is denoted by the column "Offset" in the Siemens TIA Portal programming environment.

## 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 S7-300/400/1200/1500 Item Syntax](#).

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

Address Type	Range	Type	Access
	QW:KT0-QW:KT65534 QW:KC0-QW:KC65534 QD0-QD65532	DWord, Long Word, Short DWord, Long, LBCD, Float	Read/Write Read/Write Read/Write
Discrete Outputs	A0.b-A65535.b .b is Bit Number 0-7  AB0-AB65535 AW0-AW65534 AW:KT0-AW:KT65534 AW:KC0-AW:KC65534 AD0-AD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long Word, Short DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write Read/Write
● <b>Note:</b> Q and A access the same memory area.			
Peripheral Inputs	PI0.b-PI65535.b .b is Bit Number 0-7  PIB0-PIB65535 PIW0-PIW65534 PIW:KT0-PIW:KT65534 PIW:KC0-PIW:KC65534 PID0-PID65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long Word, Short DWord, Long, LBCD, Float	Read Only  Read Only Read Only Read Only Read Only
Peripheral Inputs	PE0.b-PE65535.b .b is Bit Number 0-7  PEB0-PEB65535** PEW0-PEW65534 PEW:KT0-PEW:KT65534 PEW:KC0-PEW:KC65534 PED0-PED65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long Word, Short DWord, Long, LBCD, Float	Read Only  Read Only Read Only Read Only Read Only
● <b>Note:</b> PI and PE access the same memory area.			
Peripheral Outputs	PQ0.b-PQ65535.b .b is Bit Number 0-7  PQB0-PQB65535 PQW0-PQW65534 PQW:KT0-PQW:KT65534 PQW:KC0-PQW:KC65534 PQD0-PQD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long Word, Short DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write Read/Write
Peripheral Outputs	PA0.b-PA65535.b .b is Bit Number 0-7  PAB0-PAB65535 PAW0-PAW65534 PAW:KT0-PAW:KT65534 PAW:KC0-PAW:KC65534 PAD0-PAD65532	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long Word, Short DWord, Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write Read/Write
● <b>Note:</b> PQ and PA access the same memory area.			
Internal Memory	F0.b-F65535.b .b is Bit Number 0-7  FB0-FB65535 FW0-FW65534 FW:KT0-FW:KT65534	Boolean  Byte, Char, String** Word, Short, BCD DWord, Long	Read/Write  Read/Write Read/Write Read/Write

Address Type	Range	Type	Access
	FW:KC0-FW:KC65534 FD0-FD65532	<b>Word</b> , Short <b>DWord</b> , Long, LBCD, Float	Read/Write Read/Write
Internal Memory	M0.b-M65535.b .b is Bit Number 0-7  MB0-MB65535 MW0-MW65534 MW:KT0-MW:KT65534 MW:KC0-MW:KC65534 MD0-MD65532	<b>Boolean</b>  <b>Byte</b> , Char, String** <b>Word</b> , Short, BCD <b>DWord</b> , <b>Long</b> <b>Word</b> , Short <b>DWord</b> , Long, LBCD, Float	Read/Write  Read/Write Read/Write Read/Write Read/Write
● <b>Note:</b> 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  <i>Alternates</i>  DB1DBX0.b-DBNDBX65534.b 1-N is Block Number .b is Bit Number 0-15  DB1D0.b-DBND65534.b 1-N is Block Number .b is Bit Number 0-15	<b>Boolean</b>   <b>Boolean</b>  <b>Boolean</b>	Read/Write   Read/Write  Read/Write
Data Block Left Byte	DB1-N:KL0-KL65535 1-N is Block Number  <i>Alternates</i>  DB1DBB0-DBNDBB65535 1-N is Block Number  DB1DL0-DBNDL65535 1-N is Block Number	<b>Byte</b> , Char, String**   <b>Byte</b> , Char, String**  <b>Byte</b> , Char, String**	Read/Write   Read/Write  Read/Write
Data Block Right Byte	DB1-N:KR0-KR65534 1-N is Block Number  <i>Alternates</i>  DB1DR0-DBNDR65534 1-N is Block Number	<b>Byte</b> , Char, String**   <b>Byte</b> , Char, String**	Read/Write   Read/Write
Data Block Unsigned Word	DB1-N:KH0-KH65534 1-N is Block Number	<b>Word</b> , Short, BCD	Read/Write
Data Block Signed Word	DB1-N:KF0-KF65534 1-N is Block Number  <i>Alternates</i>  DB1DBW0-DBNDBW65534 1-N is Block Number  DB1DW0-DBNDW65534 1-N is Block Number	Word, <b>Short</b> , BCD   Word, <b>Short</b> , BCD  Word, <b>Short</b> , BCD	Read/Write   Read/Write  Read/Write
Data Block Signed Long	DB1-N:KD0-KD65532 1-N is Block Number	<b>DWord</b> , <b>Long</b> , LBCD, Float	Read/Write

Address Type	Range	Type	Access
	<i>Alternates</i>  DB1DBD0-DB1DBD65532 1-N is Block Number  DB1DD0-DB1DD65532 1-N is Block Number	DWord, Long, LBCD, Float  DWord, Long, LBCD, Float	Read/Write  Read/Write
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 (like 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](#).

#### Notes:

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

### Hex Strings

The HEXSTRING subtype is specific to the Siemens TCP/IP Ethernet Driver. The syntax for the HEXSTRING subtype is *HEXSTRINGy.n*, where *y* is the byte offset and *n* is the length. The *n* value must be specified in the range of 1 through 212. String is the only valid data type for a HEXSTRING tag.

The value assigned to a HEXSTRING must be an even number of characters. There is no padding, so the entire string must be specified. For example, tag HexStr defined as DB1.STRING0.10 uses 10 bytes of storage and has a display length of 20. To assign a value, the string must be 20 characters long and contain only valid hexadecimal characters. An example valid hex string for this tag is "56657273696f6E353137".

### 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
DB1:DBB0=0x8
```

#### Example 2

DB1:KH1=0x9A  
DB1:KL1=0x9  
DB1:KR1=0xA  
DB1:DBB1=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 assign a value to a timer in the controller, 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

- To access bit 3 of internal memory F20, declare an address as follows: F20.3
- To access data block 5 as word memory at byte 30, declare an address as follows: DB5:KH30
- To access data block 2 byte 20 and bit 7, declare an address as follows: DB2:KM20.7
- To access data block 1 as left byte memory at byte 10, declare an address as follows: DB1:KL10
- To access internal memory F20 as a DWORD, declare an address as follows: FD20
- To access Input memory I10 as a Word, declare an address as follows: IW10

● **Note:** The offset for an atomic type tag in a data block is denoted by the column "Address" in Step 7, as shown above. This offset is denoted by the column "Offset" in the Siemens TIA Portal programming environment.

# Event Log Messages

The following information concerns messages posted to the Event Log pane in the main user interface. Consult the server help on filtering and sorting the Event Log detail view. Server help contains many common messages, so should also be searched. Generally, the type of message (informational, warning) and troubleshooting information is provided whenever possible.

---

## Reason = 'Frame contains errors'.

### Error Type:

Warning

### Possible Cause:

1. An unexpected frame was received. The response code may be incorrect.
2. The frame sequence is out of order.

### Possible Solution:

Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.

### See Also:

1. Error Matrix
2. Error Codes

---

## Reason = 'Device returned transport error'. Error code = <error>.

### Error Type:

Warning

### Possible Cause:

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

### Possible Solution:

Follow guidance from the rest of the error message or contact Technical Support.

### Note:

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

### See Also:

1. Error Matrix
2. Error Codes

---

## Reason = 'Device returned protocol error'. Error class = <class>, Error code = <error>.

### Error Type:

Warning

### Possible Cause:

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

**Possible Solution:**

Follow guidance from the rest of the error message or contact Technical Support.

**See Also:**

1. Error Matrix
2. Error Codes

**Reason = 'Device returned data access error'. Error code = <error>.**

---

**Error Type:**

Warning

**Possible Cause:**

A requested address may be out of range or referenced incorrectly.

**Possible Solution:**

1. Verify the range is correct and correctly referenced.
2. Follow guidance from the rest of the error message or contact Technical Support.

**See Also:**

1. Error Matrix
2. Error Codes

**Reason = 'Device is not responding'.**

---

**Error Type:**

Warning

**Possible Cause:**

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

**Possible Solution:**

1. Verify the cabling between the PC and the PLC device.
2. Verify the IP address for the named device matches the actual device.
3. Decrease the tag group scan rate to reduce the load on the PLC CPU.
4. Increase the values for properties: Request Timeout, Scan Cycle Load from Communication, and/or Scan Cycle Monitoring Time.

**See Also:**

Error Matrix

---

**Reason = 'Unknown error occurred'.**

---

**Error Type:**

Warning

**Possible Cause:**

Process could not complete.

**Possible Solution:**

Follow guidance from the rest of the error message or retry the process.

**See Also:**

Error Matrix

---

**Reason = NetLink returned error. Error code = <error>.**

---

**Error Type:**

Warning

**Possible Cause:**

An error was returned from the PLC or NetLink adapter.

**Possible Solution:**

1. If error code is 0x11, an incorrect MPI ID may be set. Determine the MPI ID through which communications are occurring and enter it in the MPI ID device property field.
2. If error code is 0x87, the requested data may be out of range for the device. Verify the device address limits and correct the tag references.

**See Also:**

1. Error Matrix
2. Error Codes

---

**Failed to resolve host. | Host = '<host name>'.**

---

**Error Type:**

Warning

**Possible Cause:**

1. The named device may have been assigned an incorrect IP address.
2. Communication with the host failed. Connection may have been lost, a port conflict occurred, or some communication parameter is not valid.

**Possible Solution:**

1. Verify the IP address given to the named device matches that of the actual device.
2. Verify or correct connections, port number, MPI ID, and other communication parameters.

---

**Auto-generated tag names and descriptions may not appear as expected due to string conversion error.**

---

**Error Type:**

Warning

**Possible Cause:**

The Unicode character conversion failed.

**Possible Solution:**

Verify that the Step 7 language file is present and reflects a character set that can display the Step 7 tag and comment strings.

---

**A required code page is unavailable on this machine. Tag generation may fail or tag names and descriptions may not appear as expected. | Required code page = <page>.**

---

**Error Type:**

Warning

**Possible Cause:**

The computer is not configured with support for the specified Windows code page specified.

**Possible Solution:**

1. Install any language packs necessary for displaying the Windows code page character set.
2. Try again on a computer that supports the Windows code page specified.

---

**Unable to load the Step 7 language file.**

---

**Error Type:**

Warning

**Possible Cause:**

The Step 7 language file is altered or corrupt.

**Possible Solution:**

Verify that the Step 7 project is not corrupt and can be opened in Simatic Step 7.

---

**Memory exception reading the Step 7 language file.**

---

**Error Type:**

Warning

**Possible Cause:**

The operating system has insufficient memory to read the Step 7 language file.

**Possible Solution:**

Ensure that the system resources are adequate for all applications running on the computer.

---

**Step 7 language file failed to open. | OS error = '<error>'.**

---

**Error Type:**

Warning

**Possible Cause:**

The Step 7 language file is altered or corrupt.

**Possible Solution:**

Verify that the Step 7 project is not corrupt and can be opened in Simatic Step 7.

---

**Tag generation failure. | Data block name = '<block name>', data block number = <block number>.**

---

**Error Type:**

Warning

**Possible Cause:**

An unexpected data type or other issue occurred during the parsing of the Step 7 project for the specified data block.

**Possible Solution:**

Compare the tags that were automatically generated with those in the project for the specified data block to determine which tag caused the incomplete generation. Correct issues with the block and retry.

**See Also:**

Error Codes

---

**Created tag in group due to internal block size. | Tag address = '<address>', tag name = '<name>', group name = '<name>'.**

---

**Error Type:**

Warning

**Possible Cause:**

While parsing the data blocks of the Step 7 project for automatic tag generation, an array variable was encountered that exceeds the internal block size. Although all individual array element tags generate as expected, the array tag itself is generated with a dimension that allows it to fit within the block size.

**Possible Solution:**

To use array tags and not the individual array element tags, determine the address where the array tag ends, then manually generate another tag to address the remainder of the array. For example, if data block 1 begins with an array of 64 REAL, there would be 64 array element tags with addresses DB1,REAL0; DB1,REAL4;... DB1, REAL248; DB1,REAL252. Because the size of the array exceeds the internal block size of 218, the array tag would only be created with 54 dimensions (DB1,REAL0[54]). The array tag does not provide the client with the data for the last 10 elements. If the client wants to use array tags and not the individual array element tags, another tag with the address "DB1,REAL216[10]" must be created. During automatic tag generation for arrays of complex types (such as structures, user-defined types, function blocks, or system function blocks); this warning message only occurs for tags of the first element of the complex type array.

---

**Tag not created because arrays are not supported with specified data type. | Tag name = '<name>', group name = '<name>', data type = '<type>'.**

---

**Error Type:**

Warning

**Possible Cause:**

1. A tag address that has been specified dynamically has been assigned an invalid data type.
2. While parsing the data blocks of the Step 7 project for automatic tag generation, an array variable was encountered with a data type for which the driver does not support arrays.

**Possible Solution:**

1. Modify the requested data type in the client application.
2. The client must access the data using the array element tags that were generated. Variables with the Step 7 data types of DATE, DATE\_AND\_TIME, STRING, TIME, and TIME\_OF\_DAY generate tags with

the string data type (for which arrays are not supported). During automatic tag generation for arrays of complex types (such as structures, user-defined types, function blocks, or system function blocks), this warning message only occurs for tags of the first element of the complex type array.

---

## Unable to connect to device. |

### Error Type:

Warning

### Possible Cause:

1. An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.
2. The device's CPU work load is too high.
3. This portion is malformed or contains incorrect packet lengths.

### Possible Solution:

1. Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic or increase the Request Timeout and/or Fail After Attempt count.
3. Decrease the tag group Scan Rate to reduce the load on the PLC CPU.
4. Increase the values for properties: Scan Cycle Load from Communication and Scan Cycle Monitoring Time.

### See Also:

Error Matrix

---

## Unable to establish association with device. |

### Error Type:

Warning

### Possible Cause:

1. An S7 Messaging error occurred. This will occur if this portion is malformed or contains incorrect packet lengths.
2. An RFC1006 error (ISO over TCP/IP) occurred. This is the portion of the packet that encapsulates the S7 Messaging packet.
3. The TPDU response size is incorrect.
4. An unexpected frame was received. The response code may be incorrect.
5. The frame sequence is out of order.
6. The device CPU workload is too high.

### Possible Solution:

1. Cable noise may cause distortion in the frame, resulting in erroneous data. It may also cause dropped frames. Verify the cabling between the PC and the PLC device.
2. Reduce network traffic. If this error occurs frequently, increase the Request Timeout and/or Fail After attempt count.



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

#### ◆ See Also:

Error Matrix

---

### Unable to read from address on device. | Address = '<address>',

#### Error Type:

Warning

#### Possible Cause:

1. A data access error occurred. The requested address may be out of range or referenced incorrectly.
2. An S7 messaging error occurred. A portion is malformed or contains incorrect packet lengths.
3. A TCP/IP error occurred. A portion is malformed or contains incorrect packet lengths.

#### Possible Solution:

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Verify the device's address limits and correct the tag references causing the error.

#### ◆ See Also:

Error Matrix

---

### Unable to read from address on device. Tag deactivated. | Address = '<address>',

#### Error Type:

Warning

#### Possible Cause:

1. A data access error occurred. The requested address may be out of range or referenced incorrectly.
2. An S7 Messaging error occurred. A portion is malformed or contains incorrect packet lengths.
3. A TCP/IP error occurred. A portion is malformed or contains incorrect packet lengths.
4. The device CPU work load is too high.
5. If the tag address references a TOD data type, the DWORD value may be larger than the number of milliseconds in a day. For example, 86400000.
6. If the error code=0x11, an incorrect MPI ID may be set.
7. If the error code=0x87, users may be accessing data out of range in the device.

#### Possible Solution:

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Reduce network traffic or increase the Request Timeout and/or Fail After attempt count.
6. Decrease the tag group scan rate to reduce the workload on the PLC CPU.
7. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.
8. Change the value in the device to a valid DWORD that can be converted to a time that is less than or equal to 23:59:59.999.
9. Determine the MPI ID in use for communications and re-enter it in the MPI ID Device Property field.
10. Verify the device's address limits and correct the tag references causing the error.

#### See Also:

Error Matrix

**Unable to read data from device. | Data block = '<block>', block start = <address>, block size = <size>,**

---

#### Error Type:

Warning

#### Possible Cause:

1. A TCP/IP error occurred. A portion is malformed or contains incorrect packet lengths.
2. The device CPU work load is too high.
3. If the tag address references a TOD data type, the DWORD value may be larger than the number of milliseconds in a day. For example, 86400000.
4. An error was returned from the PLC or NetLink adapter.
5. Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.
6. If the error code=0x11, an incorrect MPI ID may be set.
7. If the error code=0x87, users may be accessing data out of range in the device.

#### Possible Solution:

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Reduce network traffic or increase the Request Timeout and/or Fail After attempt count.
6. Decrease the tag group scan rate to reduce the workload on the PLC CPU.
7. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.

8. Change the value in the device to a valid DWORD that can be converted to a time that is less than or equal to 23:59:59.999.
9. Determine the MPI ID in use for communications and re-enter it in the MPI ID Device Property field.
10. Verify the device's address limits and correct the tag references causing the error.

#### ◆ See Also:

Error Matrix

---

**Unable to read data from device. Block deactivated. | Data block = '<block>', block start = <address>, block size = <size>,'**

---

#### Error Type:

Warning

#### Possible Cause:

1. A TCP/IP error occurred. A portion is malformed or contains incorrect packet lengths.
2. The device CPU work load is too high.
3. If the tag address references a TOD data type, the DWORD value may be larger than the number of milliseconds in a day. For example, 86400000.
4. An error was returned from the PLC or NetLink adapter.
5. Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.
6. If the error code=0x11, an incorrect MPI ID may be set.
7. If the error code=0x87, users may be accessing data out of range in the device.

#### Possible Solution:

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Reduce network traffic or increase the Request Timeout and/or Fail After attempt count.
6. Decrease the tag group scan rate to reduce the workload on the PLC CPU.
7. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.
8. Change the value in the device to a valid DWORD that can be converted to a time that is less than or equal to 23:59:59.999.
9. Determine the MPI ID in use for communications and re-enter it in the MPI ID Device Property field.
10. Verify the device's address limits and correct the tag references causing the error.

#### ◆ See Also:

Error Matrix

---

## Unable to read data from device. | Memory type = '<type>', block start = <address>, block size = <size> (bytes),

---

### Error Type:

Warning

### Possible Cause:

1. An S7 Messaging error occurred. A portion is malformed or contains incorrect packet lengths.
2. The device CPU work load is too high.
3. If the tag address references a TOD data type, the DWORD value may be larger than the number of milliseconds in a day. For example, 86400000.
4. An error was returned from the PLC or NetLink adapter.
5. Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.
6. If the error code=0x11, an incorrect MPI ID may be set.
7. If the error code=0x87, users may be accessing data out of range in the device.

### Possible Solution:

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Reduce network traffic or increase the Request Timeout and/or Fail After attempt count.
6. Decrease the tag group scan rate to reduce the workload on the PLC CPU.
7. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.
8. Change the value in the device to a valid DWORD that can be converted to a time that is less than or equal to 23:59:59.999.
9. Determine the MPI ID in use for communications and re-enter it in the MPI ID Device Property field.
10. Verify the device's address limits and correct the tag references causing the error.

### See Also:

Error Matrix

---

## Unable to read data from device. Block deactivated. | Memory type = '<type>', block start = <address>, block size = <size> (bytes),

---

### Error Type:

Warning

### Possible Cause:

1. An S7 Messaging error occurred. A portion is malformed or contains incorrect packet lengths.
2. The device CPU work load is too high.
3. If the tag address references a TOD data type, the DWORD value may be larger than the number of milliseconds in a day. For example, 86400000.

4. An error was returned from the PLC or NetLink adapter.
5. Cable noise may cause distortion in the frame, resulting in erroneous data or dropped frames. Verify the cabling between the PC and the PLC device.
6. If the error code=0x11, an incorrect MPI ID may be set.
7. If the error code=0x87, users may be accessing data out of range in the device.

**Possible Solution:**

1. Verify and correct the address range.
2. Verify and correct the packet format and length.
3. Verify and correct the communications configuration and connections.
4. Verify and correct the data type, values, and ranges.
5. Reduce network traffic or increase the Request Timeout and/or Fail After attempt count.
6. Decrease the tag group scan rate to reduce the workload on the PLC CPU.
7. Increase the Scan Cycle Load from Communication and Scan Cycle Monitoring Time.
8. Change the value in the device to a valid DWORD that can be converted to a time that is less than or equal to 23:59:59.999.
9. Determine the MPI ID in use for communications and re-enter it in the MPI ID Device Property field.
10. Verify the device's address limits and correct the tag references causing the error.

**See Also:**

Error Matrix

**Unable to write to address on device. | Address = '<address>',****Error Type:**

Warning

**Possible Cause:**

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. The device CPU workload is too high.

**Possible 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. 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.

**See Also:**

Error Matrix

**Unable to write to address on device. HEXSTRING length is different from tag length. | Address = '<address>', HEXSTRING length = <length> (bytes), tag length = <length> (bytes).**

---

**Error Type:**

Warning

**Possible Cause:**

The tag and hexstring length do not match. The syntax for the HEXSTRING subtype is HEXSTRINGy.n, where y is the byte offset and n is the length. The n value must be specified in the range of 1 through 212. String is the only valid data type for a HEXSTRING tag. The value assigned to a HEXSTRING must be an even number of characters. There is no padding, so the entire string must be specified. For example, tag HexStr defined as DB1,STRING0.10 uses 10 bytes of storage and has a display length of 20. To assign a value, the string must be 20 characters long and contain only valid hexadecimal characters.

**Possible Solution:**

Correct the mismatch between the tag and hexstring length.

**Unable to write to address on device. HEXSTRING contains a non-hexadecimal character. | Address = '<address>'.**

---

**Error Type:**

Warning

**Possible Cause:**

The hexstring format is invalid. The syntax for the HEXSTRING subtype is HEXSTRINGy.n, where y is the byte offset and n is the length. The n value must be specified in the range of 1 through 212. String is the only valid data type for a HEXSTRING tag. To assign a value, the string must be 20 characters long and contain only valid hexadecimal characters.

**Possible Solution:**

Correct the format and syntax of the hexstring.

**Unable to write to address on device. HEXSTRING length must be an even number of characters. | Address = '<address>'.**

---

**Error Type:**

Warning

**Possible Cause:**

The hexstring length contains an odd number of characters, which is not valid.

**Possible Solution:**

Correct the hexstring to contain an even number of hexadecimal characters.

**Unable to write to address on device. Time of Day string contains a syntax error. Expected 'hh:mm:ss.hhh' format. | Address = '<address>', Time of Day string = '<string>'.**

---

**Error Type:**

Warning

**Possible Cause:**

The string written is not in the correct hh:mm:ss.hhh format.

**Possible Solution:**

Format the string as hh:mm:ss.hhh and retry.

## 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 unknown 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

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

Error Code	Description
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



# Appendix: Configuring Siemens Connections

[How To Configure S7-200 Connections in Micro/WIN](#)

[How To Configure S7-300/400 Connections in STEP 7](#)

[How To Configure S7-1200 Connections with the Totally Integrated Automation \(TIA\) Portal](#)

[How To Configure S7-1500 Connections](#)

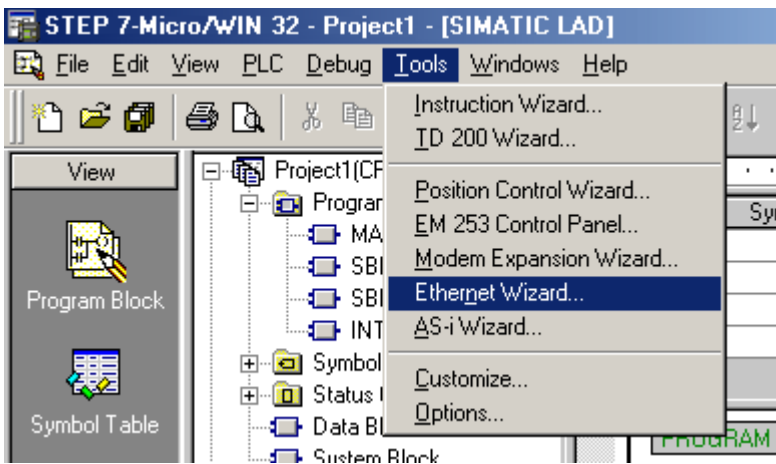
## How To Configure S7-200 Connections in Micro/WIN

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. Follow these instructions closely to use configured connections with the Siemens TCP/IP Ethernet Driver correctly.

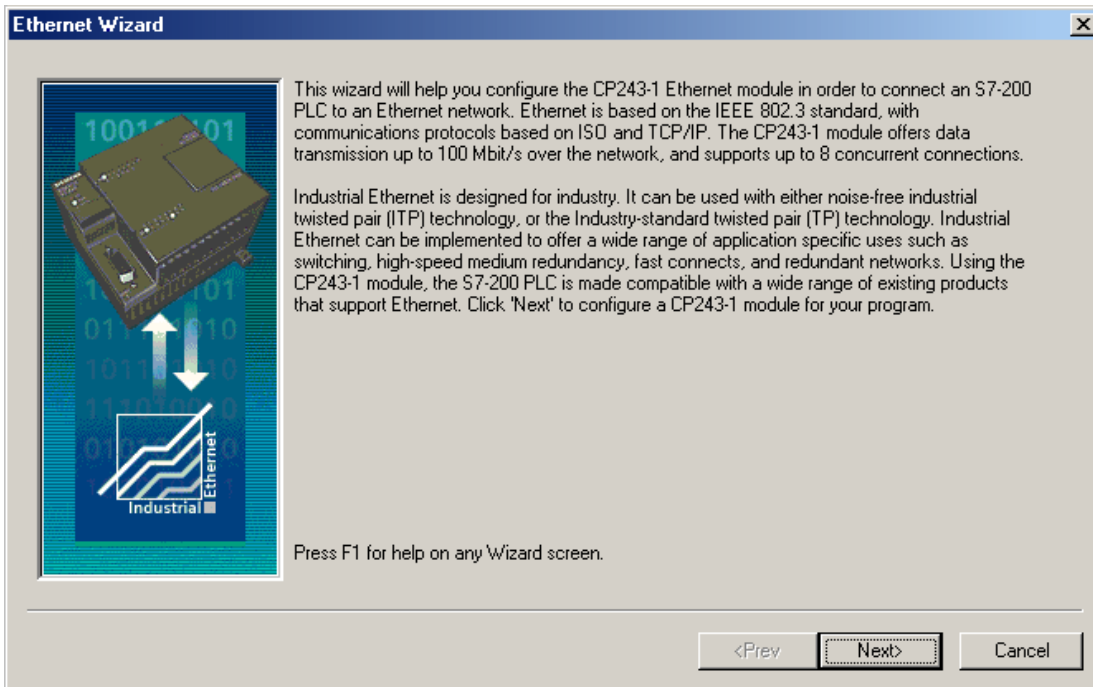
● **Note:** The Micro/WIN software may require an upgrade before the Ethernet wizard is made available.

### Step 1: Launching the Ethernet Wizard

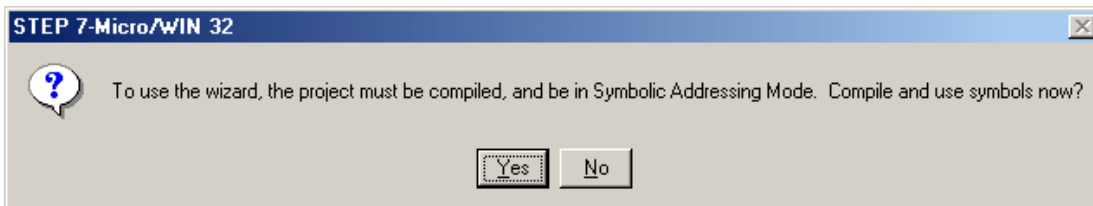
1. In the Micro/WIN main menu, click **Tools | Ethernet Wizard**.



2. Then, click **Next**.



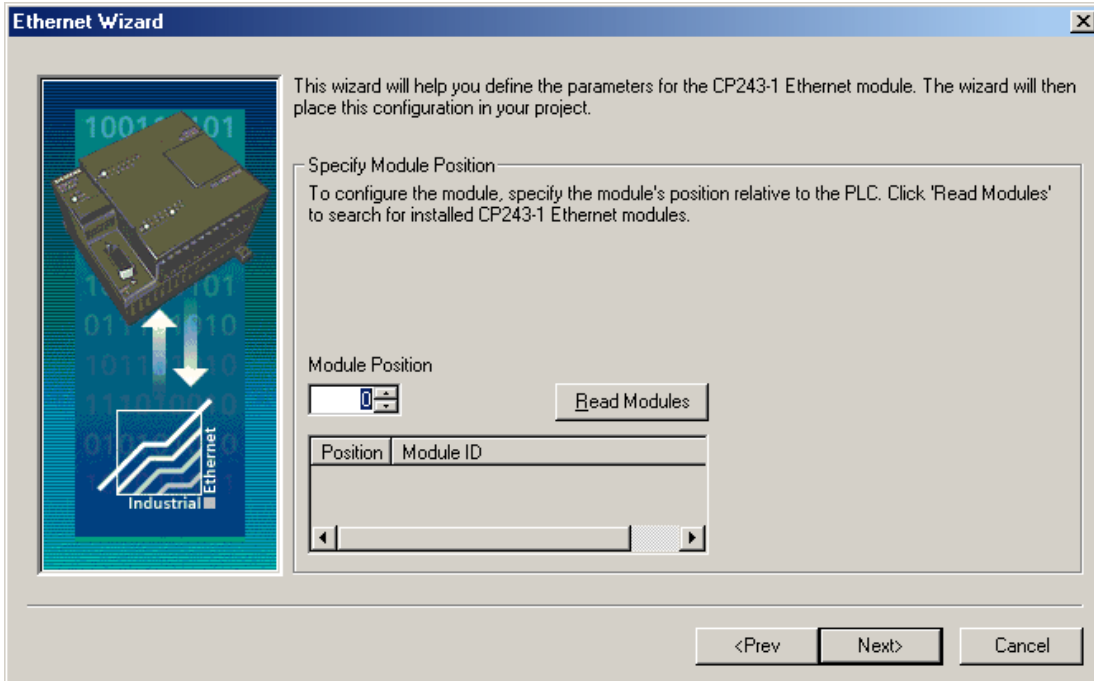
3. Click **Yes** to proceed.



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

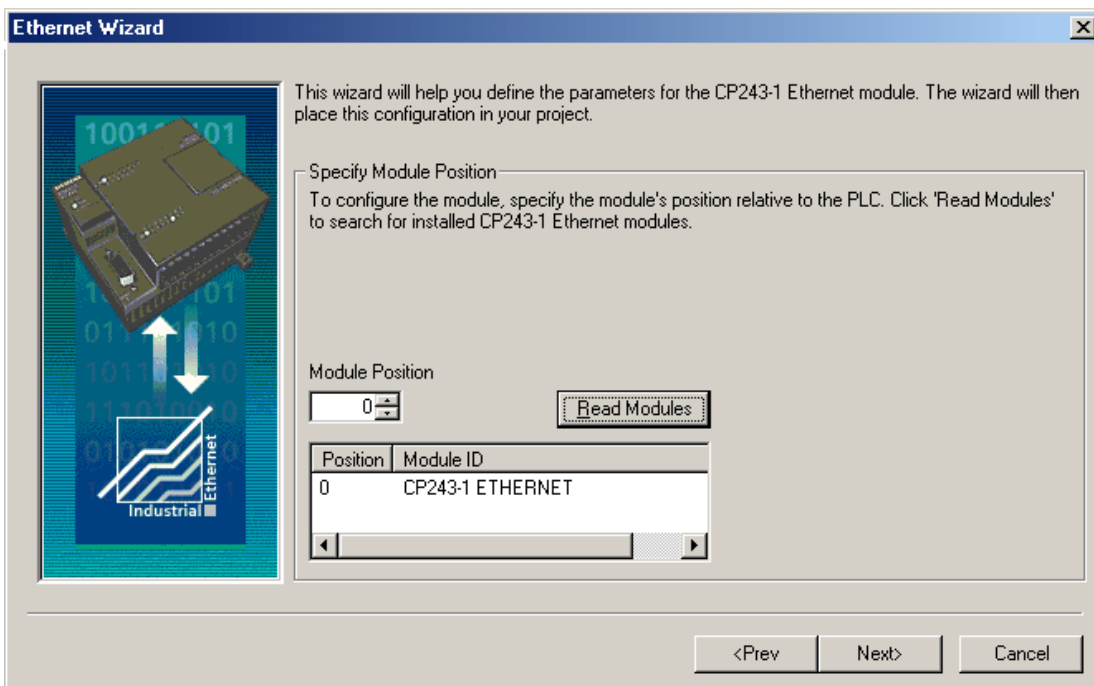
## Step 2: Setting CP243-1 Module Position

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.

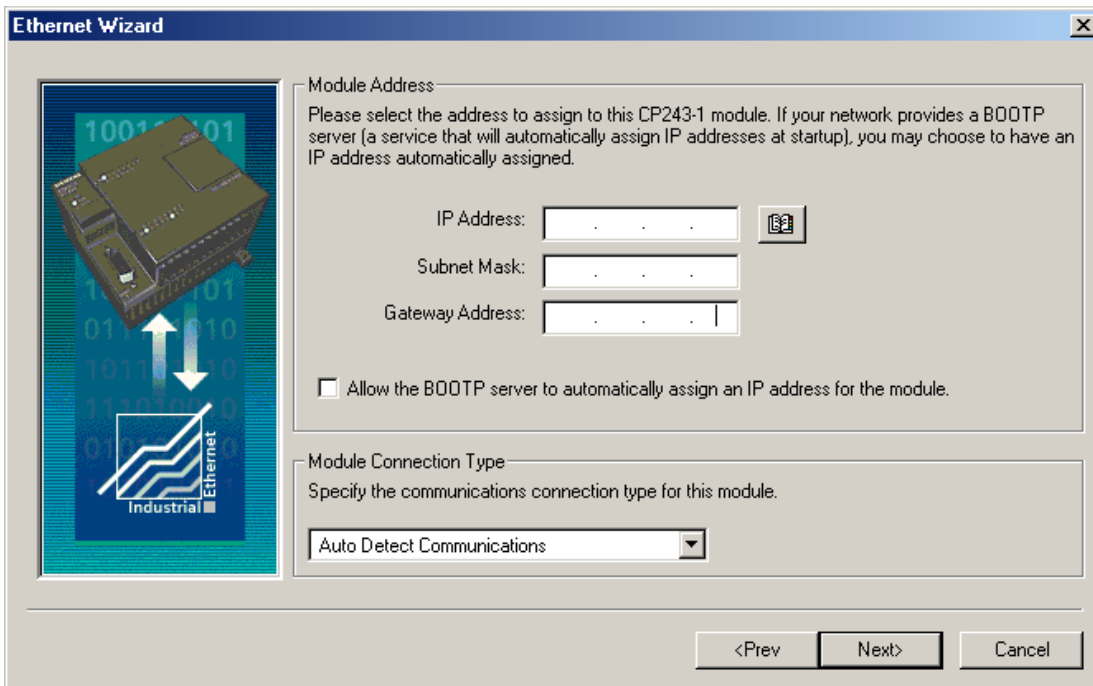
2. To view the results of Read Modules, select the **Ethernet module**. Click **Next**.



### 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** 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.



**Ethernet Wizard**

**Module Address**  
Please select the address to assign to this CP243-1 module. If your network provides a BOOTP server (a service that will automatically assign IP addresses at startup), you may choose to have an IP address automatically assigned.

IP Address: . . . .

Subnet Mask: . . . .

Gateway Address: . . . .

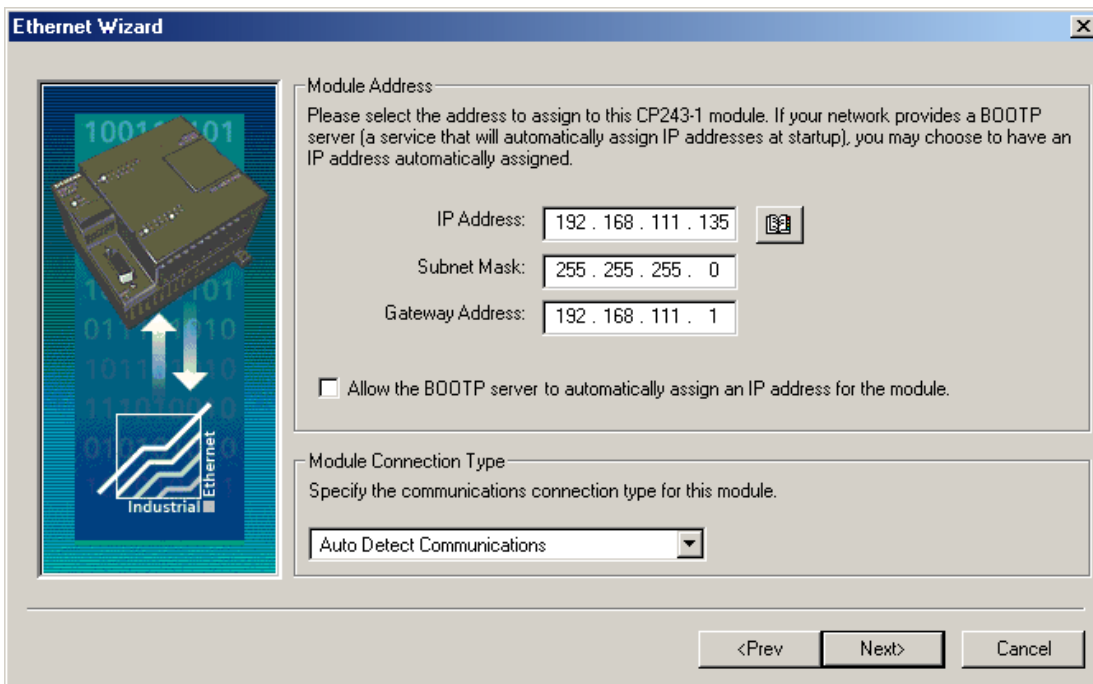
Allow the BOOTP server to automatically assign an IP address for the module.

**Module Connection Type**  
Specify the communications connection type for this module.

Auto Detect Communications

<Prev    Next>    Cancel

3. The image shown below contains demonstration values.



**Ethernet Wizard**

**Module Address**  
Please select the address to assign to this CP243-1 module. If your network provides a BOOTP server (a service that will automatically assign IP addresses at startup), you may choose to have an IP address automatically assigned.

IP Address: 192 . 168 . 111 . 135

Subnet Mask: 255 . 255 . 255 . 0

Gateway Address: 192 . 168 . 111 . 1

Allow the BOOTP server to automatically assign an IP address for the module.

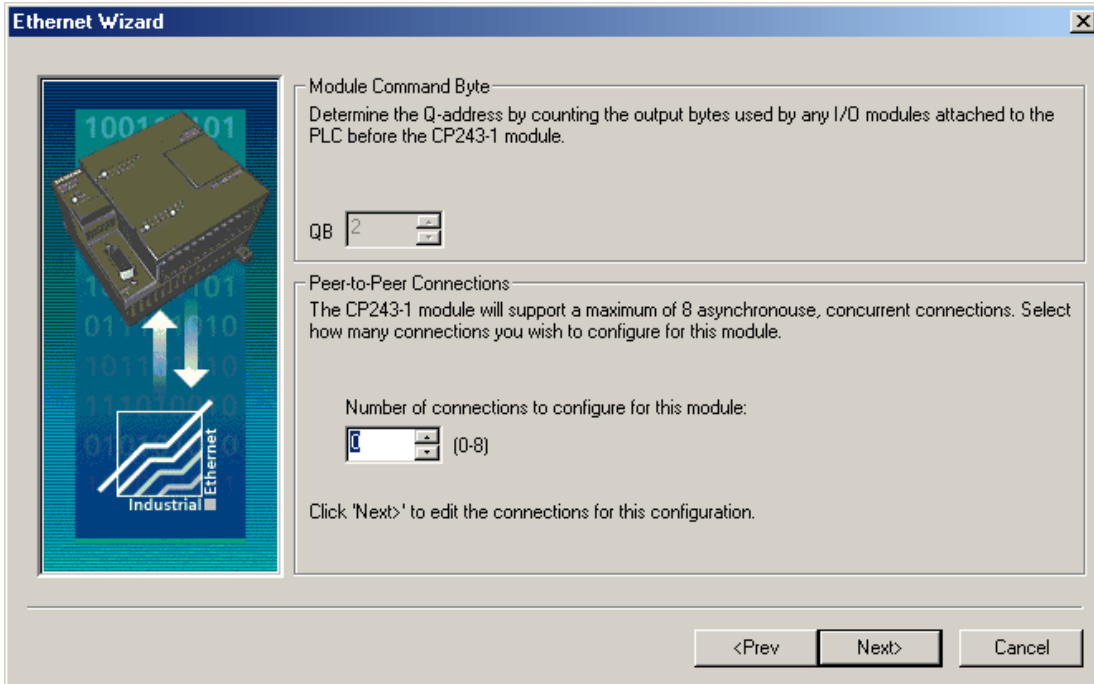
**Module Connection Type**  
Specify the communications connection type for this module.

Auto Detect Communications

<Prev    Next>    Cancel

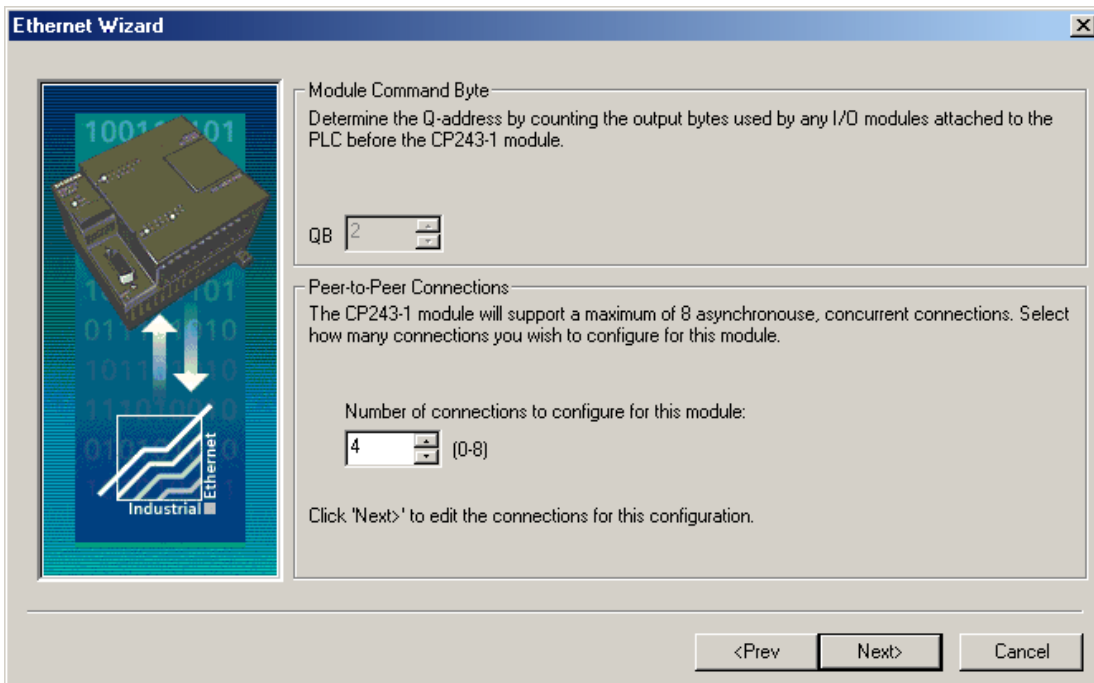
#### Step 4: Number of Configured Connections

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 (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**.

**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 0 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.

This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Client)

TSAP  
10.00

You may define up to 32 data transfers between this connection and the remote server.

Data Transfers...

Remote Properties (Server)

TSAP  
10.00

Specify the IP address of the server for this connection.

0 . 0 . 0 . 0

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

Connection0\_0

< Prev Connection    Next Connection >

OK    Cancel

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**.

**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 0 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.

This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Server)

TSAP  
10.00

This server will connection with an Operator Panel (OP).

Accept all connection requests.

Accept connection requests from the following clients only:

Remote Properties (Client)

TSAP  
10.00

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

< Prev Connection      Next Connection >

OK      Cancel

### Step 5b: Connection 1

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

**Configure Connections** [X]

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 1 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.  
 This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Client)	Remote Properties (Server)
TSAP <input type="text" value="11.00"/>	TSAP <input type="text" value="10.00"/>
You may define up to 32 data transfers between this connection and the remote server. <input type="button" value="Data Transfers..."/>	Specify the IP address of the server for this connection. <input type="text" value="0 . 0 . 0 . 0"/> <input type="button" value="IP"/>

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

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**.



**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 1 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.

This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Server)

TSAP  
11.00

This server will connection with an Operator Panel (OP).

Accept all connection requests.

Accept connection requests from the following clients only:

Remote Properties (Client)

TSAP  
10.00

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

< Prev Connection      Next Connection >

OK      Cancel

### Step 5c: Connection 2

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

**Configure Connections** [X]

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 2 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.  
 This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Client)	Remote Properties (Server)
TSAP <input type="text" value="12.00"/>	TSAP <input type="text" value="10.00"/>
You may define up to 32 data transfers between this connection and the remote server. <input type="button" value="Data Transfers..."/>	Specify the IP address of the server for this connection. <input type="text" value="0 . 0 . 0 . 0"/> <input type="button" value="IP"/>

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

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**.

**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 2 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.

This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Server)

TSAP  
12.00

This server will connection with an Operator Panel (OP).

Accept all connection requests.

Accept connection requests from the following clients only:

Remote Properties (Client)

TSAP  
10.00

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

< Prev Connection      Next Connection >

OK      Cancel

### Step 5d: Connection 3

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

**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 3 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.

This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Client)

TSAP

13.00

You may define up to 32 data transfers between this connection and the remote server.

Data Transfers...

Remote Properties (Server)

TSAP

10.00

Specify the IP address of the server for this connection.

0 . 0 . 0 . 0

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

Connection0\_3

< Prev Connection    Next Connection >

OK    Cancel

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**.

**Configure Connections**

You have requested 4 connection(s). For each connection, specify whether the connection should act as a client or server, and configure its associated properties.

Connection 3 (4 connections requested)

This is a Client Connection: Client connections request data transfers between the local PLC and a remote server.  
 This is a Server Connection: Servers respond to connection requests from remote clients.

Local Properties (Server)

TSAP  
13.00

This server will connection with an Operator Panel (OP).  
 Accept all connection requests.

Accept connection requests from the following clients only:

Remote Properties (Client)

TSAP  
10.00

Enable the Keep Alive function for this connection.

Please specify a symbolic name for this client connection. Your program can reference this connection symbolically when initiating data transfers with the remote server.

< Prev Connection    Next Connection >

OK    Cancel

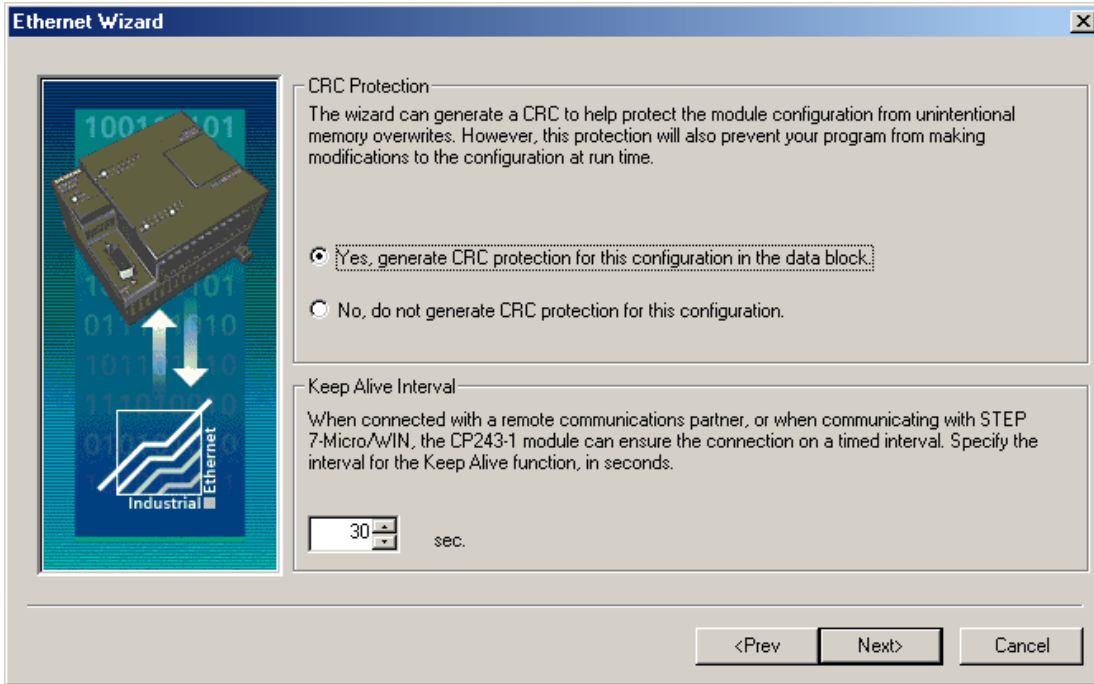
That completes the configuration of the four connections that were selected.

● **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

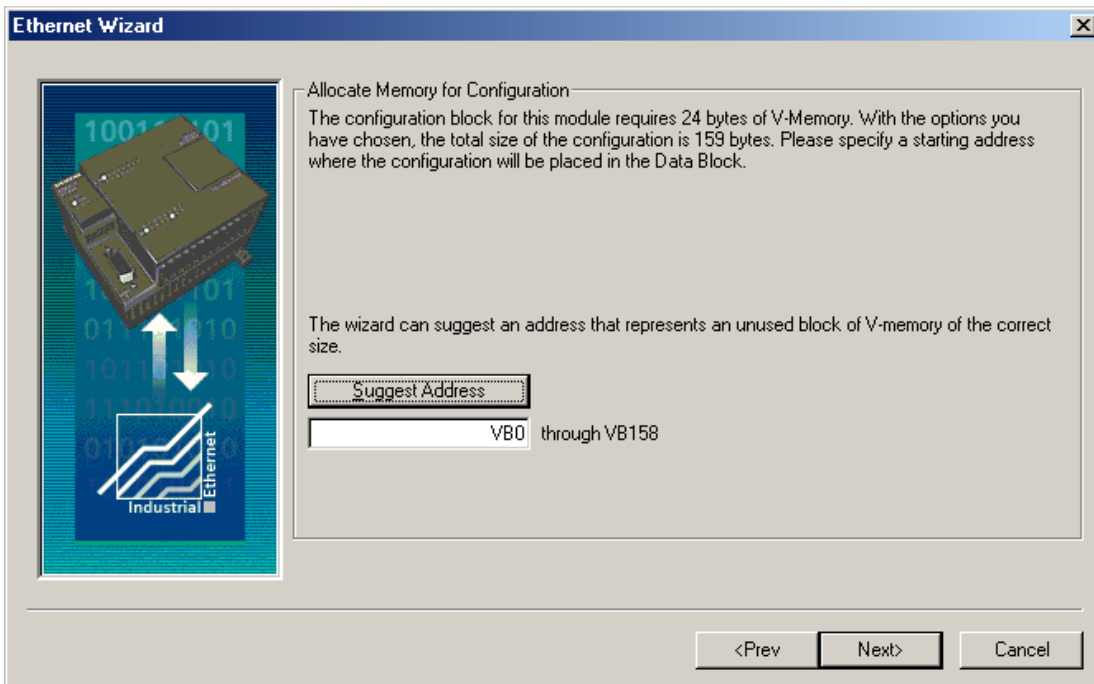
**Optional:** Enable CRC protection to monitor for accidental configuration corruption.

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.

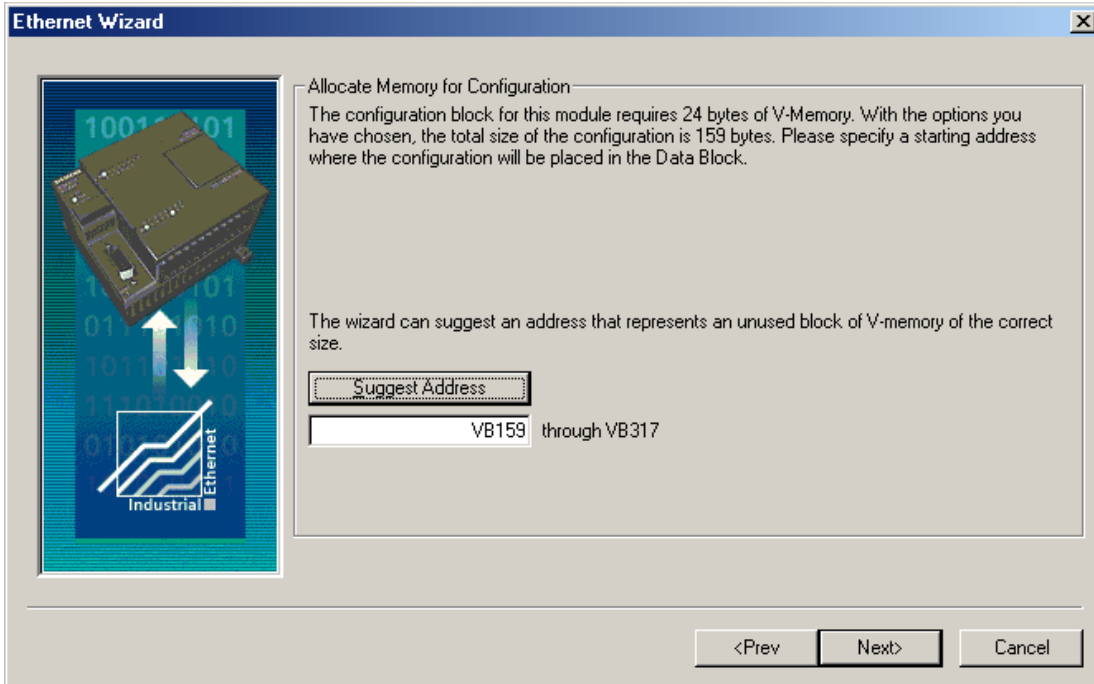


### Step 7: Memory for Configuration

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



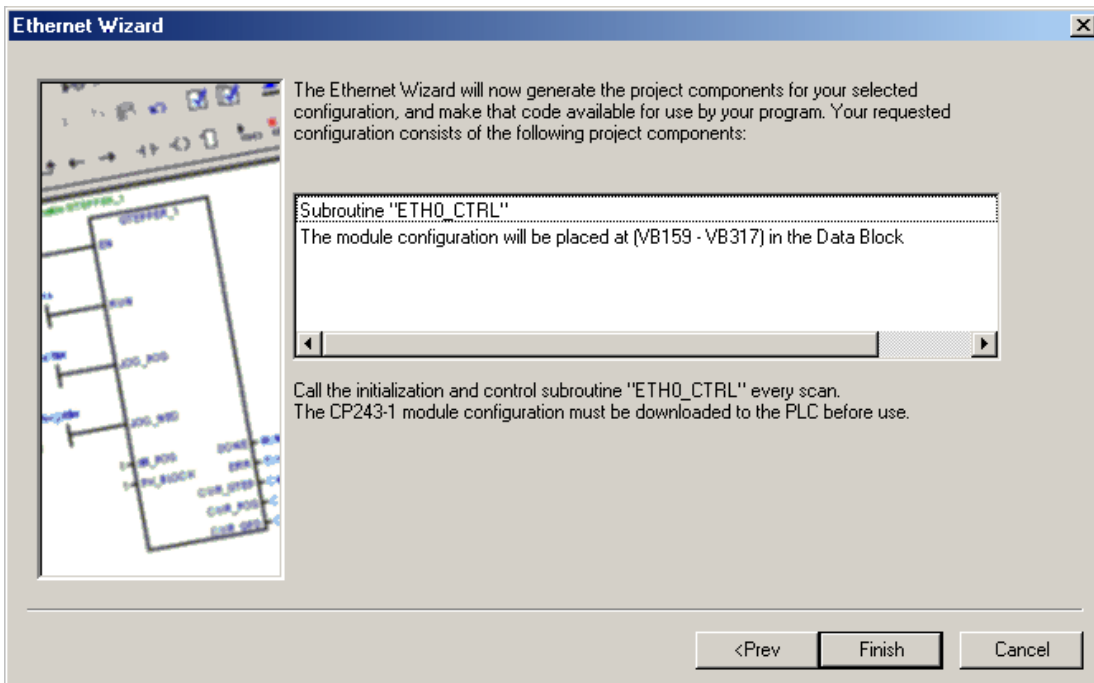
2. The image shown below displays the results.



● **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.

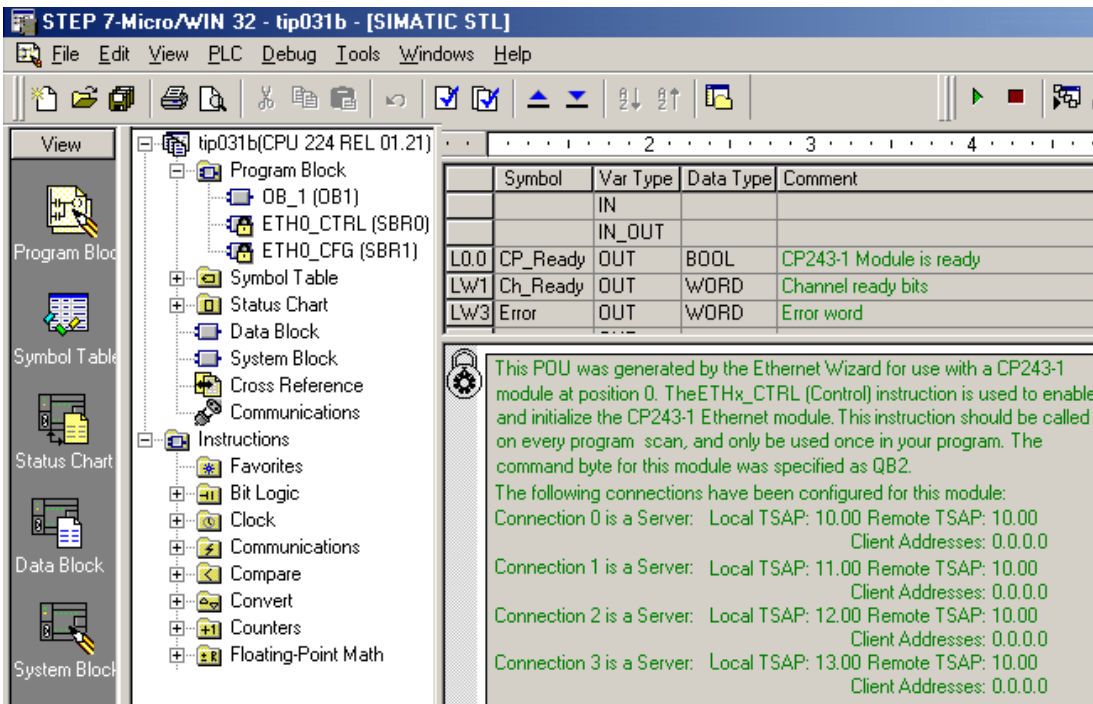
## Step 8: Ethernet Wizard Summary

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

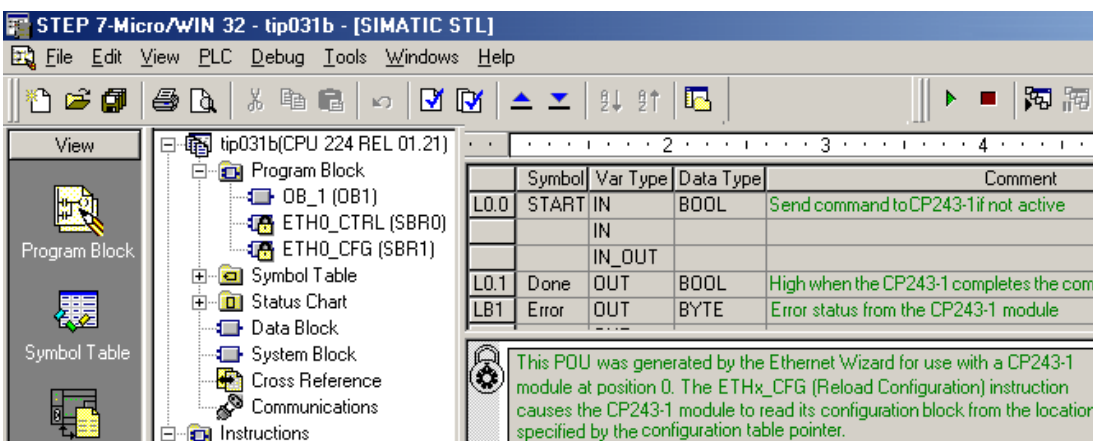


2. To review what the Ethernet wizard produced, double-click **ETH0\_CTRL** under the **Program Block**. All **TSAPs** configured are listed for future reference. Remember, the **Local TSAP** below is the **Remote TSAP** in the OPC server and the remote TSAP below is the Local TSAP in the OPC server.

3. The image below shows **ETH0\_CTRL**.



4. The image below shows **ETH0\_CFG**.



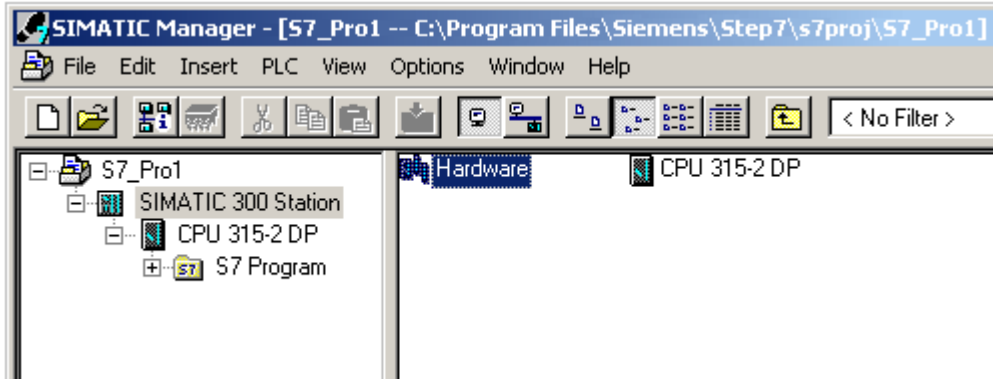
5. Now that the results of the Ethernet wizard have been confirmed, a connection can be made using the OPC server.

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

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**.

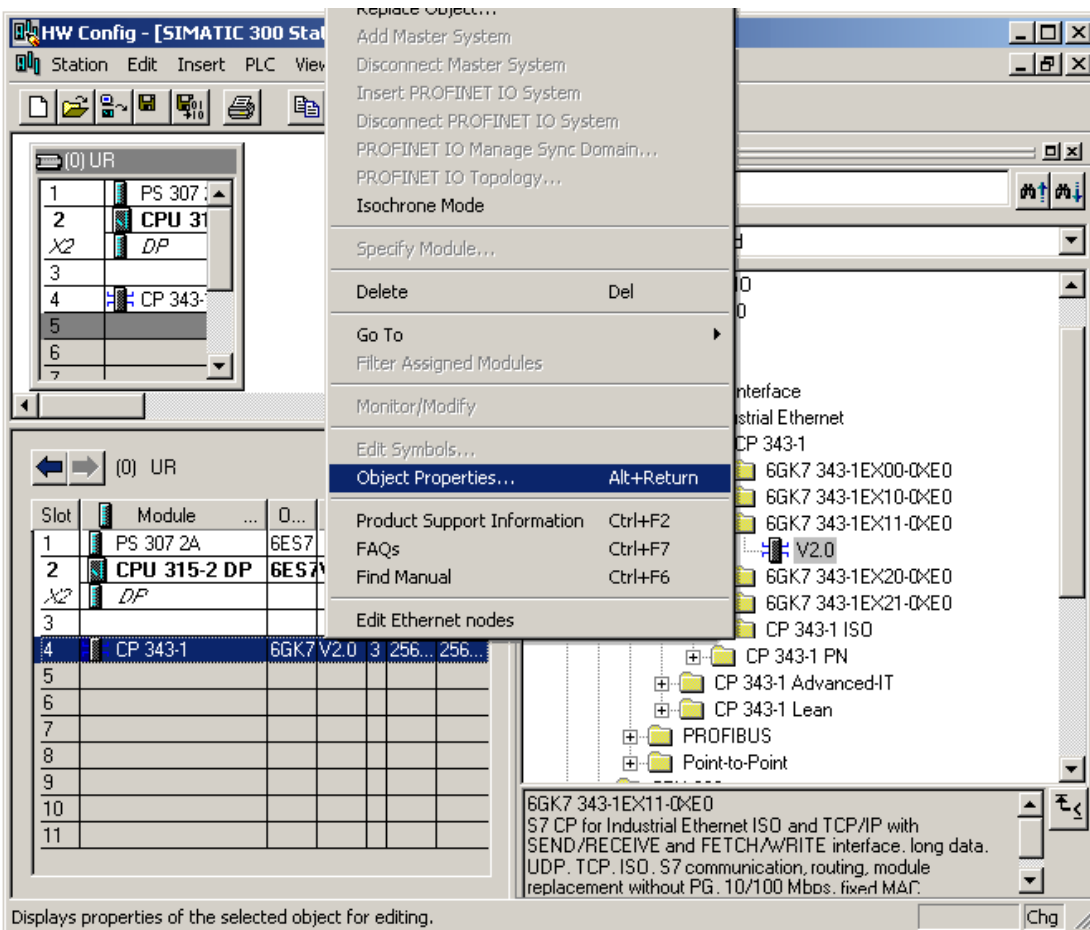




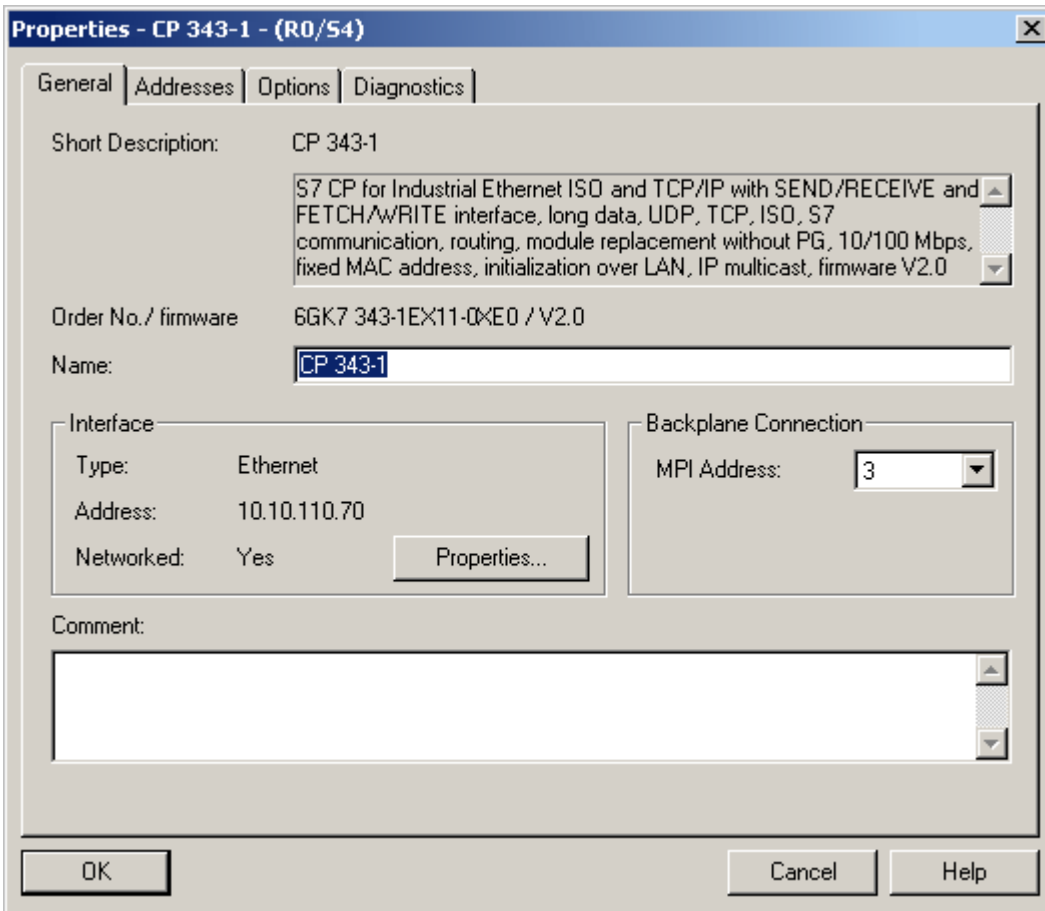
2. If this is a new Simatic project, add the necessary modules to the **Rack** in HW Config. For the Siemens TCP/IP Ethernet Driver to communicate with the CPU, there will need to be at least one Ethernet module capable of **S7 Communications**. This may be built into the CPU.

### Configuring an Ethernet Module

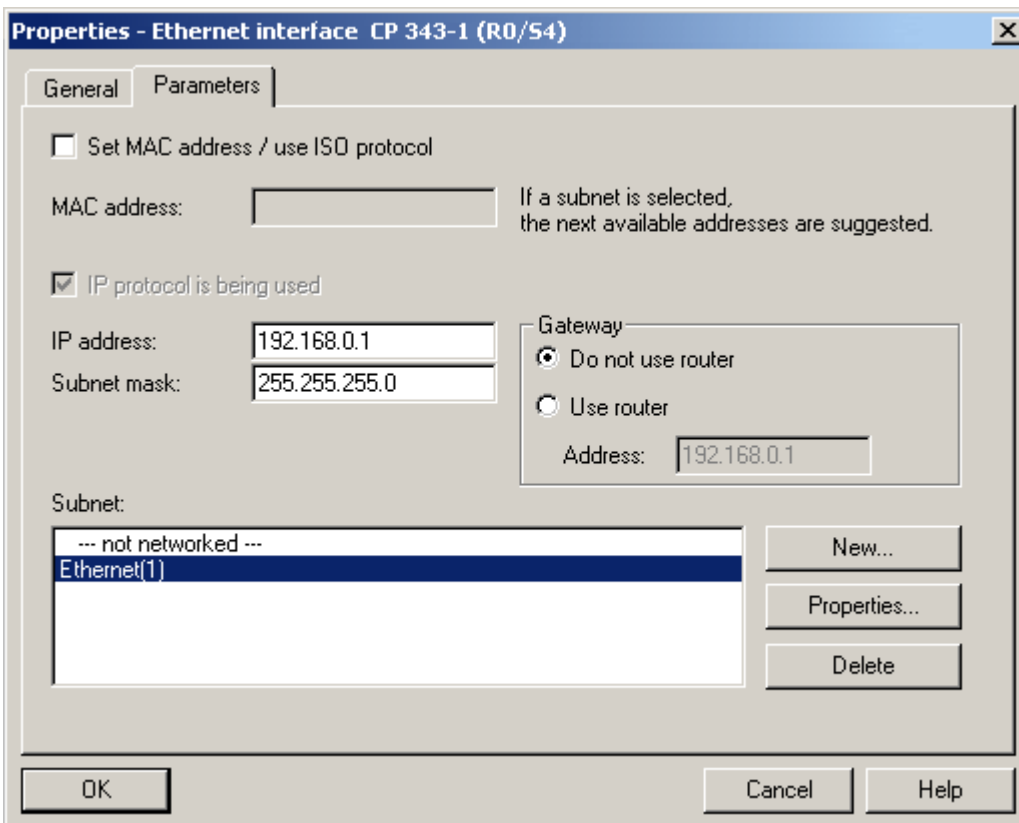
1. Right-click on the particular module in the rack and then select **Object Properties**.



2. The dialog should appear as shown below.



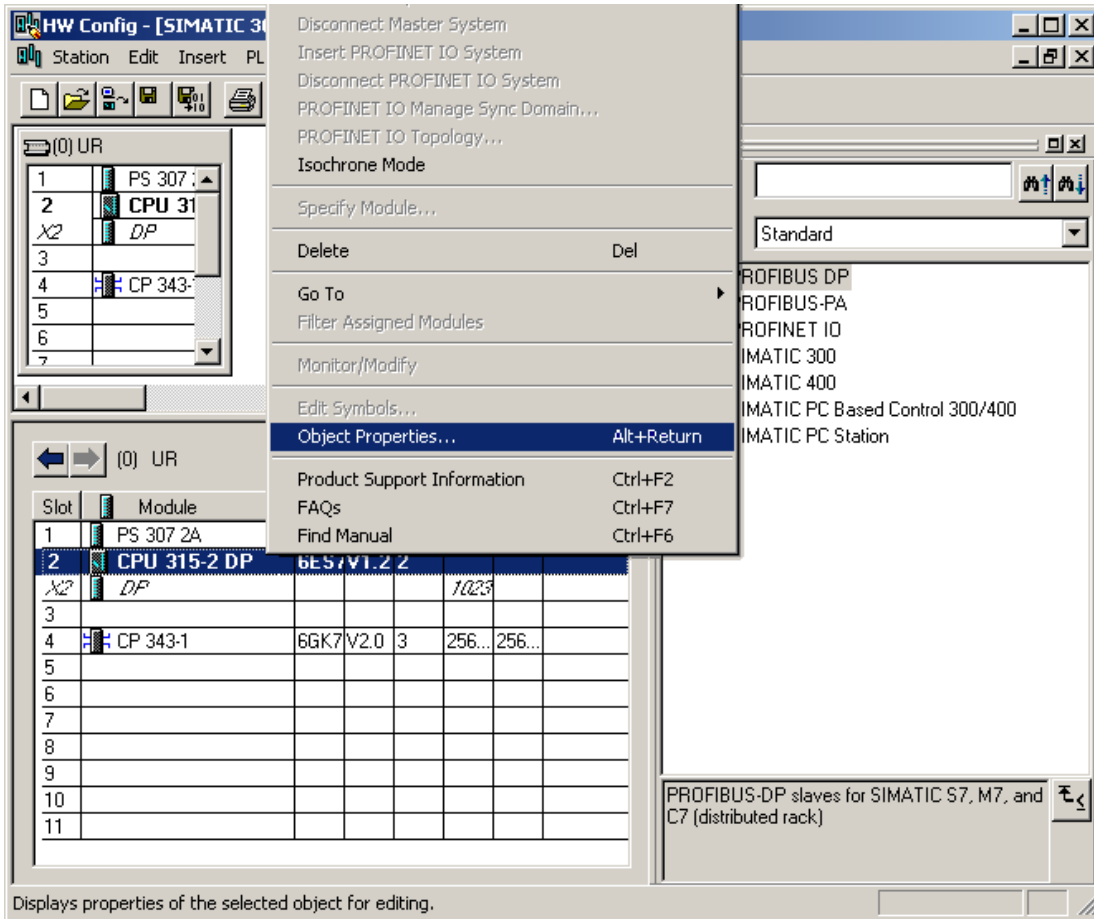
3. From the **General** tab, click the **Interface | Properties** button.



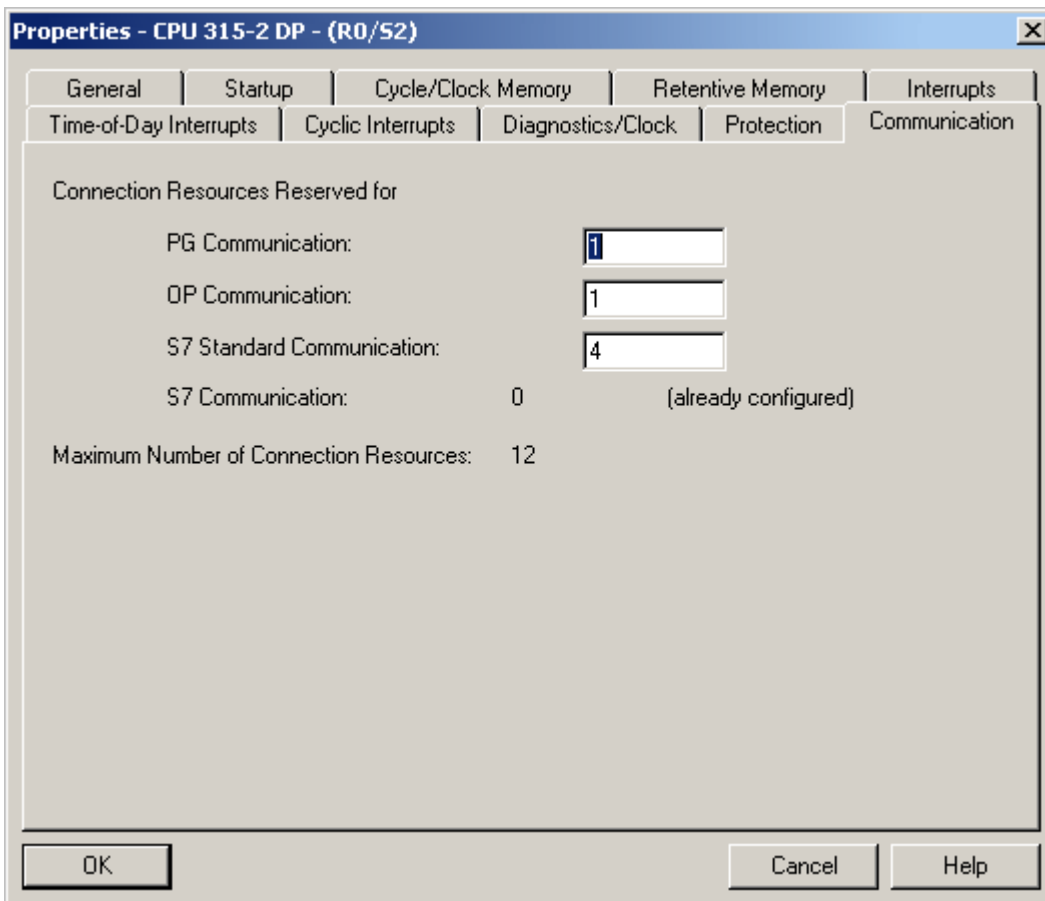
4. Specify the IP and **Subnet Mask** for this module.
5. To network this module, click **New** under **Subnet**. Next, select the network created and the click **OK**.
6. Return to the HW Config main window.

## 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**.

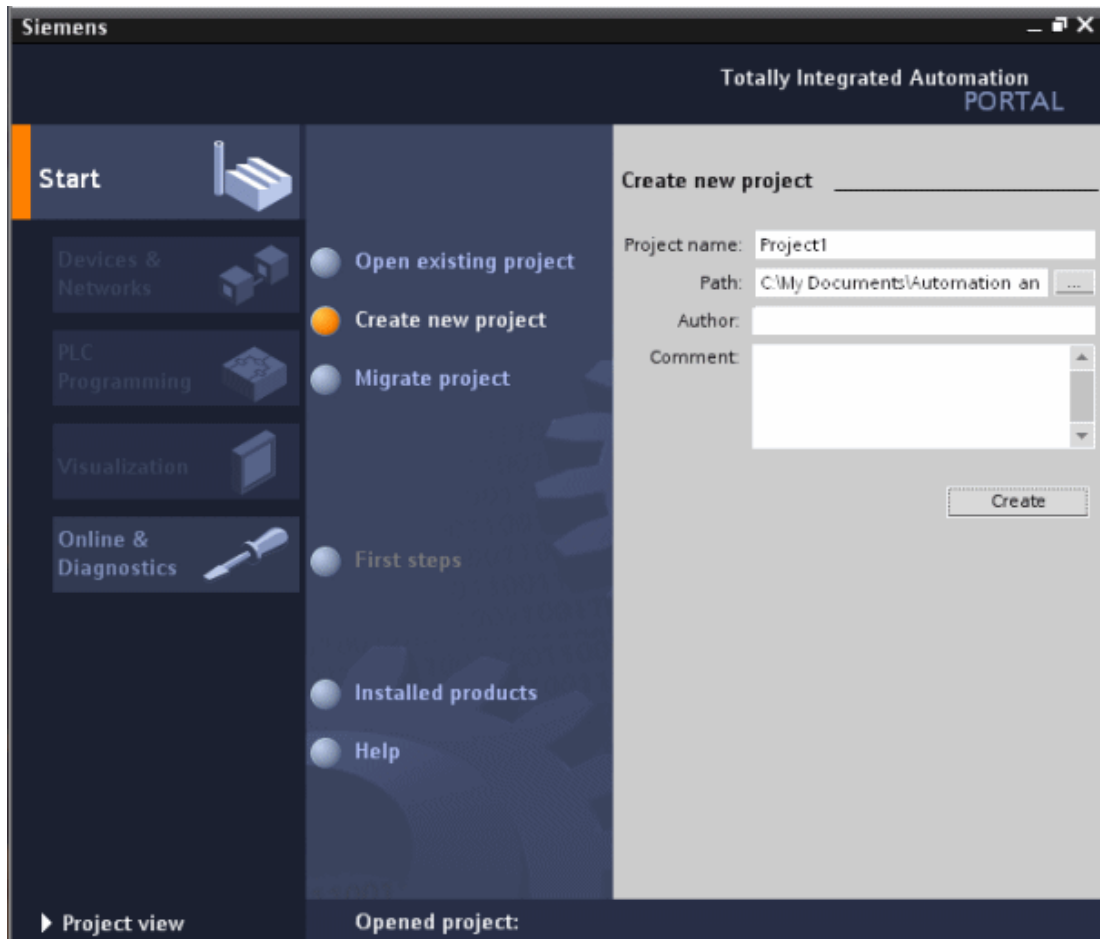
5. Click **PLC | Download** to commit to the changes.

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

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.

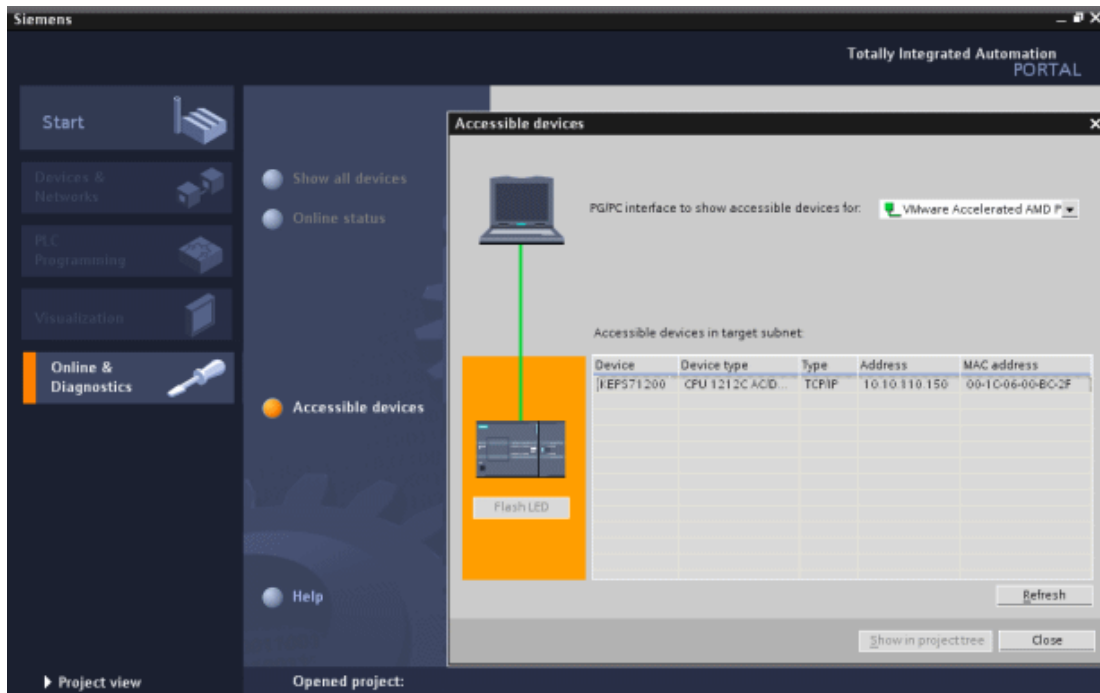
● **Note:** For new Simatic projects, refer to the PLC's documentation for information on the default IP address settings.

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

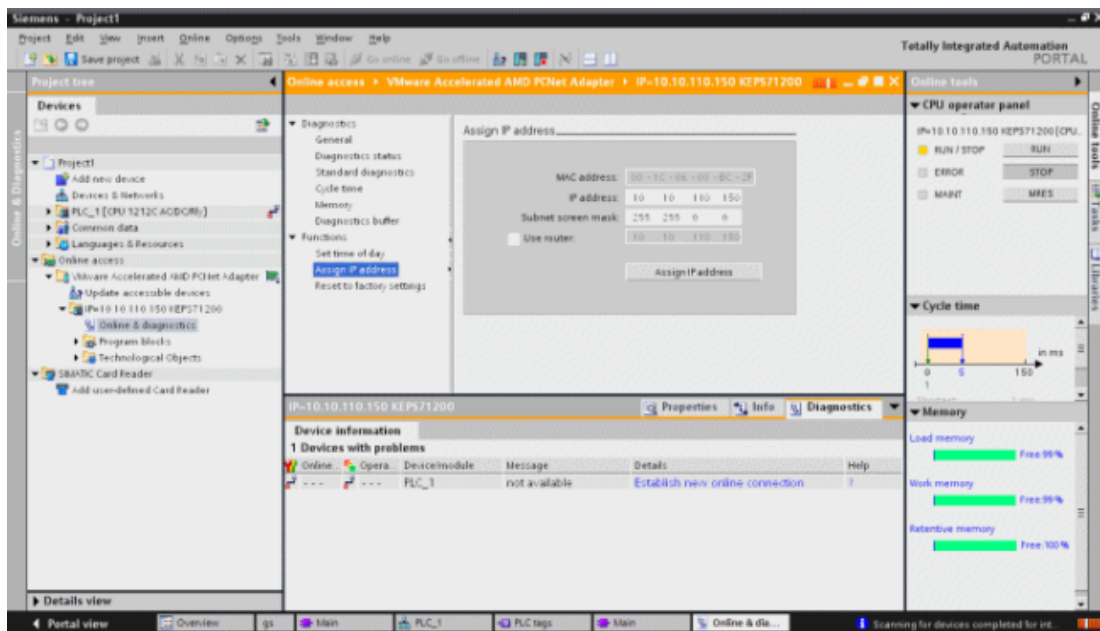


2. Next, select the **Online & Diagnostics** tab and then click **Accessible Devices**.

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



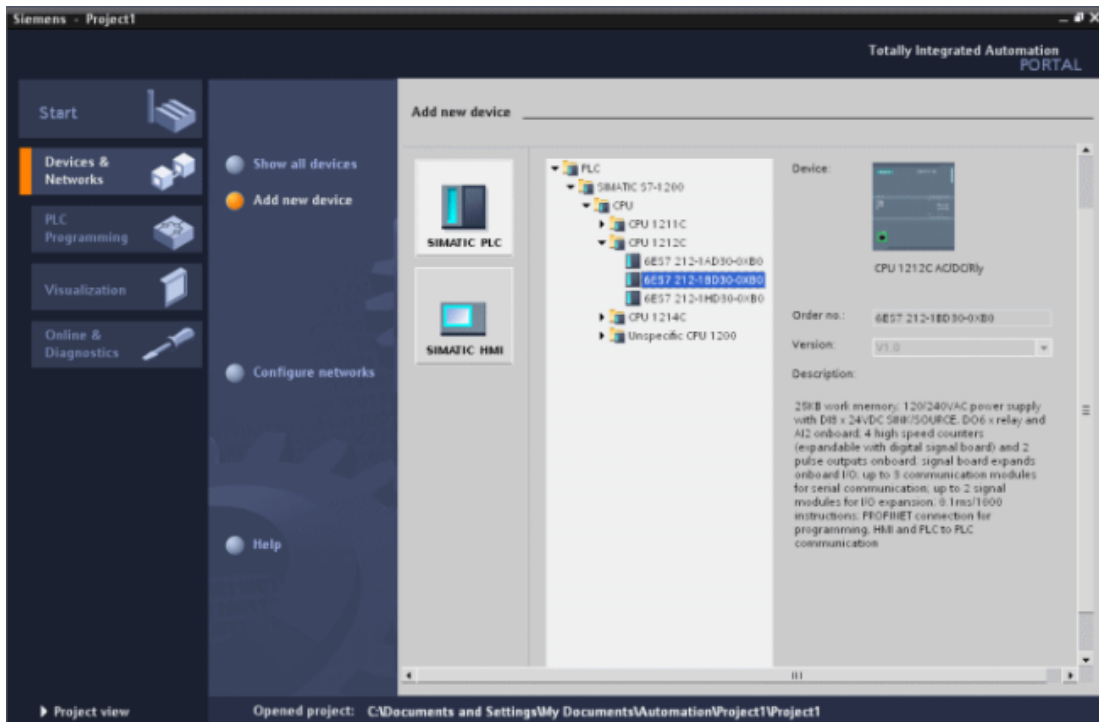
4. Once the scan is complete, select the device and then click **Show**. This will invoke the Project View.
5. In the project tree, locate the IP address and then open **Online & Diagnostics**.
6. Next, double-click **Online & Diagnostics** to invoke **Online Access**.
7. Select **Functions** and then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



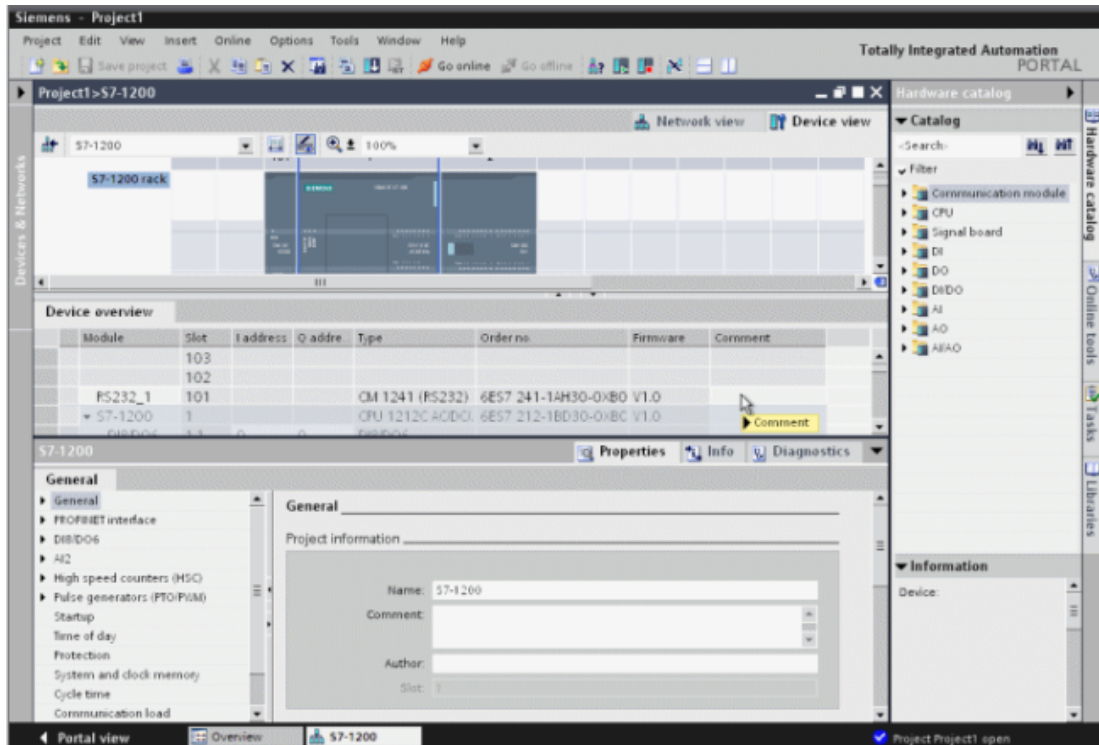
8. Enter the communication settings and click **Assign IP Address**.

**Note:** The device is now ready to be configured.

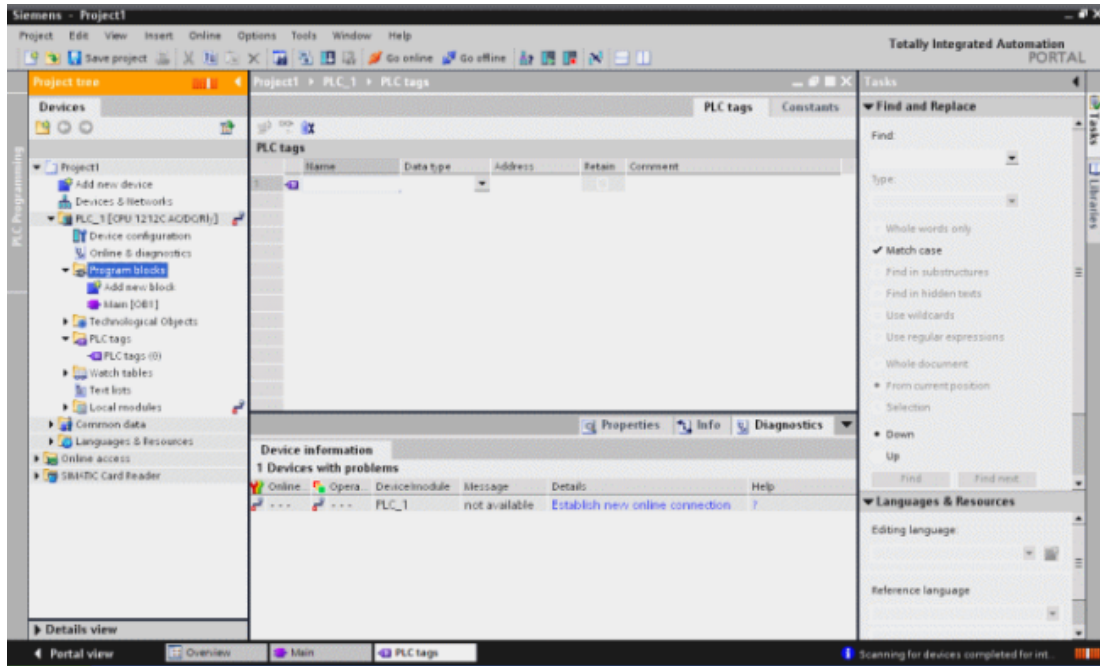
9. Return to the Portal View and then select the **Device & Networks** tab. Then, click **Add new device**.



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.

## How To Configure S7-1500 Connections

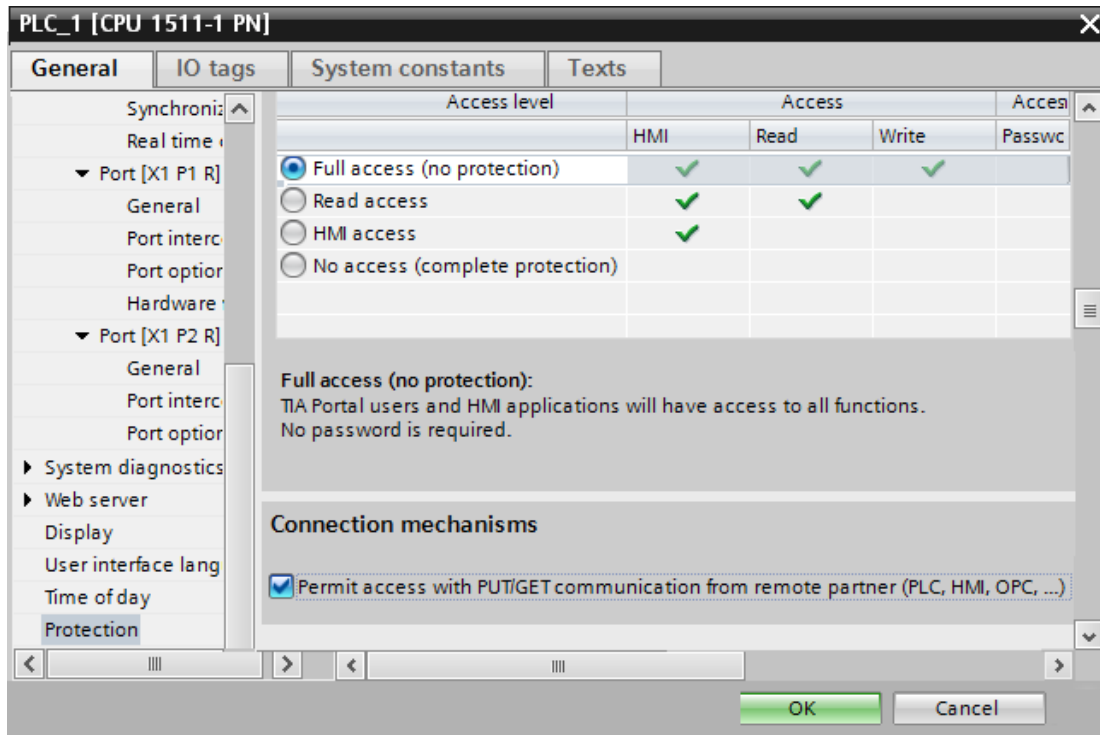
The S7-1500 controller has an embedded Ethernet port that supports S7 communications over the Ethernet protocol. It must be configured to allow access from the server, however. For more information, refer to the instructions below.

1. To start, open the PLC project in the S7 TIA Portal software.
2. Next, open **PLC Properties**.
3. In the **General** tab, select **Protection**. Then, ensure that **Full access (no protection)** is enabled.

● **Note:** At this time, the Siemens TCP/IP Ethernet Driver does not support the use of a password.



4. Next, check **Permit access with PUT/GET communication from remote partner**. Then, save the settings.



5. In the server, create a new channel. In **Device Driver**, select **Siemens TCP/IP Ethernet Driver** from the drop-down list. Continue through the channel wizard, specifying channel properties as needed. Then, click **Finish**.
6. Next, create a new device. In **Model**, select **S7-1500** from the **Device Model** drop-down list. Continue through the device wizard, specifying device properties as needed. Then, click **Finish**.

● **Note:** The controller Protection settings are directly related to the device returning protocol error [Class=0x81, Code=0x04]. If this error occurs, the controller's memory (such as the Simatic memory card) may need to be reset. Once the controller's memory is reset, downloading the S7 project to the controller should not prompt for a password.

# Appendix: Alternate Syntax Support

Limited addressing support is available for the following applications.

- [Applicom Direct-Link 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](#)

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

● **Note:** The offset for an atomic type tag in a data block is denoted by the column "Address" in Step 7, as shown above. This offset is denoted by the column "Offset" in the Siemens TIA Portal programming environment.

## Applicom Direct-Link Item Syntax

The following support for the Applicom Direct-Link OPC server is considered to be limited. Care must be taken because 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 information is intended to be a guideline for users that are already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to [Standard S7-300/400/1200/1500 Item Syntax](#).

### Address Syntax

#### Input, Output, Peripheral, Flag Memory Types

<memory type><S7 data type><address><Data Type suffix> [<Byte Switching suffix>]  
 <memory type><S7 data type><address><Data Type suffix><\_row\_col>

#### Timer and Counter Memory Types

<memory type><address>

### DB Memory Type

DB<num>.<S7 data type><address> [<Data Type suffix>] [<Byte Switching suffix>]  
 DB<num>.<S7 data type><address> [<Data Type suffix>] <\_row\_col>

where <num> ranges from 1 to 65535.

● **See Also:** [Examples](#)

## Memory Types

Memory Type	Description	Address Range	Data Type	Access
I	Inputs	Dependent on S7 Data Type		Read/Write
E				
Q	Outputs			Read/Write
A				
PI	Peripheral Inputs			Read Only
PE				
PQ	Peripheral Outputs			Read/Write
PA				
M	Flag Memory			Read/Write
F				
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**. 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	<b>Boolean</b>		
B DBB**	Unsigned Byte	B0-B65535 DBB0-DBB65535	<b>Byte, Char</b>		
W DBW**	Unsigned Word	W0-W65534 DBW0-DBW65534	<b>Word, Short, BCD</b>		
D DBD**	Unsigned Double Word	D0-D65532 DBD0-DBD65532	<b>DWord, Long, LBCD, Float</b>	F	Float

\*No S7 data type specified. Applies to non-DB memory types only.

\*\*Applies to DB memory types only.

• See Also: [Examples](#)

## Data Type Suffixes

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

## Byte Switching Suffixes

These suffixes are used to switch the bytes that compose data of type 16-bit Word, 32-bit DWord, or 32-bit Float. The switching is applied after the device-level addressing option for byte Order is applied. For more information, refer to [Addressing Options](#).

Byte Switching Suffixes can be used with all memory types except Timers and Counters (T, C, and Z) and Peripheral Inputs and Outputs (PI, PE, PQ, and PA). For information on the various types of switching that depend on the suffix and data type of the item, refer to the table below.

Suffix	16-Bit Data Types (Word, Short, BCD)	32-Bit Data Types (DWord, Long, LBCD, Float)
_X1	O1 O2 -> O2 O1 (byte switching)	O1 O2 O3 O4 -> O4 O3 O2 O1 (byte switching)
_X2	O1 O2 -> O2 O1 (byte switching)	O1 O2 O3 O4 -> O3 O4 O1 O2 (Word switching)
_X3	O1 O2 -> O2 O1 (byte switching)	O1 O2 O3 O4 -> O2 O1 O4 O3 (Switching bytes in the words)

## Array Support

The `<.array size>` notation is appended to an address to specify an array (such as "MW0.10"). Boolean arrays and string arrays are not supported.

## Examples

S7 Data Type	Data Type	Input	Flags	Data Blocks
None DBX	Boolean Boolean	I0.7 ----	M0.7 ----	---- DB1.DBX0.7
B DBB	Byte	IB0 ----	MB0 ----	---- DB1.DBB0

S7 Data Type	Data Type	Input	Flags	Data Blocks
	Array	IB0_2_5 ----	MB0_2_5 ----	---- DB1.DBB0_2_5
W DBW	Word  Array	IW0 ---- IW0_X1  IW0_10 ----	MW0 ---- MW0_X2  MW0_10 ----	---- DB1.DBW0 DB1.DBW0_X3  ---- DB1.DBW0_10
D DBD	DWord  Float (F)  Array	ID0 ---- ID0_X1  ID0F ID0F_X1  ID0_4_3 ----	MD0 ---- MD0_X2  MD0F MD0F_X2  MD0_4_3 ----	---- DB1.DBD0 DB1.DBD0_X3  DB1.DBD0F DB1.DBD0F_X3  ---- DB1.DBD0F_4_3

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

## INAT OPC Server TCPIPH1 Item Syntax

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 information is intended to be a guideline for users that are already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to [Standard S7-300/400/1200/1500 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		Read/Write
Q A	Outputs			Read/Write
PI PE	Peripheral Inputs			Read Only

Memory Type	Description	Address Range	Data Type	Access
PQ PA	Peripheral Outputs			Read/Write
M F	Flag Memory			Read/Write
DB	Data Blocks			Read/Write
T	Timers	T0-T65535	<b>DWord, Long</b>	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	<b>Word, Short</b>	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	<b>Boolean</b>		
B Byte	Unsigned Byte	B0-B65535 BYTE0-BYTE65535	<b>Byte, Char</b>	KF	Char
W Word	Unsigned Word	W0-W65534 WORD0-WORD65534	<b>Word, Short, BCD</b>	BCD KF	BCD Short
I INT	Signed Word	I0-I65534 INT0-INT65534	Word, <b>Short, BCD</b>	BCD	BCD
D DWORD	Unsigned Double Word	D0-D65532 DWORD0-DWORD65532	<b>DWord, Long, LBCD, Float</b>	BCD IEEE KF	LBCD Float Long
DI DINT	Signed Double Word	DI0-DI65532 DINT0-DINT65532	<b>DWord, Long, LBCD, Float</b>	BCD IEEE	LBCD Float
R REAL	IEEE Float	R0-R65532 REAL0-REAL65532	<b>Float</b>		
G String	S7 String	G0.n-G65532.n STRING0.n- STRING65532.n .n is string length. 0<n<= 210.	<b>String</b>		

• See Also: [Examples](#)

## Suffixes

Suffix	Description	Data Type
BCD	Two byte packed BCD for Word references Value range is 0-9999	BCD
	Four byte packed BCD for DWord references Value range is 0-99999999	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 (such as MW0.10). Boolean arrays and string arrays are not supported.

## Examples

S7 Data Type	Data Type	Input	Flags	Data Blocks
X	Boolean	IX0.7	MX0.7	DB1.X0.7
B Byte	Byte	IB0 IBYTE0	MB0 MBYTE0	DB1.B0 DB1.BYTE0
	Char (KF)	IB0KF IBYTE0KF	MB0KF MBYTE0KF	DB1.B0KF DB1.BYTE0KF
	Array	IB0KF.10 IBYTE0KF.10	MB0KF.10 MBYTE0KF.10	DB1.B0KF.10 DB1.BYTE0KF.10
W Word	Word	IW0 IWORD0	MW0 MWORD0	DB1.W0 DB1.WORD0
	BCD (BCD)	IW0BCD IWORD0BCD	MW0BCD MWORD0BCD	DB1.W0BCD DB1.WORD0BCD
	Short (KF)	IW0KF IWORD0KF	MW0KF MWORD0KF	DB1.W0KF DB1.WORD0KF
	Array	IW0BCD.10 IWORD0BCD.10	MW0BCD.10 MWORD0BCD.10	DB1.W0BCD.10 DB1.WORD0BCD.10
I INT	Short	IIO IINT0	MIO MINT0	DB1.I0 DB1.INT0
	BCD (BCD)	IIOBCD IINT0BCD	MIOBCD MINT0BCD	DB1.I0BCD DB1.INT0BCD
	Array	IIO.10 IINT0.10	MIO.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	IDIO IDINT0	MDIO MDINT0	DB1.DIO DB1.DINT0
	LBCD (BCD)	IDIOBCD IDINT0BCD	MDIOBCD MDINT0BCD	DB1.DIOBCD DB1.DINT0BCD
	Float (IEEE)	IDIOIEEE IDINT0IEEE	MDIOIEEE MDINT0IEEE	DB1.DIOIEEE DB1.DINT0IEEE
	Array	IDIOBCD.10 IDINT0BCD.10	MDIOBCD.10 MDINT0BCD.10	DB1.DIOBCD.10 DB1.DINT0BCD.10
R REAL	Float	IRO IREAL0	MRO MREAL0	DB1.R0 DB1.REAL0

S7 Data Type	Data Type	Input	Flags	Data Blocks
	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

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

## Siemens Simatic Net Item Syntax

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 information is intended to be a guideline for users that are already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to [Standard S7-300/400/1200/1500 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		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, <b>Long</b>	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	<b>Word</b> , 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	<b>Boolean</b>
B Byte	Unsigned Byte	B0-B65535 BYTE0-BYTE65535	<b>Byte, Char</b>
Char	Signed Byte	CHAR0-CHAR65535	<b>Byte, Char</b>
W Word	Unsigned Word	W0-W65534 WORD0-WORD65534	<b>Word, Short, BCD</b>
INT	Signed Word	INT0-INT65534	<b>Word, Short, BCD</b>
D DWORD	Unsigned Double Word	D0-D65532 DWORD0-DWORD65532	<b>DWord, Long, LBCD, Float</b>
DINT	Signed  Double Word	DINT0-DINT65532	<b>DWord, Long, LBCD, Float</b>
REAL	IEEE Float	REAL0-REAL65532	<b>Float</b>
String	S7 String	STRING0.n-STRING65532.n .n is string length. 0<n<= 210.	<b>String</b>

• See Also: [Examples](#)

## Array Support

The `<.array size>` notation is appended to an address to specify an array (such as MW0.10). Boolean arrays and string arrays are not supported.

## Examples

S7 Data Type	Data Type	Input	Flags	Data Blocks
X	Boolean	IX0.7	MX0.7	DB1,X0.7
B Byte	Byte	IB0 IBYTE0	MB0 MBYTE0	DB1,B0 DB1,BYTE0
	Array	IB0,10 IBYTE0,10	MB0,10 MBYTE0,10	DB1,B0,10 DB1,BYTE0,10
Char	Char	ICHR0	MCHAR0	DB1,CHAR0
	Array	ICHR0,10	MCHAR0,10	DB1,CHAR0,10
W Word	Word	IW0 IWORD0	MW0 MWORD0	DB1,W0 DB1,WORD0
	Array	IW0,10 IWORD0,10	MW0,10 MWORD0,10	DB1,W0,10 DB1,WORD0,10
INT	Short	IINT0	MINT0	DB1,INT0
	Array	IINT0,10	MINT0,10	DB1,INT0,10
D DWORD	DWord	ID0 IDWORD0	MD0 MDWORD0	DB1,D0 DB1,DWORD0
	Array	ID0,10 IDWORD0,10	MD0,10 MDWORD0,10	DB1,D0,10 DB1,DWORD0,10
DINT	Long	IDINT0	MDINT0	DB1,DINT0
	Array	IDINT0,10	MDINT0,10	DB1,DINT0,10
REAL	Float	IREAL0	MREAL0	DB1,REAL0
	Array	IREAL0,10	MREAL0,10	DB1,REAL0,10
String	String	ISTRING0.10	MSTRING0.10	DB1,STRING0.10



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

## Siemens STEP 7 Item Syntax

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 information is intended to be a guideline for users that are already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to [Standard S7-300/400/1200/1500 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		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
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

Element	Data Type	Offset	Server Address Equivalent
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

For more information, refer to [Standard S7-300/400/1200/1500 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	<b>Boolean</b>		
B DBB**	Unsigned Byte	B0-B65535 DBB0-DBB65535	<b>Byte, Char</b>		
W DBW**	Unsigned Word	W0-W65534 DBW0-DBW65534	<b>Word, Short, BCD</b>		
D DBD**	Unsigned Double Word	D0-D65532 DBD0-DBD65532	<b>DWord, Long, LBCD, Float</b>	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	Data Blocks
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

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

● **Note:** The offset for an atomic type tag in a data block is denoted by the column "Address" in Step 7, as shown above. This offset is denoted by the column "Offset" in the Siemens TIA Portal programming environment.

## Softing S7/S5 OPC Server Item Syntax

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 information is intended to be a guideline for users that are already familiar with and/or prefer the syntax of the specified product. For preferred item syntax, refer to [Standard S7-300/400/1200/1500 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		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, <b>Long</b>	Read/Write
C Z	Counters	C0-C65535 Z0-Z65535	<b>Word</b> , 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**. 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	<b>Boolean</b>		

Data Type	Description	Address Range	Data Type	Suffix	Data Type w/ Suffix
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	BCD
	Four byte packed BCD for DWord references Value range is 0-99999999	LBCD
REAL	32-bit IEEE floating point value	Float
String	S7 String	String

### Examples

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

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

# Index

## A

A required code page is unavailable on this machine. Tag generation may fail or tag names and descriptions may not appear as expected. | Required code page = <page>. 38

Address Descriptions 20

Address Syntax 24, 74, 76

Addressing Options 16

Advanced Channel Properties 8

Allow Sub Groups 13

Applicom Direct-Link Item Syntax 74

Array Support 27, 75, 77

Arrays 33

Auto-generated tag names and descriptions may not appear as expected due to string conversion error. 37

## B

BCD 19

Big Endian 16

Bits 16

Boolean 19

Byte 19

Byte Switching Suffix 75

## C

Channel Assignment 9

Channel Properties 6

Channel Properties - Ethernet Communications 7

Channel Properties - General 6

Channel Properties - Write Optimizations 7

Char 19

Communications Parameters 15

Communications Timeouts 11

Configured connection 15

Configuring Connections 53

Configuring Siemens Connections 49

Connect Timeout 11

Counters 28, 34

CPU Rack 16

CPU Slot 16

Create 14

Created tag in group due to internal block size. | Tag address = '<address>', tag name = '<name>', group name = '<name>'. 39

## D

Data Access Errors 47  
Data Block 19  
Data Collection 10  
Data Types Description 19  
Date 19  
DB Memory Type 24  
Delete 13  
Demote on Failure 12  
Demotion Period 12  
Device Properties 9  
Device Properties - Auto-Demotion 12  
Device Properties - Tag Generation 12  
Diagnostics 7  
Discard Requests when Demoted 12  
Do Not Scan, Demand Poll Only 11  
Driver 7, 9  
Duty Cycle 8  
DWord 19

## E

Error Codes 47  
Ethernet Wizard 49  
Event Log Messages 35

## F

Failed to resolve host. | Host = '<host name>'. 37  
Float 19

## G

Generate 13

## H

Help Contents 5

Hex Strings 27, 33

How To Configure S7-1200 Connections with the Totally Integrated Automation (TIA) Portal 69

How To Configure S7-1500 Connections 72

How To Configure S7-200 Connections in Micro/WIN 49

How To Configure S7-300/400 Connections in STEP 7 64

## I

ID 9

Identification 9

IEEE-754 floating point 8

INAT OPC Server TCPIPH1 Item Syntax 76

Initial Updates from Cache 11

Inter-Request Delay 11

Internal Tags 23

## L

LBCD 19

Legacy S7-300/400 Item Syntax 29

Link Type 15

Little Endian 16

Local TSAP 15

Long 19

## M

Memory exception reading the Step 7 language file. 38

Memory Types 24, 74, 76

Micro/WIN 15

MicroWin 49

Model 9

MPI ID 15

## N

NetLink 15

NetLink adapter 15

NetLink Errors 47

NetLink: S7-300 Address Descriptions 23

NetLink: S7-400 Address Descriptions 23

Network Adapter 7



Non-Normalized Float Handling 8

## O

On Device Startup 13

On Duplicate Tag 13

Operating Mode 10

Optimization Method 8

Optimizing Communications 18

Overview 5

Overwrite 13

## P

Parent Group 13

PG connection 15

Port Number 15

Program Path 17

Protocol Errors 47

## R

Reason = 'Device is not responding'. 36

Reason = 'Device returned data access error'. Error code = <error>. 36

Reason = 'Device returned protocol error'. Error class = <class>, Error code = <error>. 35

Reason = 'Device returned transport error'. Error code = <error>. 35

Reason = 'Frame contains errors'. 35

Reason = 'Unknown error occurred'. 37

Reason = NetLink returned error. Error code = <error>. 37

Redundancy 17

Remote TSAP 15

Request All Data at Scan Rate 11

Request Data No Faster than Scan Rate 10

Request Timeout 11

Respect Client-Specified Scan Rate 10

Respect Tag-Specified Scan Rate 11

Retry Attempts 11

## S

S7-1200 Address Descriptions 22

S7-1500 Address Descriptions 23

S7-200 Address Descriptions 20  
S7-300 Address Descriptions 22  
S7-300/400/1200/1500 15  
S7-400 Address Descriptions 22  
S7 Communications Parameters 15  
Scan Mode 10  
Setup 6  
Short 19  
Siemens Simatic Net Item Syntax 79  
Siemens STEP 7 Item Syntax 81  
Simulated 10  
Softing S7/S5 OPC Server Item Syntax 83  
Standard S7-300/400/1200/1500 Item Syntax 24  
STEP 7 64  
Step 7 language file failed to open. | OS error = '<error>'. 38  
STEP 7 Project 17  
String 19  
String Subtype 33  
String Support 27  
Suffixes 77  
Supported Devices 6  
Supported NetLink Cables and Gateways 6  
Syntax 74

## T

Tag Generation 12  
Tag generation failure. | Data block name = '<block name>', data block number = <block number>. 39  
Tag Import 17  
Tag not created because arrays are not supported with specified data type. | Tag name = '<name>', group name = '<name>', data type = '<type>'. 39  
Third-Party 74  
TIA Portal 69  
Timeouts to Demote 12  
Timers 28, 34  
Transport Errors 47  
TSAP 15

## U

Unable to connect to device. | 40  
Unable to establish association with device. | 40  
Unable to load the Step 7 language file. 38  
Unable to read data from device. | Data block = '<block>', block start = <address>, block size = <size>, 42

Unable to read data from device. | Memory type = '<type>', block start = <address>, block size = <size> (bytes), 44

Unable to read data from device. Block deactivated. | Data block = '<block>', block start = <address>, block size = <size>, 43

Unable to read data from device. Block deactivated. | Memory type = '<type>', block start = <address>, block size = <size> (bytes), 44

Unable to read from address on device. | Address = '<address>', 41

Unable to read from address on device. Tag deactivated. | Address = '<address>', 41

Unable to write to address on device. | Address = '<address>', 45

Unable to write to address on device. HEXSTRING contains a non-hexadecimal character. | Address = '<address>'. 46

Unable to write to address on device. HEXSTRING length is different from tag length. | Address = '<address>', HEXSTRING length = <length> (bytes), tag length = <length> (bytes). 46

Unable to write to address on device. HEXSTRING length must be an even number of characters. | Address = '<address>'. 46

Unable to write to address on device. Time of Day string contains a syntax error. Expected 'hh mm ss.hhh' format. | Address = '<address>', Time of Day string = '<string>'. 46

## W

Word 19

Write All Values for All Tags 8

Write Only Latest Value for All Tags 8

Write Only Latest Value for Non-Boolean Tags 8

Write Optimizations 7