Wonderware® Siemens SIMATIC® NET S7 I/O Server

User's Guide

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Wonderware Corporation

Wonderware Siemens SIMATIC NET S7 I/O Server User's Guide

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Trademarks

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Wonderware Siemens SIMATIC NET S7 I/O Server

Introduction

The Wonderware® Siemens SIMATIC® NET S7 I/O Server (referred to as the server through the remainder of this user's guide) is a Microsoft® Windows® application program that acts as a communication protocol server. It allows other Windows application programs access to data within the Siemens SIMATIC S7 300/400 family of PLCs. The server allows the PC to access a Siemens PLC through the MPI programming port or a Siemens Communication Processor directly connected to the SIMATIC S7 300/400 backplane. The server works on the PROFIBUS, H1 Industrial Ethernet, TCP/IP networks, and supports numerous communication processor cards.

While the server is primarily intended for use with Wonderware InTouch® (version 3.01 and later), it may be used by any Microsoft Windows program capable of acting as a DDE, FastDDE, or SuiteLink™ client.

Communication Protocols

Dynamic Data Exchange (DDE) is a communication protocol developed by Microsoft to allow applications in the Windows environment to send/receive data and instructions to/from each other. It implements a client-server relationship between two concurrently running applications. The server application provides the data and accepts requests from any other application interested in its data. Requesting applications are called clients. Some applications such as InTouch and Microsoft Excel can simultaneously be both a client and a server.

FastDDE provides a means of packing many proprietary Wonderware DDE messages into a single Microsoft DDE message. This packing improves efficiency and performance by reducing the total number of DDE transactions required between a client and a server. Although Wonderware's FastDDE has extended the usefulness of DDE for our industry, this extension is being pushed to its performance constraints in distributed environments.

NetDDE™ extends the standard Windows DDE functionality to include communication over local area networks and through serial ports. Network extensions are available to allow DDE links between applications running on different computers connected via networks or modems. For example, NetDDE supports DDE between applications running on IBM® compatible computers connected via LAN or modem and DDE-aware applications running on non-PC based platforms under operating environments such as VMS™ and UNIX®.

SuiteLink uses a TCP/IP based protocol and is designed specifically to meet industrial needs such as data integrity, high-throughput, and easier diagnostics. This protocol standard is only supported on Microsoft Windows NT 4.0 and Windows 2000.

SuiteLink is not a replacement for DDE, FastDDE, or NetDDE. The protocol used between a client and a server depends on your network connections and configurations. SuiteLink was designed to be the industrial data network distribution standard and provides the following features:

- Value Time Quality (VTQ) places a time stamp and quality indicator on all data values delivered to VTQ-aware clients.
- Extensive diagnostics of the data throughput, server loading, computer resource consumption, and network transport are made accessible through the Microsoft Windows NT and Windows 2000 operating systems Performance Monitor. This feature is critical for the scheme and maintenance of distributed industrial networks.
- Consistent high data volumes can be maintained between applications regardless if the applications are on a single node or distributed over a large node count.
- The network transport protocol is TCP/IP using Microsoft's standard WinSock interface.

Accessing Remote Items via the I/O Server

The communication protocol addresses an element of data in a conversation that uses a three-part naming convention that includes the application name, topic name and item name. The following briefly describes each portion of this naming convention:

application name — The name of the Windows program (server) that will be accessing the data element. In the case of data coming from or going to Siemens equipment via this server, the application portion of the address is **S7**.

topic name — Meaningful names are configured in the server to identify specific devices. These names are then used as the topic name in all conversations to that device. For example, **S7PLC400**.

Note You can define multiple topic names for the same device (PLC) to poll different points at different rates.

item name — A specific data element within the specified topic. For example, when using this server, an item can be a relay, timer, counter, register, etc., in the PLC.

Note The item/point names are predefined by the server. The term "point" is used interchangeably with the term "item" in this user's guide.

For more information on item/point names, see the "Item Names" section in this user's guide.

Getting Started Quickly with the I/O Server

This section briefly describes the components and procedures required to prepare the Wonderware Siemens SIMATIC NET S7 I/O Server for use. Detailed descriptions can be found in the manuals provided by Siemens and sections of this user's guide.

Required Hardware and Software

Wonderware Siemens SIMATIC NET S7 I/O Server was originally designed to work with a Siemens' communication processor card (also referred to as an adapter card or a CP) called the CP1413. In earlier versions of the user's guide, detailed instructions for the installation and configuration of the Siemens hardware and software were included. However, Siemens now offers other adapter cards and software packages that increase the number of CP options. The complexity of describing installation of the adapter cards, configuration of the Siemens software, and support of multiple operating systems, has forced us to remove the Siemens specific instructions. Refer to instructions included with the Siemens supplied driver software and card configuration tools for details. Additional documents are available in Technical Notes and articles on the Comprehensive Support CD and Web Site.

The following table shows the supported adapter cards and the needed software component from the SIMATIC NET Setup:

Software Component	PC Adapter Card
PROFIBUS Softnet S7	CP5411, CP5511, CP5611, MPI Board
PROFIBUS S7-5412	CP5412A2
PROFIBUS S7-5613	CP5613
Industrial Ethernet S7-1413	CP1413
Industrial Ethernet S7-1613	CP1613
Industrial Ethernet SOFTNET-S7 BASIC/EXTENDED	CP1411, CP1511, 3COM Network Adapter

Note The Siemens S7 server was specifically designed and tested against adapter cards CP5411, CP5412A2, CP5613, CP1413, CP1613, and 3Com Network Adapter, but other cards listed above may be compatible.

Required Driver Configuration

Siemens driver configuration is required at both ends of the PLC communication link. The PC with its CP card(s) and one or more PLCs with their CP cards must all be configured to work together before operating the server.

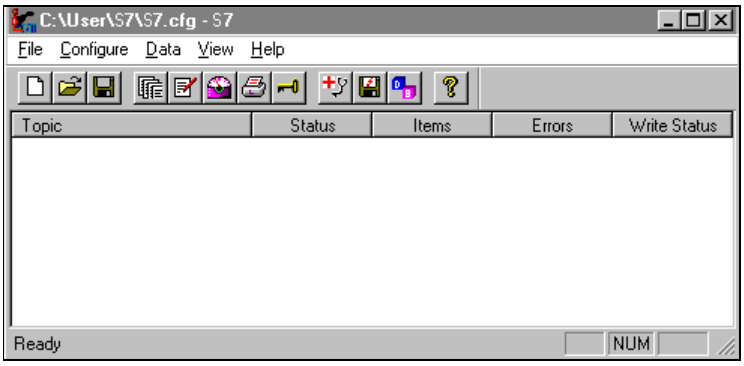
The Siemens adapter cards and drivers on an NT operating system are easy to install and configure. The PLCs are more difficult to install and configure. Please refer to the instructions included with the Siemens supplied driver software and card configuration tools.

The server can be run to generate server (also called topic) configuration files without any cards or drivers installed. This is not recommended as it eliminates most of the server's ability to detect configuration errors.

S7 Main Window

Double-click on the server's icon to start.

When the server starts, the main window will appear:



The current configuration file and its full path are displayed in the main window title bar. If any topics are active, they will appear in the client area of this window called the topic monitor list.

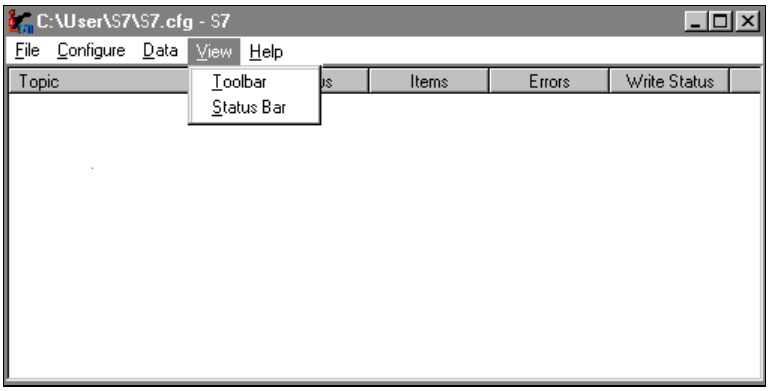
View Menu

The **View** menu has two options that change the appearance of the main window. Both options are enabled or disabled by selecting the menu option. A check next to the option indicates the option is enabled.

Toolbar option adds (when enabled) or removes the toolbar (small buttons) located below the menu.

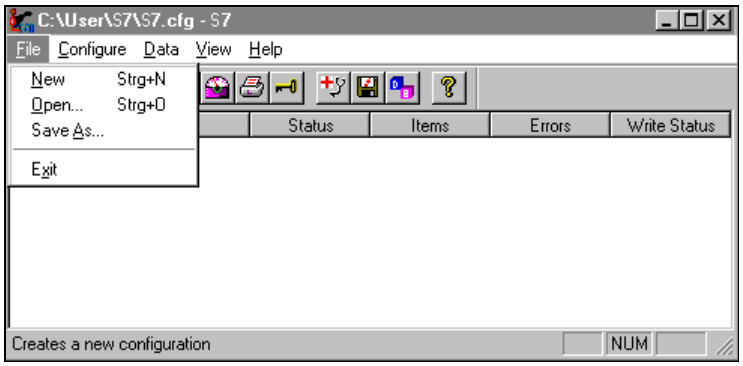
Status Bar option adds (when enabled) or removes the status indication bar located at bottom of window.

The main window shown above has both options enabled. The main window shown below has both options disabled.



File Menu

File menu options deal with loading and saving the internal topic configuration database.



New

Clears the internal topic database for a new topic configuration. This menu is disabled when the server is active (a client is connected).

Open

Replaces the internal topic database with the information contained in the user selected topic configuration file. This file is automatically loaded the next time the server is started. This menu is disabled when the server is active (a client is connected).

Save As

Saves the internal topic database under a new name. This command is only needed if you want to save the configuration under a different name. If you edit the internal topic database, the data is stored automatically in the current configuration file. This menu is disabled when the server is active (a client is connected).

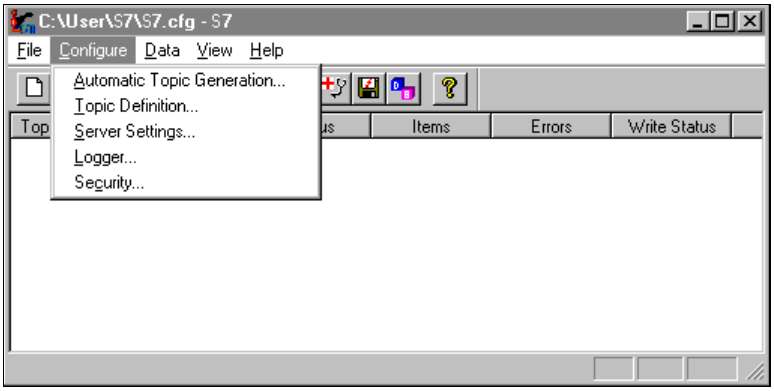
Exit

Terminates the server.

Configuring the I/O Server

Once the server has been installed, some configuration is required. Configuring the server automatically saves the data in a configuration file. If no configuration file is selected, the user is prompted to select a filename.

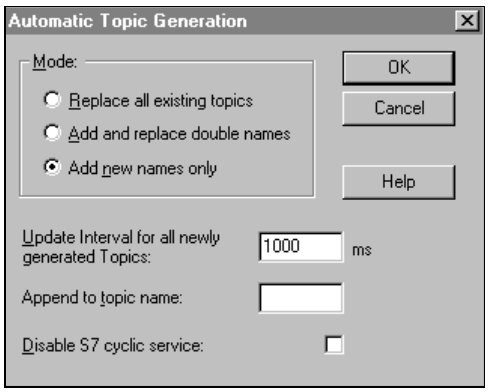
To access the options used for the various configurations, open the **Configure** menu:



Note If any of the options appear grayed, then these options are not available with this software version.

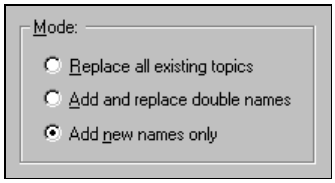
Configuring Automatic Topic Generation

The **Automatic Topic Generation** option is used to automatically generate all topics according to the Siemens SIMATIC NET S7 configuration. All combinations of CP names and connection names are automatically used to create a unique topic name. When the **Automatic Topic Generation** option is selected, the **Automatic Topic Generation** dialog box appears:

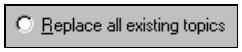


Automatic Topic Generation

This dialog allows you to generate all topics according to your Siemens SIMATIC NET S7 configuration. All combinations of CP names and connection names are used to create a unique topic name.



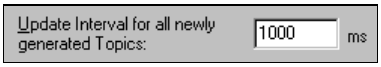
Select the option of the strategy that will be used to handle existing topics in the current configuration.



Select this option to delete all previously defined topics.

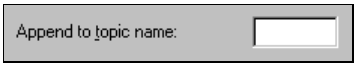
Previously defined topics that conflict with the automatically generated topic names will be replaced by the new topics.

This option is selected when adding new names and is the safest (default) mode. It will not change existing topics.



Enter the frequency (in milliseconds) that the server will acquire data for the items/points associated with all the topics generated by this procedure. The lowest non-zero value you can enter is 100ms for topics with cyclic services and 10ms for topics that have cyclic services disabled. If you enter zero, no PLC item on these topics will be updated at all.

Note Generate a set of topics with different update intervals by using different strings to append to the topic names.



Enter the name to be appended to all newly generated topics. For example, **'fast'** for topics with a short interval and **'slow'** for topics with a long interval.

Disables S7 cyclic services for all generated topics.

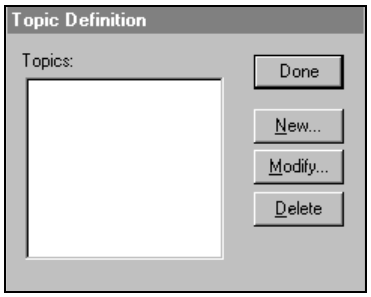
Note When creating a configuration from scratch, there are no differences between the three modes. All other configuration points available in the topic definition dialog box are filled with default values.

Click **OK** to save changes and close the dialog box.

Click **Cancel** to close the dialog box without changing current settings.

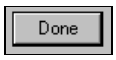
Configuring a Topic Definition

Use the **Topic Definition** option from the Configure menu to create new, modify, or delete topic definitions. One or more topic definitions must exist for each PLC that the server will communicate with. Each topic definition must contain a unique name for the PLC associated with it. When this option is selected, the **Topic Definition** dialog box will appear:



Topic Definition

Note Once topics have been defined, their names will be listed in the **Topics** section of this dialog box.

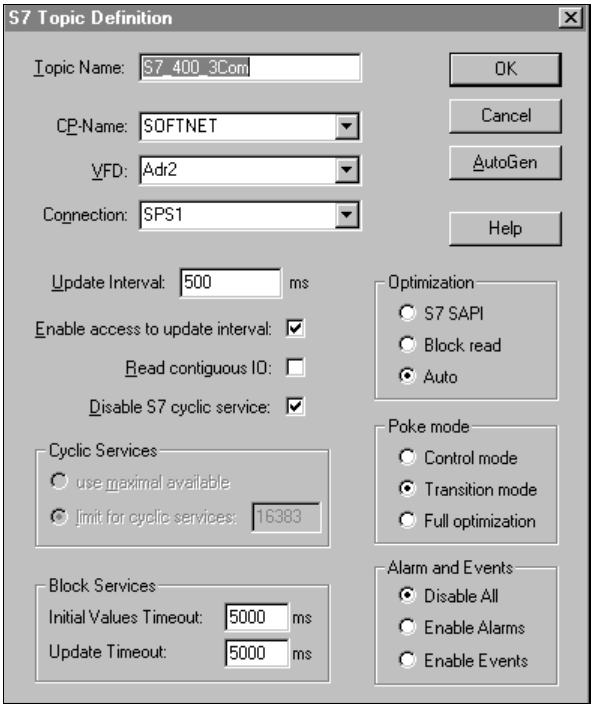


Click this button to close the dialog box and accept any new definitions, modifications or deletions made.

To modify or view an existing topic definition, select its name in the list and click on this button. The **S7 Topic Definition** dialog box (described below) will appear displaying the selected topic definition.

To delete an existing topic definition, select its name in the list and click on this button. A message box will appear prompting you to confirm the deletion.

To add a new topic definition, click on this button. The **S7 Topic Definition** dialog box will appear:



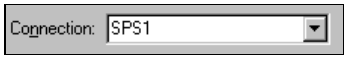
S7 Topic Definition

Enter a unique name for the topic.

Note When communicating with InTouch, this **exact** name is used as the topic name in the Access Name definition.

Select the name of the CP that will be used by this topic. These names are read out automatically of the S7 SAPI database. If you configure the S7 server offline (no S7 SAPI or board installed) you can directly type in a CP name.

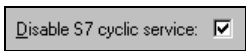
Select the name of the VFD that will be used by this topic. Only VFD names that correspond to the selected CP are found in the list. Changing the CP name changes the list contents of the VFD combo box. If you configure the S7 server offline (no S7 SAPI or board installed) you can directly type in a VFD name.



Select the name of the connection that will be used by this topic. Only connection names that correspond to the selected CP and VFD are found in the list. Changing the CP name and/or changing the VFD name changes the list contents of the connection combo box. If you configure the S7 IO server offline (no S7 SAPI or board installed) you can directly type in a connection name.

Enter the frequency (in milliseconds) that the server will acquire date for the items/points associated with this topic. If set to zero, the server will not poll the PLC to gather data.

Note Different items/points can be polled at different rates in a PLC by defining multiple topic names for the same PLC and setting a different **Update Interval** in each of the topics.

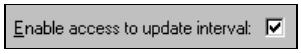


Select this option to disable the S7 SAPI cyclic services for items/points on this topic. Cyclic services have a reliable update frequency and need less bus access. Cyclic services are a limited resource in the PLC and/or Communication Processor. If this option is selected, the server polls all items/points in this topic. If this option is not selected, the server tries to register as many point/items in the cyclic services as possible. The remaining points/items will be polled.

Some reasons for disabling cyclic services:

- A topic with a long interval should not occupy the cyclic service resource
- To force the server to attempt to collect data faster than 100ms

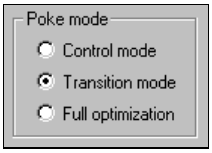
Note The mode 'cyclic' or 'poll' can be observed for each item in the monitor window. See the section ‘S7 Data Monitor’ for further informations.



Enable this option to allow client modification of the update interval while the server is in operation. If enabled, a client can read and write the update interval on this topic using the item name **UPDATEINTERVAL**. If disabled, the client can only read the **Update Interval** configured for the topic.

Note The actual update interval for the slowest item on this topic can be read using the item name **MAXINTERVAL**. This gives you an indication of the performance of your configuration during operation.

Selecting this option forces the server to read input and output blocks (also peripherals) only if their address spaces are contiguous. Check this if you have some holes in your PLC’s input or output address space.



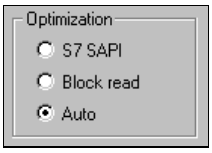
With this 3 radio buttons you are able to tune the poking behaviour to the PLC. The 3 modes behave as follows.

Control mode: This mode makes no folding of write values. This should be selected when using this topic with control clients like InBatch and InControl. If selected the server processes all poked values in the order they are received from a client and makes no folding of poke values.

Transition mode: This mode implements poke optimization except the server receives more than one value per item in one timeslice. If this happens only the first, the second and the last value is poked. This is the default selection and preserves InTouch sliders from stuttering.

Full optimization: This mode tells the server that he should build poke messages regardless of folding and poke order aspects.

Note The highest performance can be achieved with the **Full optimization** mode. But if you must be aware of the poke order and that no intermediate poke value is lost you have to choose the **Control mode**.



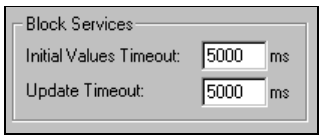
Choose one of these buttons to configure which optimization mode the server should use to get data from the PLC.

By default, the Auto mode is best to use when exploiting the whole PDU. The Auto mode should have the best performance in cases where you are not making too many activations and deactivations.

The Block read mode always registers a whole byte array containing some items. If you frequently switch items (activating and deactivating) that have similar addresses, this would be the best selection. In this mode, there are less activations and deactivations on the protocol.

The S7 SAPI mode is the same optimization mode used in the pre-release of the former S7 server. This mode has been implemented to keep the server compatible to the former server. This should be the less preferred optimization mode.

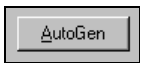
If you know how many services the remote PLC could handle this dialog box limits the use of cyclic services in this topic and can distribute the available cyclic services among the topics associated with this connection.



Timeouts are needed for block services to supervise the reading of initial values and updating the block items to this connection. A timeout value 0 disables the time supervision of block messages. Block services are unconfirmed services. If the remote station does not send data within this time range, the block service is reinitialized again and an error message is displayed in the WWLogger.

Select if Alarms or Events will be available in this topic.

Note On one SIMATIC NET connection only Alarms **or** Events are possible. If you need Alarms and Events in the same client application you need to create topics on two different connections (VFD's).



You can reach the **Automatic Topic Generation** dialog box using this button (refer to the associated section to get help in generating topics automatically).

Click **OK** to save changes and close the dialog box.

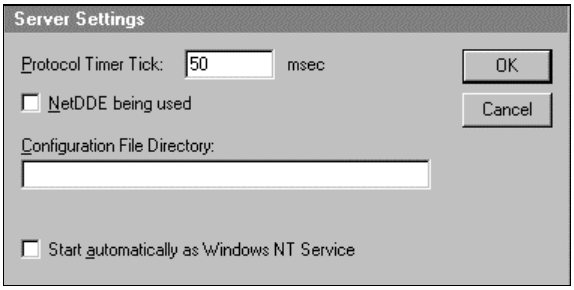
Click **Cancel** to close the dialog box without changing current settings.

Configuring the I/O Server Settings

Use the **Server Settings** option from the Configure menu to change the protocol timer, network using Wonderware NetDDE, change the default configuration file path, or to enable the server to start automatically as a Windows NT service.

Note When configuring the server on Windows NT, the user must be logged on with system administrator privileges. This will ensure that updates to the system registry may be performed.

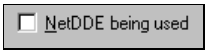
When the **Server Settings** option is selected, the **Server Settings** dialog box will appear:



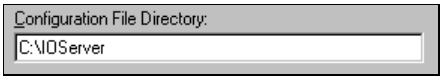
Server Settings

Enter the frequency (in milliseconds) that the server is to check for data to process. This should be approximately two to four times faster than the fastest rate desired to update data from the equipment.

Note The default protocol timer tick value will vary between servers.



Select this option if you are networking using Wonderware NetDDE.



To create a new default configuration file, enter the complete path for the directory in which the file is to be saved in this field. This new path will automatically be written to the **WIN.INI** file and the server will use this path to load its configuration file the next time it is started.

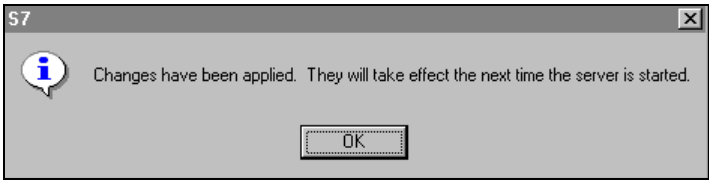
Enabling this option will cause the server to start as a Windows NT service.

Windows NT offers the capability of running applications even when a user is not logged on to the system. This is valuable when systems must operate in an unattended mode. Enabling this option and rebooting the system will cause the server to run as a Windows NT service. However, to view configuration information or to reconfigure the server, the user must log on to the system. Any server related problems that may arise such as missing adapter cards, licensing failures or device drivers not loading will not be visible to the user until a log on is performed. Disabling this option and rebooting the system will cause the server to run as a Windows NT application program once again.

Note It is highly recommended that the server is configured and communicating successfully prior to running it as a Windows NT service.

Click **Cancel** to close the dialog box without saving changes.

Click **OK** to accept the server settings. The following message box will appear:

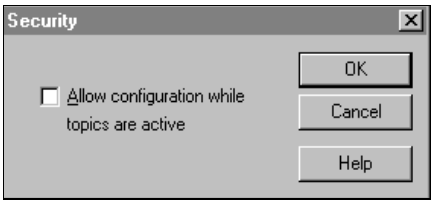


Click **OK** to close the dialog box.

Note You must restart the server for the changes to take effect.

Configuring Security

Use the **Security** option from the configure menu to control server configuration changes.



Security

When the server is not active (no clients connected), all server configuration options are available for modification.

The default setting for **Allow configuration while topics are active** is disabled. When disabled, all topics are viewable but locked against changes while the server is active (a client is connected).

Enable **Allow configuration while topics are active** to allow write access to some parameters of the topic configuration while the server is active. This server supports write access to **Update Interval** and **Enable Access to Update Interval**. You cannot add, delete, rename or change other parameters of a topic configuration.

Click **OK** to save changes and close the dialog box.

Click **Cancel** to close the dialog box without saving changes.

Configuring Logger

Use the **Logger** option from the configure menu to set the working logger mode of the server. The options controlled by this dialog box are NOT retained in the configuration file.

Set Logger Mode

Note Each time the server starts, the logger mode will default to **ERRORS**.

Select **OFF** to disable normal server logging.

Select **ERRORS** for normal operation logging to the Wonderware Logger.

Select **TRACE** to log errors and all activation/deactivation activities including calls to the S7.

Select **ALL** to log all activities including single item value updates.

Enable **Show protocol** to add PLC communication message data to the selected logger mode.

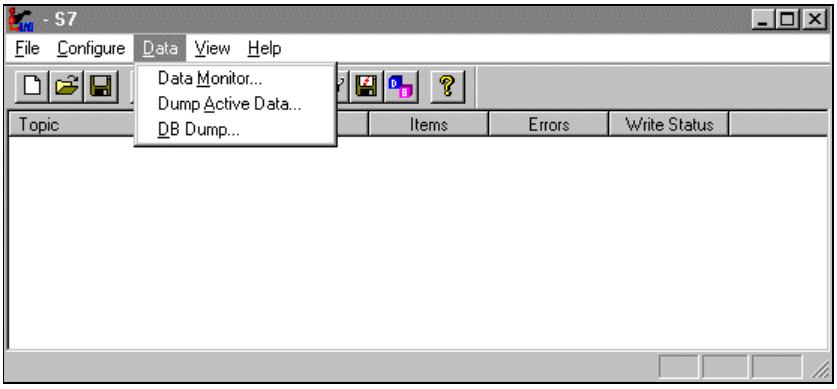
Click **OK** to use changes and close the dialog box.

Click **Cancel** to close the dialog box without changing current settings.

Note When logging activity increases, the server's performance degrades.

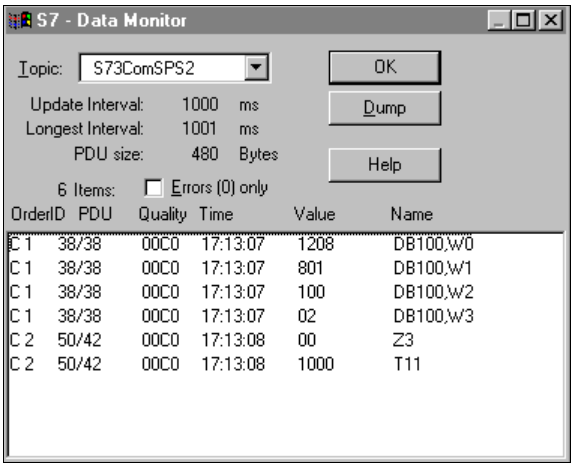
Data Menu

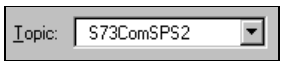
The Data menu contains two commands, **Monitor** and **Dump Active Data**, that are used for diagnostic purposes during runtime (when a client is attached). The remaining command, **DB Dump**, is used to transfer the internal topic database to InTouch.



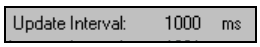
S7 Data Monitor

Use the **Monitor** option from the data menu to display information about a selected topic with active items or errors. The information is updated as it changes. This is a useful tool for tracking down errors, for determining performance and to validate item values. When the **Monitor** option is selected, the **S7 Data Monitor** dialog box will appear.





This drop down list box allows you to select any of the active topics. A preceding '*' indicates that at least one item in this topic has an error while a preceding '#' indicates bad status.

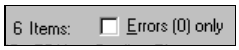


This field displays the current configured update interval of the topic. This value changes whenever the value is poked via I/O. The displayed value is the **UPDATEINTERVAL** item value.

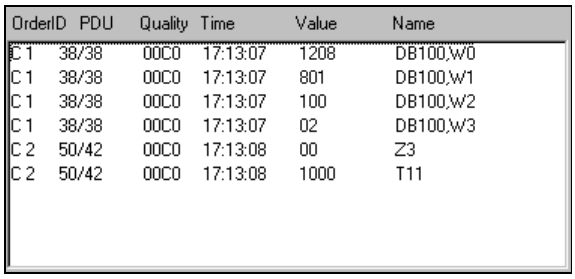
This field displays the current update interval of the slowest item of the topic. This value is measured for each poll cycle and each received cyclic service indication. If this value drastically differs from the desired update interval the communication media is not fast enough to satisfy the load. The displayed value is the **MAXINTERVAL** item value.

Note Both values: update interval and longest interval are accessible via I/O. You can create an WindowView performance meter by displaying these values graphically for each topic. If I/O access is enabled, you can even tune the bus performance conveniently from WindowView.

This line shows the available PDU size for this topic. The larger the value, the more data can be send in one message.



This field displays the number of active items and the number of items with errors (in parenthesis). If you check this box, only items with errors will be displayed in the item data list box.



The item list box adapts to the size of the dialog box. So you can resize it for your personal needs. The server will save the size and position.

The item data list box displays information about each item. The box is divided into 6 columns. The first column displays the message type and the orderid of the message which contains this item (‚P' for a polled message and ‚C' for a cyclic message). The second column shows the filling of the request and response PDU. The maximum value is the PDU size shown above in the monitor window. The third column displays the data quality. The fourth column shows the timestamp of the last update of that item. The fifth column shows the raw item value prior to conversion in HEX. Only message data are displayed as an ASCII string and real data in a short real format. The last column contains the item name.

There are six basic data quality states an item can have:

Data quality good 00C0

Data communications are good. Data is good.
The register was read or written without any problems converting the data.

Clamp hi 0056

Data communications are good. Data is not good.

The data is clamped at high limit.

The register was read or written OK but it was necessary to clamp its value to a limit.

The value is larger than the maximum allowed.

A string is truncated.

Example: A floating point value is clamped to FLT_MAX.

Clamp lo 0055

Data communications are good. Data is not good.

The data is clamped at low limit.

The register was read or written OK but it was necessary to clamp its value to a limit.

The value is smaller than the minimum allowed.

Cannot convert 0040

Data communications are good. Data is not good.

The data could not be converted.

The server may return either a constant in place of the data or return quality information alone.

The data is not useable, it is not known whether the value is too large or too small.

Incorrect data type.

Floating point not-a-number.

Example: 0x000a in a PLC BCD register.

No access 0004

Bad, Configuration Error.

Data communications are good. Data cannot be sent and/or received.

Cannot access the item.

The item does not exist.

The item is not available.

The server is able to communicate with the PLC but is not able to access the register.

The server determined the point is not valid.

The PLC responds that the register does not exist, cannot be read, or cannot be written.

Cannot access a fenced, write-protected, or read-only item.

The PLC is in a mode which does not permit access to this item.

Incorrect number of data bytes (but the message is otherwise good).

Invalid command or invalid op code (but the message is otherwise good).

The PLC is busy. The server gave up retrying.

No communication 0018

Data communications are down.

Cannot access the PLC due to a communications error.

The topic is in slow poll (or equivalent) mode.

The PLC does not exist and/or is not responding.

There is no link validating message.

Lack or resources in the server. A TSR (or driver) cannot allocate memory.

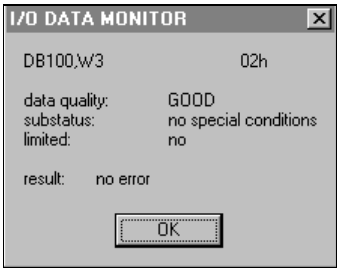
Lack of resources in the communications link.

The communications link is off-line.

All communications channels are in use.

The network is unable to route the message to the PLC.

Click on an item line to open a dialog box displaying the item properties:



Click **OK** to return to the **S7 Data Monitor** dialog box.

Click **Dump** to dump the contents of the monitor window into an ASCII text file. The resulting file can be loaded into Excel or any standard text editor. All columns are separated by tabs. After the dump is complete, a message box containing the newly created ASCII text file name is displayed.

The server automatically generates the ASCII text file name and sets the files location using the following pattern:

<current working directory>\datmonXX.txt

Where XX is a two digit number between 00 and 99. S7 increments the number each time a file is dumped.

Note Existing files with the same name are erased.

Click **OK** to return to the **S7 Data Monitor** dialog box.

Dump Active Data

Use the **Dump Active Data** option from the data menu to dump information on topics with active items into an ASCII text file. The resulting file can be loaded into Excel or any standard text editor. All columns are separated by tabs.

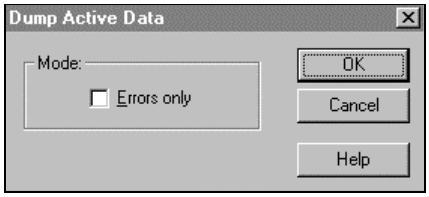
The server automatically generates the ASCII text file name and sets the files location using the following pattern:

<current working directory>\datdmpXX.txt

Where XX is a two digit number between 00 and 99.

The server increments XX each time a file is dumped.

When the **Dump Active Data** option is selected, the **Dump Active Data** dialog box will appear.

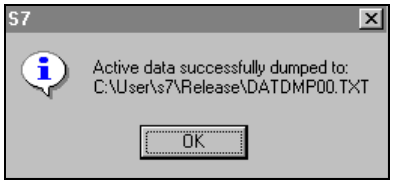


Enable **Errors only** option to dump topics with errors.

Click **OK** to start the dump.

Click **Cancel** to close dialog without creating dump file.

After the dump is complete, a message box containing the newly created ASCII text file name is displayed.

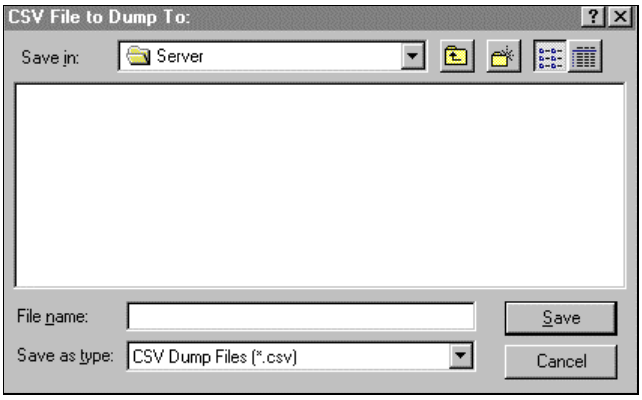


Note Existing files with the same name are erased.

Dump Topic Database

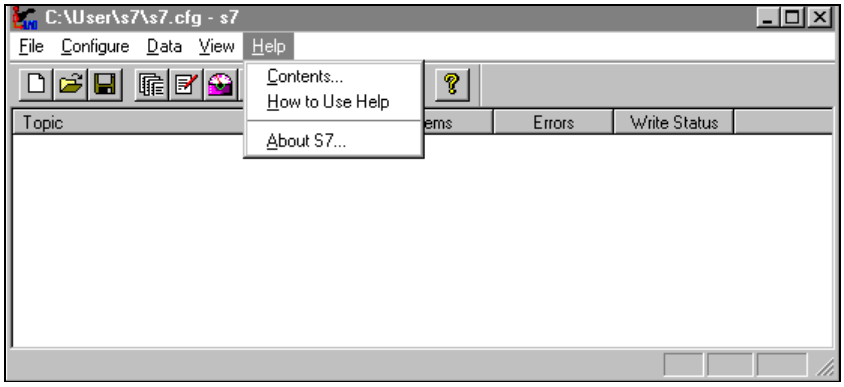
Use the **DB Dump** option from the data menu to dump the internal topic database into a CSV format file. Wonderware's DbLoad utility can use the resulting file to automatically generate InTouch access names.

Create the file by selecting a directory and filename using the standard dialog shown below:



Accessing I/O Server Help

The Help menu contains two commands that are used to access help for the server.



The following briefly describes the Help menu options.

Contents

This option is used to display the table of contents for the Help file.

How to Use Help

This option is used to access a list of basic instructions for using the Help file.

About S7

This option is used to access miscellaneous information regarding the server, such as the software version, the copyright information, license information, etc.

Your FactorySuite system license information can be viewed through the license viewing utility that is launched from the **About** dialog box.

For more information on obtaining technical support, see your online *FactorySuite System Administrator's Guide*.

Item Names

The Wonderware Siemens SIMATIC NET S7 IO Server uses an item naming convention based on the two letter data type identifiers that are used in programming Siemens PLCs. With one exception, the Siemens SIMATIC NET S7 IO Server accepts both German and English standard identifiers.

Siemens SIMATIC S7 PLC Item Naming

The following tables represent the Item Naming for the Siemens SIMATIC S7 PLC. The ranges specified below may vary according to the type of controller being used.

Data Blocks DB (Datenbausteine)

Instance Blocks DI (Instanzbausteine)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	D<B,I>*d*,X*x*.*y*		Discrete	0 or 1
String	D<B,I>*d*,S*x*,*v*		Message	String
	D<B,I>*d*,STRING*x*,*v*		Message	String
Byte	D<B,I>*d*,B*x*		Integer	0 to 255
	D<B,I>*d*,BYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Byte Array	D<B,I>*d*,B*x*,*v*		Message	Hex ASCII String
	D<B,I>*d*,BYTE*x*,*v*		Message	Hex ASCII String
Char	D<B,I>*d*,CHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	D<B,I>*d*,CHAR*x*,*v*		Message	Hex ASCII String
Word	D<B,I>*d*,W*n*		Integer	0 to 65535
	D<B,I>*d*,WORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D	Message	1990-1-1 to 2168-12-31
Word Array	D<B,I>*d*,W*n*,*v*		Message	Hex ASCII String
	D<B,I>*d*,WORD*n*,*v*		Message	Hex ASCII String
Integer	D<B,I>*d*,INT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D	Message	1990-1-1 to 2168-12-31
Integer Array	D<B,I>*d*,INT*n*,*v*		Message	Hex ASCII String
Double Word	D<B,I>*d*,D*m*		Integer	0 to 2147483647
	D<B,I>*d*,DWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Word Array	D<B,I>*d*,D*m*,*v*		Message	Hex ASCII String
	D<B,I>*d*,DWORD*m*,*v*		Message	Hex ASCII String
Double Integer	D<B,I>*d*,DINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	D<B,I>*d*,DINT*m*,*v*		Message	Hex ASCII String
Real	D<B,I>*d*,REAL*m*		Real	±3.4e38
Real Array	D<B,I>*d*,REAL*m*,*v*		Message	Hex ASCII String

Note All Data Blocks are **Read/Write** (*d*=1 to 65,535, *x*=0 to 65,535, *n*=0 to 65,534, *m*=0 to 65,532, *y*=0 to 7, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. The longest string that can be poked is 256 bytes or the PDU size minus 28 bytes, whichever is less. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to a Data Block. **Examples:** DB123,W24; DB23,DINT10BCD; DI5,X2.0; DI6,BYTE4,10.

Flag Bytes (Merker)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	FX*x.y*		Discrete	0 or 1
	MX*x.y*		Discrete	0 or 1
String	FS*x,v*		Message	String
	MS*x,v*		Message	String
	FSTRING*x,v*		Message	String
	MSTRING*x,v*		Message	String
Byte	FB*x*		Integer	0 to 255
	MB*x*		Integer	0 to 255
	FBYTE*x*		Integer	0 to 255
	MBYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Byte Array	FB*x,v*		Message	Hex ASCII String
	MB*x,v*		Message	Hex ASCII String
	FBYTE*x,v*		Message	Hex ASCII String
	MBYTE*x,v*		Message	Hex ASCII String
Char	FCHAR*x*		Integer	-128 to 127
	MCHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	FCHAR*x,v*		Message	Hex ASCII String
	MCHAR*x,v*		Message	Hex ASCII String
Word	FW*n*		Integer	0 to 65535
	MW*n*		Integer	0 to 65535
	FWORD*n*		Integer	0 to 65535
	MWORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D	Message	1990-1-1 to 2168-12-31
Word Array	FW*n,v*		Message	Hex ASCII String
	MW*n,v*		Message	Hex ASCII String
	FWORD*n,v*		Message	Hex ASCII String
	MWORD*n,v*		Message	Hex ASCII String

Flag Bytes (Merker) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Integer	FINT*n*		Integer	-32768 to 32767
	MINT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D	Message	1990-1-1 to 2168-12-31
Integer Array	FINT*n,v*		Message	Hex ASCII String
	MINT*n,v*		Message	Hex ASCII String
Double Word	FD*m*		Integer	0 to 2147483647
	MD*m*		Integer	0 to 2147483647
	FDWORD*m*		Integer	0 to 2147483647
	MDWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Word Array	FD*m,v*		Message	Hex ASCII String
	MD*m,v*			
	FDWORD*m,v*		Message	Hex ASCII String
	MDWORD*m,v*		Message	Hex ASCII String
Double Integer	FDINT*m*		Integer	-2147483648 to 2147483647
			Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
	MDINT*m*	TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	FDINT*m,v*		Message	Hex ASCII String
	MDINT*m,v*		Message	Hex ASCII String
Real	FREAL*m*		Real	±3.4e38
	MREAL*m*			
Real Array	FREAL*m,v*		Message	Hex ASCII String
	MREAL*m,v*			

Note All Flags are **Read/Write** (*x*=0 to 65,535, *y*=0 to 7, *n*=0 to 65,534, *m*=0 to 65,532, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. The longest string that can be poked is 256 bytes or the PDU size minus 28 bytes, whichever is less. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to a Flag Byte.

Input Bytes (Eingänge)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	I*x.y*		Discrete	0 or 1
	E*x.y*		Discrete	0 or 1
	IX*x.y*		Discrete	0 or 1
	EX*x.y*		Discrete	0 or 1
String	IS*x,v*		Message	String
	ES*x,v*		Message	String
	ISTRING*x,v*		Message	String
	ESTRING*x,v*		Message	String
Byte	IB*x*		Integer	0 to 255
	EB*x*		Integer	0 to 255
	IBYTE*x*		Integer	0 to 255
	EBYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Byte Array	IB*x,v*		Message	Hex ASCII String
	EB*x,v*		Message	Hex ASCII String
	IBYTE*x,v*		Message	Hex ASCII String
	EBYTE*x,v*		Message	Hex ASCII String
Char	ICHAR*x*		Integer	-128 to 127
	ECHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	ICHAR*x,v*		Message	Hex ASCII String
	ECHAR*x,v*		Message	Hex ASCII String
Word	IW*n*		Integer	0 to 65535
	EW*n*		Integer	0 to 65535
	IWORD*n*		Integer	0 to 65535
	EWORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D	Message	1990-1-1 to 2168-12-31
Word Array	IW*n,v*		Message	Hex ASCII String
	EW*n,v*		Message	Hex ASCII String
	IWORD*n,v*		Message	Hex ASCII String
	EWORD*n,v*		Message	Hex ASCII String
Integer	IINT*n*		Integer	-32768 to 32767
	EINT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D	Message	1990-1-1 to 2168-12-31
Integer Array	IINT*n,v*		Message	Hex ASCII String
	EINT*n,v*		Message	Hex ASCII String
Double Word	ID*m*		Integer	0 to 2147483647
	ED*m*		Integer	0 to 2147483647
	IDWORD*m*		Integer	0 to 2147483647
	EDWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS

Input Bytes (Eingänge) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Double Word Array	ID*m,v*		Message	Hex ASCII String
	ED*m,v*		Message	Hex ASCII String
	IDWORD*m,v*		Message	Hex ASCII String
	EDWORD*m,v*		Message	Hex ASCII String
Double Integer	IDINT*m*		Integer	-2147483648 to 2147483647
	EDINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	IDINT*m,v*		Message	Hex ASCII String
	EDINT*m,v*		Message	Hex ASCII String
Real	IREAL*m*		Real	±3.4e38
	EREAL*m*		Real	±3.4e38
Real Array	IREAL*m,v*		Message	Hex ASCII String
	EREAL*m,v*		Message	Hex ASCII String

Note All Inputs are **Read Only** (*x*=0 to 65,535, *y*=0 to 7, *n*=0 to 65,534, *m*=0 to 65,532, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will **not** process a write (**POKE**) to an Input Byte.

Output Bytes (Ausgänge)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	O*x.y*		Discrete	0 or 1
	A*x.y*		Discrete	0 or 1
	OX*x.y*		Discrete	0 or 1
	AX*x.y*		Discrete	0 or 1
String	OS*x,v*		Message	String
	AS*x,v*		Message	String
	OSTRING*x,v*		Message	String
	ASTRING*x,v*		Message	String
Byte	OB*x*		Integer	0 to 255
	AB*x*		Integer	0 to 255
	OBYTE*x*		Integer	0 to 255
	ABYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Byte Array	OB*x,v*		Message	Hex ASCII String
	AB*x,v*		Message	Hex ASCII String
	OBYTE*x,v*		Message	Hex ASCII String
	ABYTE*x,v*		Message	Hex ASCII String
Char	OCHAR*x*		Integer	-128 to 127
	ACHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	OCHAR*x,v*		Message	Hex ASCII String
	ACHAR*x,v*		Message	Hex ASCII String
Word	OW*n*		Integer	0 to 65535
	AW*n*		Integer	0 to 65535
	OWORD*n*		Integer	0 to 65535
	AWORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D	Message	1990-1-1 to 2168-12-31
Word Array	OW*n,v*		Message	Hex ASCII String
	AW*n,v*		Message	Hex ASCII String
	OWORD*n,v*		Message	Hex ASCII String
	AWORD*n,v*		Message	Hex ASCII String
Integer	OINT*n*		Integer	-32768 to 32767
	AINT*n*		Integer	-32768 to 32768
		BCD	Integer	-999 to 999
		D	Message	1990-1-1 to 2168-12-31
Integer Array	OINT*n,v*		Message	Hex ASCII String
	AINT*n,v*		Message	Hex ASCII String
Double Word	OD*m*		Integer	0 to 2147483647
	AD*m*		Integer	0 to 2147483647
	ODWORD*m*		Integer	0 to 2147483647
	ADWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS

Output Bytes (Ausgänge) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Double Word Array	OD*m,v*		Message	Hex ASCII String
	AD*m,v*		Message	Hex ASCII String
	ODWORD*m,v*		Message	Hex ASCII String
	ADWORD*m,v*		Message	Hex ASCII String
Double Integer	ODINT*m*		Integer	-2147483648 to 2147483647
	ADINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	ODINT*m,v*		Message	Hex ASCII String
	ADINT*m,v*		Message	Hex ASCII String
Real	OREAL*m*		Real	±3.4e38
	AREAL*m*		Real	±3.4e38
Real Array	OREAL*m,v*		Message	Hex ASCII String
	AREAL*m,v*		Message	Hex ASCII String

Note All Outputs are **Read/Write** (*x*=0 to 65,535, *y*=0 to 7, *n*=0 to 65,534, *m*=0 to 65,532, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. The longest string that can be poked is 256 bytes or the PDU size minus 28 bytes, whichever is less. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to an Output Byte.

Peripheral Input Bytes (Peripherieeingänge)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	PI*x.y*		Discrete	0 or 1
	PE*x.y*		Discrete	0 or 1
	PIX*x.y*		Discrete	0 or 1
	PEX*x.y*		Discrete	0 or 1
String	PIS*x,v*		Message	String
	PES*x,v*		Message	String
	PISTRING*x,v*		Message	String
	PESTRING*x,v*		Message	String
Byte	PIB*x*		Integer	0 to 255
	PEB*x*		Integer	0 to 255
	PIBYTE*x*		Integer	0 t o 255
	PEBYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999

Peripheral Input Bytes (Peripherieeingänge) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Byte Array	PIB*x,v*		Message	Hex ASCII String
	PEB*x,v*		Message	Hex ASCII String
	PIBYTE*x,v*		Message	Hex ASCII String
	PEBYTE*x,v*		Message	Hex ASCII String
Char	PICHAR*x*		Integer	-128 to 127
	PECHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	PICHAR*x,v*		Message	Hex ASCII String
	PECHAR*x,v*		Message	Hex ASCII String
Word	PIW*n*		Integer	0 to 65535
	PEW*n*		Integer	0 to 65535
	PIWORD*n*		Integer	0 to 65535
	PEWORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D		1990-1-1 to 2168-12-31
Word Array	PIW*n,v*		Message	Hex ASCII String
	PEW*n,v*		Message	Hex ASCII String
	PIWORD*n,v*		Message	Hex ASCII String
	PEWORD*n,v*		Message	Hex ASCII String
Integer	PIINT*n*		Integer	-32768 to 32767
	PEINT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D		1990-1-1 to 2168-12-31
Integer Array	PIINT*n,v*		Message	Hex ASCII String
	PEINT*n,v*		Message	Hex ASCII String
Double Word	PID*m*		Integer	0 to 2147483647
	PED*m*		Integer	0 to 2147483647
	PIDWORD*m*		Integer	0 to 2147483647
	PEDWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Word Array	PID*m,v*		Message	Hex ASCII String
	PED*m,v*		Message	Hex ASCII String
	PIDWORD*m,v*		Message	Hex ASCII String
	PEDWORD*m,v*		Message	Hex ASCII String
Double Integer	PIDINT*m*		Integer	-2147483648 to 2147483647
	PEDINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	PIDINT*m,v*		Message	Hex ASCII String
	PEDINT*m,v*			

Peripheral Input Bytes (Peripherieeingänge) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Real	PIREAL*m*		Real	±3.4e38
	PEREAL*m*		Real	±3.4e38
Real Array	PIREAL*m,v*		Message	Hex ASCII String
	PEREAL*m,v*		Message	Hex ASCII String

Note All Peripheral Inputs are **Read Only** (*x*=0 to 65,535, *n*=0 to 65,534, *m*=0 to 65,532, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will **not** process a write (**POKE**) to a Peripheral Input Byte. Some input modules are not readable.

Peripheral Output Bytes (Peripherieausgänge)

Data Format	Item/Point	Suffix	Data Type	Range
Bit	PO*x.y*		Discrete	0 or 1
	PA*x.y*		Discrete	0 or 1
	POX*x.y*		Discrete	0 or 1
	PAX*x.y*		Discrete	0 or 1
String	POS*x,v*		Message	String
	PAS*x,v*		Message	String
	POSTRING*x,v*		Message	String
	PASTRING*x,v*		Message	String
Byte	POB*x*		Integer	0 to 255
	PAB*x*		Integer	0 to 255
	POBYTE*x*		Integer	0 to 255
	PABYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Byte Array	POB*x,v*		Message	Hex ASCII String
	PAB*x,v*		Message	Hex ASCII String
	POBYTE*x,v*		Message	Hex ASCII String
	PABYTE*x,v*		Message	Hex ASCII String
Char	PACHAR*x*		Integer	-128 to 127
	POCHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	POCHAR*x,v*		Message	Hex ASCII String
	PACHAR*x,v*		Message	Hex ASCII String
Word	POW*n*		Integer	0 to 65535
	PAW*n*		Integer	0 to 65535
	POWORD*n*		Integer	0 to 65535

Peripheral Output Bytes (Peripherieausgänge) (continued)

Data Format	Item/Point	Suffix	Data Type	Range
	PAWORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D		1990-1-1 to 2168-12-31
Word Array	POW*n,v*		Message	Hex ASCII String
	PAW*n,v*		Message	Hex ASCII String
	POWORD*n,v*		Message	Hex ASCII String
	PAWORD*n,v*		Message	Hex ASCII String
Integer	POINT*n*		Integer	-32768 to 32767
	PAINT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D		1990-1-1 to 2168-12-31
Integer Array	POINT*n,v*		Message	Hex ASCII String
	PAINT*n,v*		Message	Hex ASCII String
Double Word	POD*m*		Integer	0 to 2147483647
	PAD*m*		Integer	0 to 2147483647
	PODWORD*m*		Integer	0 to 2147483647
	PADWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Word Array	POD*m,v*		Message	Hex ASCII String
	PAD*m,v*		Message	Hex ASCII String
Double Integer	PODINT*m*		Integer	-2147483648 to 2147483647
	PADINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	PODINT*m,v*		Message	Hex ASCII String
	PADINT*m,v*			
Real	POREAL*m*		Real	±3.4e38
	PAREAL*m*		Real	±3.4e38
Real Array	POREAL*m,v*		Message	Hex ASCII String
	PAREAL*m,v*		Message	Hex ASCII String

Note All Peripheral Outputs are **WriteOnly** (*x*=0 to 65,535, *n*=0 to 65,534, *m*=0 to 65,532, *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. The longest string that can be poked is 256 bytes or the PDU size minus 28 bytes, whichever is less. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to a Peripheral Output Byte. All output modules are not readable but only POKES are allowed.

Counters

Data Format	Item/Point	Suffix	Data Type	Range
Word	C*x*	None	Integer	0...65535
	Z*x*	None	Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s

Note All Counters are **Read/Write** (*x*=0 to 65,535). The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to a Counter. Although the S7 server allows to poke any word value into counters, the S7 PLC can only process values in the range of 0..2457 or 0..999 (BCD).

Timers

Data Format	Item/Point	Suffix	Data Type	Range
Word	T*x*	None	Integer	0 to 14745
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
	TREAL*x*	None	Real	0.0 to 9990.00

Note All Timers are **Read/Write** (*x*=0 to 65,535). The Wonderware Siemens SIMATIC NET S7 I/O Server will process a write (**POKE**) to a Timer. Although the S7 server allows to poke any word value into timers, the S7 PLC can only process values that represent a valid time format.

Block Items

Block items are available only if a BSEND routine is configured/programmed in the remote PLC. With these items you are able to read huge data blocks (up to 64kByte) out of the PLC. These items are only available if your SIMATIC NET driver supports block services. For more information refer to your Siemens manuals.

Data Format	Item/Point	Suffix	Data Type	Range
Bit	BL*d*,X*x*.*y*		Discrete	0 or 1
String	BL*d*,S*x*,*v*		Message	String
	BL*d*,STRING*x*,*v*		Message	String
Byte	BL*d*,B*x*		Integer	0 to 255
	BL*d*,BYTE*x*		Integer	0 to 255
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999

Block Items (continued)

Data Format	Item/Point	Suffix	Data Type	Range
Byte Array	BL*d*,B*x*,*v*		Message	Hex ASCII String
	BL*d*,BYTE*x*,*v*		Message	Hex ASCII String
Char	BL*d*,CHAR*x*		Integer	-128 to 127
		DT	Message	1990-1-1-0:00:00.000 to 2089-12-31-23:59:59.999
Char Array	BL*d*,CHAR*x*,*v*		Message	Hex ASCII String
Word	BL*d*,W*n*		Integer	0 to 65535
	BL*d*,WORD*n*		Integer	0 to 65535
		BCD	Integer	0 to 9999
		KT	Message	0.0 to 999.3
		S5T	Message	0ms to 2h46m30s
		TR	Real	0.0 to 9990.0 (s)
		D	Message	1990-1-1 to 2168-12-31
Word Array	BL*d*,W*n*,*v*		Integer	0 to 65535
	BL*d*,WORD*n*,*v*		Integer	0 to 65535
Integer	BL*d*,INT*n*		Integer	-32768 to 32767
		BCD	Integer	-999 to 999
		D	Message	1990-1-1 to 2168-12-31
Integer Array	BL*d*,INT*n*,*v*		Message	Hex ASCII String
Double Word	BL*d*,D*m*		Integer	0 to 2147483647
	BL*d*,DWORD*m*		Integer	0 to 2147483647
		BCD	Integer	0 to 99999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Word	BL*d*,D*m*,*v*		Message	Hex ASCII String
Array	BL*d*,DWORD*m*,*v*		Message	Hex ASCII String
Double Integer	BL*d*,DINT*m*		Integer	-2147483648 to 2147483647
		BCD	Integer	-9999999 to 9999999
		TOD	Message	0:00:00.000 to 23:59:59.999
		T	Message	-24D_20H_31M_23S_648MS to 24D_20H_31M_23S_647MS
Double Integer Array	BL*d*,DINT*m*,*v*		Message	Hex ASCII String
Real	BL*d*,REAL*m*		Real	±3.4e38
Real Array	BL*d*,REAL*m*,*v*		Message	Hex ASCII String

Note All Block Items are **ReadOnly** (*d*=0 to 4,294,967,296 (this is the r_id configured in the SFB 12 call in the remote PLC), *x*=0 to 65,533, *n*=0 to 65,532, *m*=0 to 65,530, *y*=0 to 7, *v*=0 to 65534). The longest string or array that can be read in a cyclic service has the length of 65534 bytes. The longest string InTouch can process is 131 bytes. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will **not** process a write (**POKE**) to a Block Item.

Alarms and Events

The Wonderware Siemens SIMATIC NET S7 I/O Server offers the possibility to read Alarms and Events generated either by SFB33 to SFB36 (Alarms) or by the Symbol Editor (Events).

The item syntax for Alarms and Events is as follows:

ALARM<*EV_ID*>.<Extension 1>[,<Extension 2>[<Suffix>]]

EVENT<*EV_ID*>.<Extension 1>[,<Extension 2>[<Suffix>]]

For valid values for Extension 1, Extension 2 and Suffix and for valid combinations please refer to the following table:

Item	Extension 1	Extension 2	Suffix	Message	Range
ALARM<*EV_ID*>	EVENT_STATE			Integer	0 to 65535
	STATE			Integer	0 to 65535
	ACK_STATE			Integer	0 to 65535
	TIME_STAMP			Message	String
	NO_ADD_VALUES			Integer	0 to 10
	ADD_VALUE*w*	DATA_TYPE		Message	String
		LENGTH		Integer	0 to 65535
		X*x.y*		Discrete	0 or 1
		S*x,v*		Message	String
		STRING*x,v*		Message	String
		B*x*		Integer	0 to 255
		BYTE*x*		Integer	0 to 255
			DT	Message	String
		B*x*		Message	Hex ASCII String
		BYTE*x,v*		Message	Hex ASCII String
		CHAR*x*		Integer	-128 to 127
			DT	Message	String
		CHAR*x,v*		Message	Hex ASCII String
		W*n*		Integer	0 to 65535
		WORD*n*		Integer	0 to 65535
			BCD	Integer	0 to 9999
			KT	Message	0.0 to 999.3
			S5T	Message	0ms to 2h46m30s
			D	Message	String
		W*n,v*		Message	Hex ASCII String
		WORD*n,v*		Message	Hex ASCII String
		INT*n*		Integer	-32768 to 32767
			BCD	Integer	0 to 9999
			D	Message	String
		INT*n,v*		Message	Hex ASCII String
		D*m*		Integer	0 to 2147483647
		DWORD*m*		Integer	0 to 2147483647
			BCD	Integer	0 to 99999999
			T	Message	String
			TOD	Message	String
		D*m,v*		Message	Hex ASCII String
		DWORD*m,v*		Message	Hex ASCII String
		DINT*m*		Integer	-2147483648 to 2147483647
			BCD	Integer	0 to 99999999
			T	Message	String
			TOD	Message	String

Alarms and Events (continued)

Item	Extension 1	Extension 2	Suffix	Message	Range
		DINT*m,v*		Message	Hex ASCII String
		REAL*m*		Real	±3.4e38
		REAL*m,v*		Message	Hex ASCII String
EVENT<*EV_ID*>	EVENT_STATE			Integer	0 to 65535
	STATE			Integer	0 to 65535
	ACK_STATE			Integer	0 to 65535
	TIME_STAMP			Message	String
	NO_ADD_VALUES			Integer	0 to 10
	ADD_VALUE*w*	DATA_TYPE		Message	String
		LENGTH		Integer	0 to 65535
		X*x.y*		Discrete	0 or 1
		S,*v*		Message	String
		STRING*x,v*		Message	String
		B*x*		Integer	0 to 255
		BYTE*x*		Integer	0 to 255
			DT	Message	String
		B*x,v*		Message	Hex ASCII String
		BYTE*x,v*		Message	Hex ASCII String
		CHAR*x*		Integer	-128 to 127
			DT	Message	String
		CHAR*x,v*		Message	Hex ASCII String
		W*n*		Integer	0 to 65535
		WORD*n*		Integer	0 to 65535
			BCD	Integer	0 to 9999
			KT	Message	0.0 to 999.3
			S5T	Message	0ms to 2h46m30s
			D	Message	String
		W*n,v*		Message	Hex ASCII String
		WORD*n,v*		Message	Hex ASCII String
		INT*n*		Integer	-32768 to 32767
			BCD	Integer	0 to 9999
			D	Message	String
		INT*n,v*		Message	Hex ASCII String
		D*m*		Integer	0 to 2147483647
		DWORD*m*		Integer	0 to 2147483647
			BCD	Integer	0 to 99999999
			T	Message	String
			TOD	Message	String
		D*m,v*		Message	Hex ASCII String
		DWORD*m,v*		Message	Hex ASCII String
		DINT*m*		Integer	-2147483648 to 2147483647
			BCD	Integer	0 to 99999999
			T	Message	String
			TOD	Message	String
		DINT*m,v*		Message	Hex ASCII String
		REAL*m*		Real	±3.4e38
		REAL*m,v*		Message	Hex ASCII String

Note All Alarms and Events are **Read only** (<*EV_ID*> is the ID defined by Step7, in integer format, filled with leading zeros up to 6 characters; *w*=1 to 10; *x*=0 to 65,535; *n*=0 to 65,534; *m*=0 to 65,532; *y*=0 to 7; *v*=1 to net PDU data size/type size - header information, this size may vary). The longest string or array that can be read in a cyclic service has the length of the PDU size minus 32 bytes. The longest string InTouch can process is 131 bytes. Arrays are converted into HEXASCII strings representing the big endian format of the binary data. The Wonderware Siemens SIMATIC NET S7 I/O Server will not process writes (**POKES**) to Alarms and Events.

Note This version of Wonderware Siemens SIMATIC NET S7 I/O Server does not allow acknowledgment of Alarms and Events.

Examples:

ALARM000010.TIME_STAMP
EVENT001234.ADD_VALUE2,LENGTH
ALARM000555.ADD_VALUE10,REAL0
EVENT000001.ADD_VALUE3,D0TOD

Some additional explanations:

EVENT_STATE:	State of the Alarm/Event itself. If the Alarm/Event is TRUE, then EVENT_STATE is TRUE and vice versa. Please refer to the Step7 documentation for more detailed information.
STATE:	The state of the communication. Please refer to the Step7 documentation for more detailed information.
ACK_STATE:	The state of the acknowledgement of coming or going Alarms/Events. Please refer to the Step7 documentation for more detailed information.
TIME_STAMP:	Time stamp of the Alarm/Event, provided by the PLC.
NO_ADD_VALUES:	Number of additional values that are sent with this Alarm/Event message.
ADD_VALUE*w*,DATA_TYPE:	Data type of a specific additional value of an Alarm/Event
ADD_VALUE*w*,LENGTH:	Length of a specific additional value of an Alarm/Event
<*EV_ID*>:	The event ID is created automatically by the Step7 programming software. In case of Alarms (FB33 to FB36) this is the EV_ID-parameter of the function block. The value of the parameter must be converted from hexadecimal to decimal and then filled up with leading „0“ to the length of 6 characters (e.g.: EV_ID: DW#16#4E25 => <*EV_ID*>: 020005). In case of Events (Generated by the symbol editor) this is the „Message Number“. This number is in decimal format and must be filled with leading „0“ up to 6 characters (e.g.: „Message number“: 20000 => <*EV_ID*>: 020000).

Predefined Item/Point Names

All S7 topics have predefined item/point names to monitor and control communication properties.

UPDATEINTERVAL Item

The **UPDATEINTERVAL** item is used to access the currently set update interval. It is the same value displayed in the monitor window of the S7 server. It indicates the currently requested update interval in milliseconds. If the corresponding topic is configured for "Enable I/O access to update interval", a client can poke new values into this item. In any case the value can always be read through I/O. The range of valid values differs with respect to the topic settings. The value of zero indicates that no items on that topic are updated.

I/O Type: INTEGER

ACCESS: READ/WRITE (if configured)

RANGE: 1.. 2147483647

0 (topic inactive, no items are updated)

Note By poking a value of zero into the update interval item a client can conveniently stop all update activities on the corresponding topic without having to deactivate the items.

MAXINTERVAL Item

The **MAXINTERVAL** item is used to access the measured maximum update interval in milliseconds of all items of the corresponding topic for the last completed poll cycle. It is the same value displayed in the monitor window of the S7 server under "Longest Interval". This item is read only. The value of the slowest item is displayed.

I/O Type: INTEGER

ACCESS: READ

RANGE: 0..2147483647

Note Use the **UPDATEINTERVAL** and **MAXINTERVAL** items to conveniently tune the performance of the communication via I/O.

STORESETTINGS Item

The **STORESETTINGS** item is used to make the temporary update interval changes via I/O permanent. If the client pokes a value of 1 into the **STORESETTINGS** item the currently set update interval is written to the servers configuration file. If the update interval has been changed via I/O and **STORESETTINGS** is not poked to 1 the server will use the original update interval for that topic the next time it is started. Reading the item will always give 0.

I/O Type: DISCRETE

ACCESS: READ/WRITE

RANGE: 0, 1

Note Use this item to conveniently store your optimized configuration via I/O.

ITEMCOUNT Item

The **ITEMCOUNT** item is used to access the number of active items in the corresponding topic. It is the same value displayed in the monitor window of the S7 server under "Items". This item is read only.

I/O Type: INTEGER

ACCESS: READ

RANGE: 0..2147483647

Note Use the **ITEMCOUNT** item to monitor the number of currently active items.

ERRORCOUNT Item

The **ERRORCOUNT** item is used to access the number of active items that have errors in the corresponding topic. It is the same value displayed in the monitor window of the S7 server under "errors ( ) only". If the communication status of a topic is bad, all items have errors (item count equals error count). This item is read only.

I/O Type: INTEGER

ACCESS: READ

RANGE: 0..2147483647

Note Use the **ERRORCOUNT** item to monitor if there are any badly configured items or invalid item values. This is the case if the topic status is 1 and **ERRORCOUNT** is not zero.

WRITECOMPLETE Item

The **WRITECOMPLETE** item is used to access the state of pending write activities on the corresponding topic. If the topic is opened the value of the **WRITECOMPLETE** item is initially 1 indicating all write activities are complete - no pokes are pending. If values are poked into any items of the topic the value of the **WRITECOMPLETE** item changes to 0 indicating write activity is currently in progress. If the server has completed all write activities the value of the **WRITECOMPLETE** item changes to 1 if all pokes were successful or to -1 if at least one poke has failed. If the value of the **WRITECOMPLETE** item is not zero the client can poke 1 or -1 to it (poke a 1 to clear errors or a -1 to test a client reaction on write errors).

I/O Type: INTEGER

ACCESS: READ/WRITE

RANGE: -1,0,1

Note Use the **WRITECOMPLETE** item to serialize a sequence of poke values into a single item or to monitor success or failure of poking into one or more items.

STATUS Item

The **STATUS** item is used to access the state of communication between the server and PLC. The discrete item, **STATUS**, is set to **1** when communication is successful or is set to **0** when communication with the PLC fails.

I/O Type: DISCRETE

ACCESS: READ

RANGE: 0,1

READCOMPLETE Item

The **READCOMPLETE** item is used to access the state of initial reads on all items in the corresponding topic. If the topic is opened and no item is advised, the value of the **READCOMPLETE** item is 0. After all activated items have been read once, the **READCOMPLETE** item changes to 1. If at least one item could not be read the **READCOMPLETE** item alters to –1 indicating there have been read errors.

If at least one new item is advised now **READCOMPLETE** changes to 0 and after this/these item(s) has/have been read it changes to 1 or –1 again.

Poking a 0 to this item resets the internal read states of all items in this topic. This resets the **READCOMPLETE** item to 0. If all items are read again after this poke, the **READCOMPLETE** item changes back to 1 or –1.

I/O Type: INTEGER

ACCESS: READ/WRITE

RANGE: -1,0,1

POLLNOW Item

Poking a 1 to the predefined **POLLNOW** item forces all items within this topic to be read immediately. This is useful if you want to get the newest values from the device, regardless of its updateinterval. You can use this if you want to trigger the reads within a topic by your own.

I/O Type: DISCRETE

ACCESS: READ/WRITE

RANGE: 0,1

Note You can use **POLLNOW** and **READCOMPLETE** for measuring of the longest interval. Create a topic with updateinterval 0. Poke **POLLNOW** to 1 and **READCOMPLETE** to 0 and store the actual time. Then wait until **READCOMPLETE** changes back to 1. The difference between the current time and the stored time equals the updateinterval.

Monitoring the Status of Communications with a PLC

For each topic name (PLC), there is a built-in discrete item that can be used to monitor the status of communications with the PLC. The discrete item, **Status,** is set to **0** when communication with the PLC fails and is set to **1** when communication is successful.

Using the Status Item in Excel

The status of the PLC communications can be read into Excel by entering the following DDE reference formula in a cell on a spreadsheet:

=S7|S7PLC400!Status

where:

S7	Is the name (without extension) of the server application.
S7PLC400	Is the exact topic name defined in the server for the PLC.
Status	Built-in discrete item used to monitor the status of communications with the PLC.

Monitoring the Status of Communications with InTouch

InTouch supports built-in topic names called DDEStatus and IOStatus that are used to monitor the status of communications between the server and InTouch. For more information on the built-in topic names DDEStatus and IOStatus, see your online ”InTouch User’s Guide”.

Using DDEStatus and IOStatus in Excel

The status of communication between the server and InTouch can be read into Excel by entering the following DDE reference formula in a cell on a spreadsheet:

=view|DDEStatus!S7PLC400

or:

=view|IOStatus!S7PLC400

where:

view	Is the name of the InTouch application.
[DDE][IO]Status	Built-in topic name used to monitor the status of communications between the server and InTouch.
S7PLC400	The exact access name defined in InTouch for the S7 I/O server.

Reading Values from the I/O Server into Excel

Values may be read directly into Excel spreadsheets from the server by entering a DDE formula into a cell using the following format:

=applicationname|topicname!itemname

Example formula:

=S7|S7PLC400!EW4

where:

S7	Is the name of the server application.
S7PLC400	Is the exact topic name defined in the server for the PLC.
EW4	Is the actual location in the PLC that contains the data value. This is the item name.

In this example, each time the value of **EW4** changes in the PLC, the server will automatically send the new value to the cell containing the formula in Excel.

Note Refer to the Microsoft Excel manual for complete details on entering Remote Reference formulas for cells.

Writing Values to the I/O Server from Excel

Values may be written to the server from Microsoft Excel by creating an Excel macro that uses the **POKE** command. The proper command is entered in Excel as follows:

channel=INITIATE("applicationname","topicname")

=POKE(channel,"itemname",Data_Reference)

=TERMINATE(channel)

=RETURN()

The following describes each of the above **POKE** macro statements:

channel=INITIATE("applicationname","topicname")

Opens a channel to a specific topic name (defined in the server) in a particular application name (the executable name less the .EXE) and assigns the number of that opened channel to **channel.**

Note By using the **channel=INITIATE** statement the word **channel** must be used in the **=POKE** statement instead of the actual cell reference. The **"applicationname"** and **"topicname"** portions of the formula must be enclosed in quotation marks.

=POKE(channel,"itemname",Data_Reference)

POKEs the value contained in the **Data_Reference** to the specified item name (actual location in the PLC) via the **channel** number returned by the previously executed **INITIATE** function. **Data_Reference** is the row/column ID of the cell containing the data value.

=TERMINATE(channel)

Closes the channel at the end of the macro. Some applications have a limited number of channels therefore, they should be closed when finished. **Channel** is the channel number returned by the previously executed **INITIATE** function.

=RETURN()

Marks the end of the macro.

Note Refer to the **.XLM** sample Excel poke macro provided on the server program disk. Also refer to the Microsoft Excel manual for complete details on entering Remote Reference formulas for cells.

Troubleshooting I/O Server Communication Problems

This section provides you with some simple steps that can be taken to ascertain and correct communication problems. The problems described here represent the most probable causes of communication failure.

Note This is a general troubleshooting guide and for the sake of brevity we cannot cover every possible source of communication problems.

Debugging Communication Between InTouch and an I/O Server

This section explains the most common error situations that can occur when attempting to establish communication between InTouch and a server.

Servers are Window applications that communicate with I/O, PLCs, and/or other data sources. If a server supports either the Microsoft Dynamic Data Exchange (DDE) or the Wonderware SuiteLink protocol, it is capable of communicating with the Wonderware InTouch program.

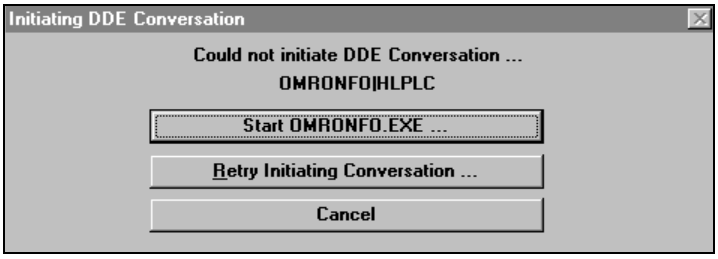
Note All Wonderware version 7.0 or later servers support both DDE and SuiteLink. However, the SuiteLink protocol is only supported on the Windows NT (version 4.0 or later) operating system.

Servers respond to data requests made by other applications. Requesting applications are called clients. When WindowViewer acts as a client and requires the value of an item, it contacts the server and requests the item's value. The server will report the value and update WindowViewer only if a change occurs. All WindowViewer data requests provide information relating an item to a register, coil number, or I/O data point understood by the server. The server uses the information to automatically handle all messages to and from I/O, hardware devices (PLC), and/or other data sources.

Note We highly recommend starting all the servers required by the InTouch application before starting WindowViewer. InTouch (versions prior to 7.0) will display the **Initiating DDE Conversation** message box for each uninitiated conversation.

For example:

If you start up WindowViewer and cannot successfully establish a conversation with a server, the following Initiating DDE Conversation dialog box will appear:



The information in the second line indicates that you have at least one I/O type tagname defined in your Tagname Dictionary that is associated with an Access Name that defines OMRONFO as the Application Name, and HLPLC as the Topic Name. Make note of exactly how the application and topic names are spelled.

- This example only applies when using a version of InTouch prior to InTouch 7.0.

To troubleshoot communication problems between WindowViewer and the server, perform the following steps as listed below:

- **Verify the I/O Server is running.**

1. Start the server program.
2. Verify the server is running by checking to see if it is in the Windows Task List.

   On Windows NT, click the right mouse button on the Windows taskbar and select Task Manager from the menu. Click the Applications tab to view all currently running applications. Or press the CTRL+SHIFT+ESC keys.

   On Windows 95, press the ALT+TAB keys while holding down the ALT key.

   On Windows 3.1 or Windows for Workgroups, press the CTRL+ESC keys.

- **If the I/O Server is running, verify the I/O Server's program name is correct in all WindowMaker Access Name definitions.**

1. Switch to (or start) WindowMaker. Select Access Names from the Special Menu, the Access Name Definitions dialog box appears listing all Access Names defined in the WindowMaker.
2. In the Access Names list, select the Access Name referencing the server and click Modify. The Modify Access Name dialog box will appear.
3. Verify the server's program name in the Application Name box is correct. If it is wrong then correct it and click OK , else click Cancel.

   - The server's exact "executable name" must be typed in the Application Name box in all Access Name definitions. The ".exe" extension is not used.

   - If you are debugging a remote tagname reference, also verify that the node name for the remote computer in the Node Name box is correct.

4. Repeat steps 2 & 3 and verify the server program name is correct in all Access Names that use it.

- **If you still cannot establish a conversation, verify the exact topic name used in the WindowMaker Access Name definitions are defined in the I/O Server program.**

1. Close WindowViewer if it is running. The server cannot be configured if WindowViewer is running.
2. Start the server program.
3. From the server's Configure menu select Topic Definition. The Topic Definition dialog box appears listing all topic names defined in the server.
4. Verify that the topic name exists and is spelled exactly the same (including spaces) as the topic name referenced in the WindowMaker Access Name definition.

   - Blank spaces cannot follow the topic name in either the server's Topic Definition or the Access Name definition.

5. If the topic name is different, either correct it in the server or switch to WindowMaker and correct it in the Access Name definition.
6. Once you performed the above procedure, restart WindowViewer and switch to the server program. Data should now appear in the server's program window to indicate that WindowViewer and the server are communicating.

   The data in the server's program window indicates the read and write messages the server is sending to and receiving from the PLC. These are not error messages; only status messages are written to the server's program window.
7. If no data appears in the server's program window, switch to the Wonderware Logger to check for error messages. For example, a common error message is:

   "Error for DDE: OMRONFO|HLPLC!<null>("item") Advise failed"

   This message appears when the item defined in one or more tagnames is invalid for the server.

   InTouch tagnames use specific naming conventions when accessing data from a server. The valid item names for all Wonderware servers are documented in their respective user's guides. Typically, the item naming conventions used by each server are consistent with the names used by the equipment manufacturer.

   For more information on the Wonderware Logger, see your online *FactorySuite System Administrator's Guide*.

➢ **If you are still experiencing problems, continue with the following troubleshooting section.**

Debugging Communication Between SuiteLink and an I/O Server

If you have successfully applied the debug techniques listed in the previous section and are still experiencing communication problems to a server that is attempting to communicate using the SuiteLink protocol, perform the following steps as listed below:

➢ **Verify the I/O Server supports the Wonderware SuiteLink protocol, that is, the I/O Server is version 7.0 or above.**

➢ **Try communicating to the I/O Server using the DDE protocol. If this is not possible, then proceed to the next troubleshooting section otherwise continue with the following steps:**

1. Verify Microsoft's TCP/IP stack is installed and configured properly.

   SuiteLink uses the Microsoft TCP/IP stack for its communications even if the client application and the server reside on the same node.
2. If you do not have an Ethernet card to bind to the TCP/IP stack, install the Microsoft Loop Back Adapter.
3. Install the Microsoft TCP/IP stack.

Debugging Communication Between an I/O Server and a PLC

This section provides you with simple steps to diagnose and correct server to PLC communication problems. The debug techniques listed below address both serial and board servers. Disregard any information that is not applicable to the server type that you are using.

When attempting to establish communication between a server and a PLC, if no data appears in the server's program window and the data items are not updating in WindowViewer, switch to the Wonderware Logger and check for error messages.

For more information on the Wonderware Logger, see your online *FactorySuite System Administrator's Guide*.

For example, some of the most common errors that may appear in the Wonderware Logger for serial servers are:

Response Timeout
WCRET = -2
WakeUp = -2
Receive Overrun
Framing Errors

Note Unless specified otherwise, most serial communication based servers are full duplex. If you require a server for half duplex (one that monitors the CTS and RTS lines) or if you are not sure whether the PLC's protocol is full or half duplex, call your PLC supplier.

Also, during in-house server testing, we have found that the communication cards that use the National 16450 and 16550 UARTs seem to be less susceptible to level and timing problems. Cards based on other chips may work, but we recommend using the National cards. Some of the highly integrated UART chips (most notably, Winbond and UMC) have a tendency for their transmitters to hang, requiring re-initialization of the UART. If this occurs, you may have to restart the server or execute the Reinitialize I/O command from the Special menu in WindowViewer.

- **Check your cabling to the PLC.**

  Is it wired correctly? Check for shorts, loose wires, broken wires, crossed wires, and so on.

  A continuity tester can be helpful here.

- **Verify the I/O Server's serial configuration settings (Parity, Stop Bits, Baud Rate, Handshaking and so on) against the settings in the hardware device.**

- **Verify the communication port is working properly in Windows.**

  1. Close the server program.

     If you are using a server that requires a TSR, you will not be able to verify that the port is functioning properly while the TSR is running. Stop all TSRs then continue with this procedure. If you confirm that the port functions properly without the TSR running, change your software interrupt (IRQ) to another number, for example, change 60 to 62.

- Also, if you are using an AT type computer, two devices cannot share interrupts. Verify that the communication port you are using has a unique interrupt setting.

2. On Windows 3.1 or Windows for Workgroups, start the Terminal program. On Windows 95 or Windows NT, start the HyperTerminal program.
3. Configure the Terminal (or HyperTerminal) program to use the same communication port with the same settings (baud rate, parity, stop bits and so on) as the hardware device.
4. Connect a null modem cable to a second computer's port.
5. On the second computer, start and configure the Terminal (or HyperTerminal) program with the same settings as the first computer.
6. Verify that you can send data between the two computers.
   - If you do not have two computers and the computer you are using has another port, start two instances of the Terminal (or HyperTerminal) program with each configured to their own port. Then try communicating between them.
   - If you have an external modem, connect the modem to the communication port that you are testing to see if you can dial out.
7. If the communication port does not appear to be functioning properly, check your environment files (**AUTOEXE.BAT**, **CONFIG.SYS, SYSTEM.INI,** and **WIN.INI**). Look for suspicious programs or drivers that might be taking control of the port or its interrupt before the server is loaded. Always keep your environment files as clean as possible. If you are in doubt about an entry, comment it out.
8. If the previous step was unsuccessful, try another communication port or another computer.

Note A common misconception of connecting to a PLC with a DOS program and the same communication port will work in Windows is not the case! Windows is an entirely different environment than DOS.

- **What type of UART is on the COM port?**

  If it's not a 16550, then you must lower your baud rate to 9600 or slower. Only the 16550 UART can sustain continuous, error free communications at speeds higher than 9600 baud. Other UARTs may work at speeds faster than 9600 baud, but errors may be written to the Wonderware Logger. For example, "Receive Overruns." To determine which UART you have, enter MSD at a DOS prompt, then choose COM Ports from the MSD menu.

- **If you are running Windows for Workgroups, verify the following:**

  1. Add these lines to the [386Enh] section of your **SYSTEM.INI** file which is located in your \Windows directory:

     EMMEXCLUDE=A000-EFFF
     COMxFIFO=0

     where x specifies the COM port number. You need to add a separate COMxFIFO line for each serial port using a 16550 UART chip.

2. If you are running Windows for Workgroups (version 3.1 or later), download SERIAL.386 (this fixes a Microsoft bug) from the Wonderware Bulletin Board system (949-727-0726) or from the Wonderware WEB site at: http://wondertech.wonderware.com.

   - The size of this file is 10620 bytes, has a date of 2/17/94, and is a self-extracting zip file called wg1001.exe. It's located in the "PatchFix Library" on the Wonderware BBS in the File Transfers / Patchfix area.
   - You must be registered to access the Wonderware Web site.

3. If the above numbers, 1. and 2., do not work, verify the value of the ComBoostTime parameter in your **SYSTEM.INI** file. This parameter represents the number of milliseconds a virtual machine processes a COM interrupt. (The default value is 2.) It is not recommended that you change this setting. However, if you are receiving errors such as "Receive Overruns" or "WCRE=-2", try increasing the value to 20.

- **Verify the parameters for WWCOMTSR.**

  Do not specify a receive and/or transmit buffer size of 8!

  For example:

  Correct:
  COM1:0 COM2:1,2048,2048
  COM1:0 COM2:1

  Incorrect:
  COM1:0 COM2:1,8,8

- **Does your computer crash when trying to communicate through the COM port?**

  If so, verify that each TSR has a unique software interrupt.

  - A utility, ShowSoft, is available on the Knowledge Base CD that can assist in determining the available software interrupts.

- **Does your computer lock up?**

  Verify the COM port's IRQ's do not conflict with each other or with other communication boards in the computer.

- **If the PLC or field device has more than one COM port, verify the connection to the correct port.**

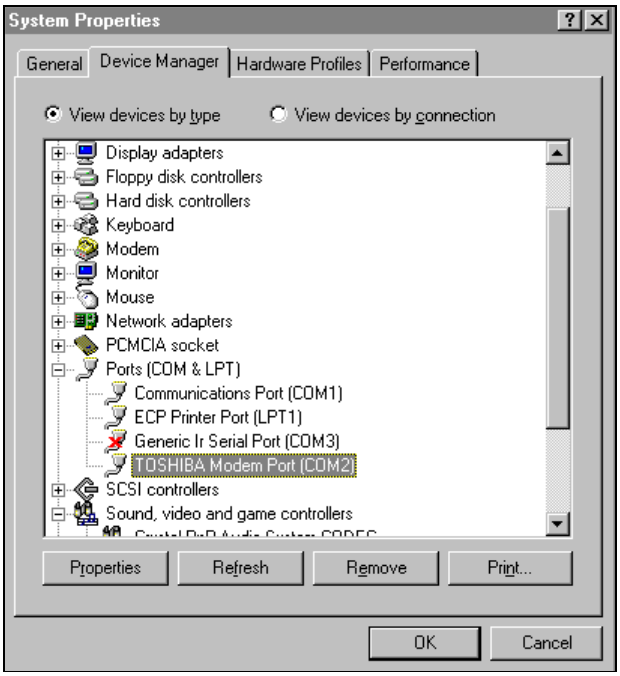
  The COM port on your computer uses the RS-232 hardware communication standard and connects the cable from the COM port to an RS-232 compliant device.

  Note To connect to an RS-422 or RS-485 port on the PLC, you need an RS-232 to RS-422/485 conversion device.

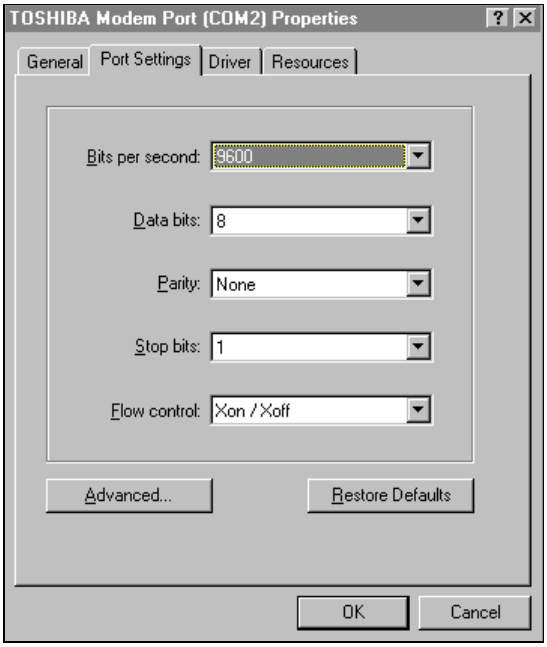
  If possible, use an external converter instead of a board-based converter that plugs into a slot in the computer. A board-based converter is difficult to get working for inexperienced users. If a board-based converter is not set up properly, it can conflict with other communication boards in the computer such as, internal modems.

➢ **If you are using the Windows 95 operating system, verify the following:**

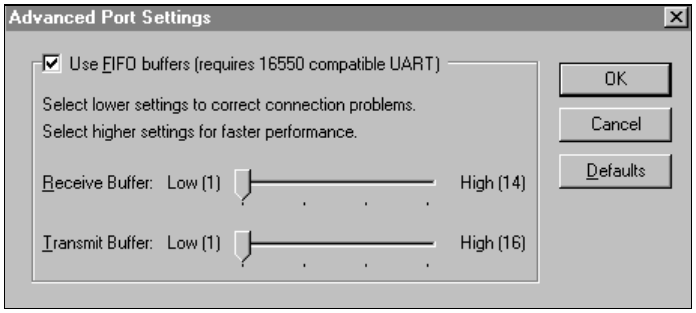
1. Click Start on the Windows taskbar. Point to Settings, then click Control Panel in the menu. The Control Panel dialog box will appear.
2. Double-click the System icon. The System Properties dialog box will appear. Click the Device Manager tab and select the COM port that you are using for the server. For example:



3. Click Properties. The Properties dialog box will appear. Click the Port Settings tab.



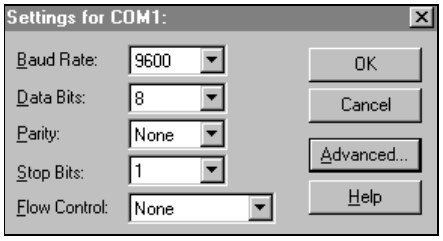
4. Click Advanced. The Advanced Port Settings dialog box appears:



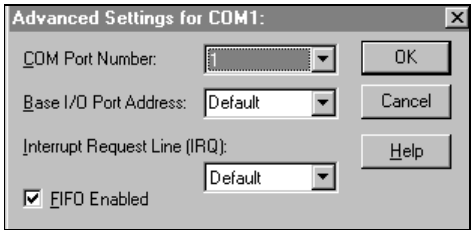
5. Lowering the default Receive Buffer and Transmit Buffer settings to their minimum may solve I/O communication problems for portable computers (notebook or laptops) and framing errors for standard computers.
6. If using a 16550 UART chip, select the Use FIFO buffers (requires 16550 compatible UART) option. If you are not using a UART chip, make sure this option is not selected.

➢ **If you are using the Windows NT operating system, verify the following:**

1. Click Start on the Windows taskbar. Point to Settings, then click Control Panel in the menu. The Control Panel dialog box will appear.
2. Double-click the Ports icon, the Ports dialog box will appear.
3. Select a port and click the Settings button. The Settings for COMx dialog box appears:



4. Click Advanced. The Advanced Settings for COMx dialog box appears:



5. Lowering the setting for the Interrupt Request Line (IRQ) value to the minimum may solve I/O communication problems for portable computers (notebook or laptops) and framing errors for standard computers.
6. If you are using a 16550 UART chip, select the FIFO Enabled option. If you are not using a UART chip, make sure this option is not selected.

- **How long is your RS-232 cable?**

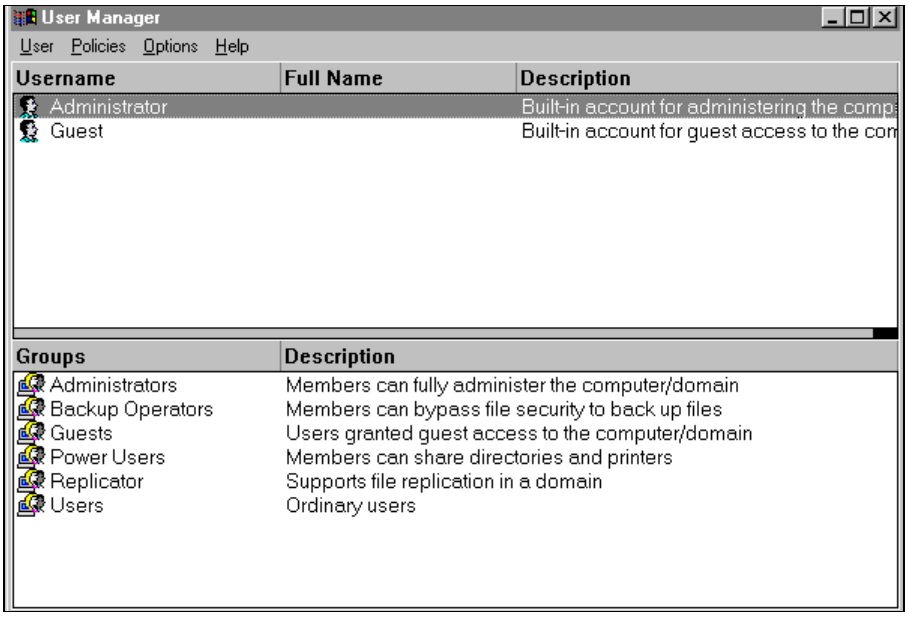
  Fifteen meters (fifty feet) is the maximum practical length for the RS-232 standard.

- **Try using a different COM port for the I/O Server.**

- **If you are installing an I/O Server or configuring a board-based I/O Server on a computer running on the Windows NT operating system, log on with Administrator privileges.**

  Without Administrator privileges, the server and Server Install program cannot make the necessary edits to the Windows NT Registry during installation or board configuration of the server.

  1. Click Start on the Windows taskbar. Point to Programs, then to Administrative Tools (Common), and click User Manager in the menu. The User Manager dialog box will appear:



  2. Double-click the Username you typed in during log on.
  3. If the User Properties dialog box does not appear, you do not have Administrator privileges.
  4. If the User Properties dialog box does appear, click on the Groups button and verify "Administrators" is in the "Member of" list.

- **If you experience occasional or random communication errors in the Wonderware Logger, such as "Response Timeouts," check for noise.**

  Do the physical cables run past any known noise sources such as photocopiers, fluorescent lamps, fans, pumps, motors or generators? Are the cables properly shielded from its environment? With radio modems and satellite link ups, occasional communications errors in the Wonderware Logger are normal and to be expected as long as they do not adversely impact the flow of data.

- **Increase the Reply Timeout setting in the I/O Server to a value between 5 and 10 seconds.**

  Not allowing the PLC or field device enough time to respond to the server's request for data may result in communication errors.

- **Verify the PLC is properly configured and the cable is good by using the programming software for the PLC.**

  1. Connect to the PLC with the programming software. The connection must be through the same port and cable. Go into the programming software configuration and write down what the communications parameters are (baud rates, routes, node number, error checking, etc.).
  2. Close the programming software. Open the I/O Server and verify the communications settings are the same.
  3. Poke data into the PLC with InTouch or WWClient.
  4. Shut down the server and use the programming software to verify that the values were correctly poked.

     Performance of this test depends upon the type of PLC you are using.

- **Reinstall the I/O Server and verify that you are using the latest version.**

  Wonderware is continually improving our servers and using the latest version will guarantee the best results.

  New versions of the Wonderware I/O Servers are released regularly on the Knowledge Base CD. These are available to Comprehensive Support customers on the Wonderware Bulletin Board System (949-727-0726) or from the Wonderware WEB site at: http://wondertech.wonderware.com.

- **Move the I/O Server's configuration file to another location on the computer's hard drive. This will clear all configuration for the I/O Server, then reconfigure the I/O Server.**

  Wonderware server configuration files are typically the exact same name as the server's executable name with the .CFG extension. For example, **OMRONFO.CFG.** Refer to the Configuration File section of the specific server user's guide for the exact name of the configuration file.

- **If possible, reinstall the Windows operating system.**

  Files installed earlier on your computer or the NT registry may have been corrupted or accidentally modified.

- **If these troubleshooting suggestions do not solve your problem, there may be a problem with your computer. There are many subtle differences between the various computer hardware brands. Using a computer that is a different brand and meets the following criteria:**

  1. Select a different PC manufacturer and if this is not possible, try a different PC model from the same manufacturer.

2. The computer can not use an OEM (Original Equipment Manufacturer) version of Microsoft Windows. We highly recommend using only a Microsoft Windows product. Contact your vendor to determine if installing an off-the-shelf copy of Microsoft Windows will cause any problems.

- **If you feel you have tested all possible situations that may be causing your failed I/O communications, contact your local Wonderware distributor for technical support.**

  For more information on obtaining technical support, see your online *FactorySuite System Administrator's Guide*.

Special Wonderware Logger Messages

The following messages may appear in the Wonderware Logger. They can be very useful in debugging communication problems.

➢ **The following logger messages can occur in error situations if log errors (default) is selected in the logger settings.**

- **ERROR: poking item: <item name>(<topic name>)**

Writing a value to an item failed.

- **POKE: invalid value, clamp at high limit for item: <item name> on <topic name>**

- **POKE: invalid value, clamp at low limit for item: <item name> on <topic name>**

An invalid value has been specified for poking data. Value is clamped and transfered to the PLC.

- **POKE ERROR: invalid value, cannot convert for item : <item name> on <topic name>**

An invalid value has been specified for poking data. Value cannot be converted and write operation is aborted. After all write operations are completed the "writecomplete" item will go to -1.

- **Error invalid topic name: <topic name>**

Topic name does not exist. Change topic name or configure correct topic.

- **Invalid item name: <item name> (<topic name>)**

Item name does not exist. Check for correct item name.

- **Write complete (ERROR) – item: <item name> on <topic name>**

A write operation has failed on item with <item name>.

- **New status (<topic name>): 0 (ERROR)**

Connection to PLC has gone bad.

- **ERROR: Cannot load S732.DLL**

There's no SIMATIC NET component for S7 installed on your PC. The needed dynamic link library was not found.

- **ERROR: Block services not available in this version of the SIMATIC NET driver**

Block services are not available because they are not supported under this version of your SIMATIC NET component.

- **ERROR(<errorlevel>): s7_init (CP=<CP-name>,VFD=<VFD-name>**

Your configured CP/VFD couldn't be initialised. Goto "Setting the PG-PC interface" for diagnostics.

- **ERROR(<errorlevel>): s7_get_initiate_cnf (cpd=<CP-handle> cref=<Conn-handle> <CP-name> <VFD-name> <Conn-name>) [(<errorcode>) <errormessage>]**

The initialization of the configured connection failed. Check the errorcode in your Siemens manuals and whether your remote PLC is available.

- **ERROR(<errorlevel>): <name of failed function call>(orderid=<orderid>): [(<errorcode>) <errormessage>]**

General error message describing the failure of a S7 SAPI activity. Check remote device for troubleshooting and check the Siemens manual for error codes.

- **ERROR: <function name>: wrong message state -> discarding it (cpd=<CP-handle>,cref=<Conn-handle>,orderid=<orderid>**

Function call and message state for this orderid doesn't fit. Discarding the message and/or canceling a cyclic message.

- **ERROR: s7_get_abort_ind OK (cpd=<CP-handle> cref=<Conn-handle>)**

This error message indicates that the communication to this connection has been aborted by the remote PLC. Check the state of the remote device.

- **INFO: made a backup file (<backup-file name>) of your configuration file**

This informal message indicates that your former configuration file must have been converted into a new configuration file format. The former configuration file was stored under <backup-file name>.

➢ **The following logger messages can occur in normal operation mode if log trace is selected in the logger settings. These messages show the general activity of the server. Note: it can slow down the servers performance.**

- **TRACE: Topic allocated: <topic name>**

A topic has been created (client has connected on this topic).

- **TRACE: Free topic: <topic name>**

A topic has been freed (client has disconnected on this topic).

- **TRACE: Item <item name> created on <topic name>**

An item has been created in the server.

- **Activating item <item name> on <topic name>**

An item has been activated in the server. A client has advised/requested data.

- **Deactivating item <item name> on <topic name>**

An item has been deactivated in the server. A client has unadvised data.

- **New value for device - item: <item name> on: <topic name>**

A client performed a write operation on an item.

- **Write complete (OK) - item: <item name> on: <topic name>**

The write operation was completed successfully on the protocol. The PLC has confirmed the reception of data.

- **TRACE: <function for receiving data>: can't find message -> discarding it (cpd=<CP-handle>,cref=<Conn-handle>,orderid=<orderid>**

There's no database for the received data. Discarding the message. This may occur when items have been deactivated.

➢ **The following logger messages can occur in normal operation mode if log all is selected in the logger settings. These messages show all of the servers activities. Note: it can slow down the servers performance.**

- **New <data type> value: <value> for item: <item name> on <topic name>**

An item was updated with a new value from the PLC.

- **Write complete item: 0**

A client has initiated write operation and the server signals the processing of poke values by setting the "write complete" item to zero

➢ **The following logger messages can occur in normal operation mode if "show protocol" is selected in the logger settings. These messages show the sent and received messages. Note: it can slow down the servers performance.**

- **PROTOCOL: <calling function name> dumping s7 objects (containing <number of items> items)**
- **index=<index in message> var_name=<message name> var_length=<variable size>**

…

dumps the all s7 objects of one message which are containing <number of items> items

For example:

PROTOCOL: s7_multiple_read_req dumping s7 objects (containing 20 items)

index=0 var_name=DB223,B280,24 var_length=24

index=1 var_name=DB223,B320,1 var_length=1

index=2 var_name=DB222,B8,18 var_length=18

- **PROTOCOL: <receive function name> dumping [read/write] values**
- **<S7 name>: result=<message result>, value=<HEXASCII value>, var_length=<variable size>**

…

dumps the all s7 objects of one cyclic, read or write message which are containing items. For block items the whole block is dumped. This could seriously affect your servers performance.

For example:

PROTOCOL: s7_get_cycl_read_ind dumping read values

DB222,B0,6: result=255, value=0x000000000000, var_length=6

DB222,B1330,12: result=255, value=0x000000000000000000000000, var_length=12

DB222,B1342,2: result=255, value=0x0000, var_length=2

DB222,B1270,14: result=255, value=0x0004570000000000000000000000, var_length=14

DB222,B1290,14: result=255, value=0x000203487502346700000000000000, var_length=14

DB222,B1310,14: result=255, value=0x000001200000000000000000000000, var_length=14

DB222,B1350,14: result=255, value=0x00000000000000000AEDF00000, var_length=14

DB222,B1370,14: result=255, value=0x000000024682345340000000000000, var_length=14

DB222,B1390,14: result=255, value=0x0000000EA0000000000000000000, var_length=14

DB222,B1410,14: result=255, value=0x00011476ACBFD00000000000000, var_length=14

DB222,B1430,14: result=255, value=0x000000000000000000000000000000, var_length=14

DB222,B20,260: result=255, var_length=260 cannot dump read values (var_length to big)