

# Wonderware<sup>®</sup> GE Fanuc Series 90<sup>™</sup> Protocol I/O Server

## User's Guide

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Wonderware GE Fanuc Series 90 Protocol I/O Server

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# Wonderware GE Fanuc Series 90 Protocol I/O Server



## Introduction

The Wonderware® GE Fanuc Series 90™ Protocol 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 from GE Fanuc Series 90 compatible PLCs (also referred to as devices).

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 or higher & 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 system 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 GE Fanuc PLC equipment via this server, the application portion of the address is **GESNP**.

*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, **Series90**.

---

**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 later in this user's guide.

## Configuring the I/O Server

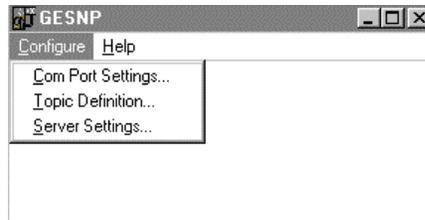
Once the server has been installed, a small amount of configuration is required. Configuring the server automatically creates a configuration file named **GESNP.CFG**. This file stores the configuration information for the adapter cards or communication ports and all of the topic definitions (described in detail later).



To perform the required configurations, start up the server by double-clicking on its icon. If the server starts up as an icon, double-click on the icon to open the server's window.

The configuration file is automatically saved to the directory in which the server is installed unless a different directory is specified.

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 a Communication Port

Use the **Communication Port Settings** option from the Configure Menu to configure the communication ports that will be used to communication with GE Fanuc PLC equipment. When this option is selected, this dialog box will appear:

## Communication Port Settings

**Note** All communication ports can be configured without leaving this dialog box. Repeat these steps; select a COM Port, set configuration, and click **Save**.

Select a communication port connected to the GE Fanuc PLC device.

Enter the amount of time (in seconds) that all PLCs connected via this communication port will be given to reply to commands from the server.

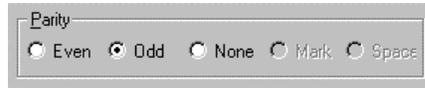
**Note** This timeout is sustained only when the PLC fails to respond. When the PLC is responding normally, there is no penalty. The default value of 1 second should be sufficient for most configurations.

Select the Baud Rate (serial bit rate) setting that matches the configuration of the GE Fanuc PLC device.

Select the number of Data Bits that matches the configuration of the GE Fanuc PLC device.



Select the number of Stop Bits that matches the configuration of the GE Fanuc PLC device. If the Baud Rate is greater than 300, the Stop Bits should be set to **1**.



Select the Parity setting that matches the configuration of the with GE Fanuc PLC device.

All devices on a single communication port must be configured with the same Baud Rate, Data Bits, Stop Bits, and Parity.

Click **Defaults** to reset the settings to their default values without saving changes.

Click **Save** to save settings for the selected COM Port. The dialog box will remain displayed giving you the option to configure additional COM Ports.

Click **Done** to close the dialog box. If the settings have not been saved, the following dialog box will appear:



Click **Yes** to save settings for the COM Port.

Click **No** to prevent saving the settings.

Click **Cancel** to return to the **Communication Port Settings** dialog box without saving the settings.

## Saving the I/O Server's Configuration File

If a configuration file does not currently exist in the configuration file directory, the server will automatically display the **Save Configuration** dialog box:



### Save Configuration



This field displays the drive\directory into which the server will save the current configuration file. To save the configuration file to a different directory, enter the path for that directory in this field.



This option is selected and disabled on initial entry to the **Save Configuration** dialog box. This field becomes active if the Configuration File Directory is changed. Once enabled, selecting this option will record a new Configuration File path in the **WIN.INI** file. This option allows the server to find its configuration file automatically each time it is started.

---

**Note** When the server initially starts up, it attempts to locate its default configuration file by first checking the **WIN.INI** file for a previously specified path. If a path is not present in the **WIN.INI** file, the server will assume that the current working directory is to be used.

---

Click **Defaults** to reset the settings to their default values without saving changes.

Click **OK** to save the configuration file to the specified directory.

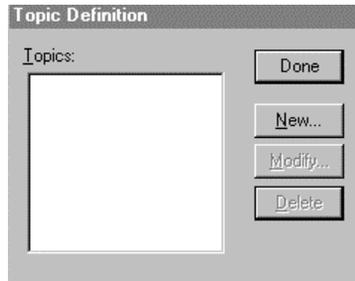
### Saving Multiple Configuration Files

There is no limit to the number of configuration files that you can create as long as they are saved in separate directories. This allows you to have multiple configuration files that can be accessed by using a special switch (/d:). For example, to start the server using a configuration file located in a different directory, click the **Start** button on the taskbar, then choose **Run** and enter the following in the **Open** combo box:

**GESNP /d:c:\directoryname**

## 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.

---

Done

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

Modify...

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

Delete

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.)

New...

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

## GESNP Topic Definition

Topic Name:

Enter a unique name (up to 32-characters) for the PLC in this field.

---

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

---

PLC Address:

Enter the address of the PLC (also referred to as SNPID or CPU ID) associated with this topic definition in this field. This address must match the CPU ID in the PLC and is case sensitive.

Program Name:

This is an optional field and only applies to point types %L and %P. Enter the PLC program name in this field (up to 7-characters in length). This name must match the Program Name in the PLC and is case sensitive.

Com Port:

The communications port currently associated with this topic will appear in this field. To select a different port, click the down arrow to open the list of communication ports. Click the name of the communications port to be associated with this topic.

Messages Per Cycle:

Enter the number of messages the server will read from this topic (device) before polling another topic (device). This value allows the operator to "tune" the server for performance. The default is three messages per topic, if there are three messages due. Increasing this value will cause the server to process more messages for the current topic before moving on to the next topic with messages due. In multi-dropped configurations with more than one PLC, it may be more efficient to increase this number. This will reduce the amount of context switching that the server is required to do between the PLCs.

Update Interval:  msec

Enter the frequency (in milliseconds) that the server will read (poll) the items/points associated with this topic. (Different items/points can be polled at different rates by defining multiple topic names for the same PLC and setting different updates rates for each topic.)

T4 Interval Timer:  msec

T4 is the break processing time. It is the minimum amount of time the server is required to wait between the end of transmission of the long break and the first character of the attach message. This value must be at least 50 msec. If using modems, it must be at least 600 msec.

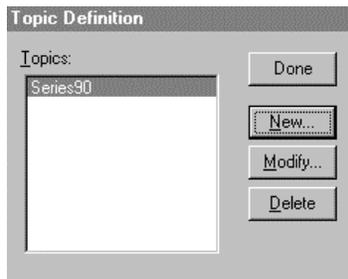
---

**Note** Increasing this value will severely impact server performance in a multi-dropped configuration. Increasing this value is only recommended if you are experiencing server attach errors.

---

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

Click **OK** to accept the topic definition and return to the **Topic Definition** dialog box:



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

---

**Note** If this is the first configuration performed for the server, the **Save Configuration** dialog box will appear prompting you to save the configuration.

---

## Configuring the I/O Server Settings

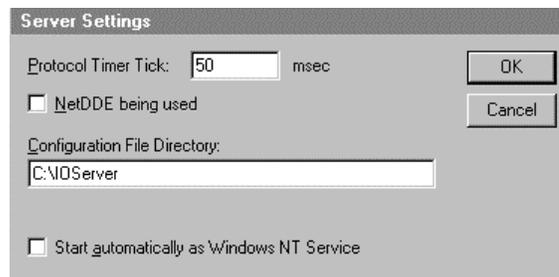
Use the **Server Settings** option from the Configure menu to change the protocol timer, network using Wonderware NetDDE, change the default configuration file path, or to enable the server to start automatically as a Windows NT service.

---

**Note** When configuring the server on Windows NT or Windows 2000, 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

Protocol Timer Tick:  msec

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 device.

---

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

---

NetDDE being used

Select this option if you are networking using Wonderware NetDDE.

Configuration File Directory:

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.

---

**Note** There is no limit to the number of configuration files created. However, each must be saved in a different directory. When using the server with InTouch, we recommend that you save the configuration file in your application directory. For more information on the Configuration File, see "Saving the I/O Server's Configuration File" in this user's guide.

---

Start automatically as Windows NT Service

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

Windows NT & Windows 2000 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 or Windows 2000 application program once again.

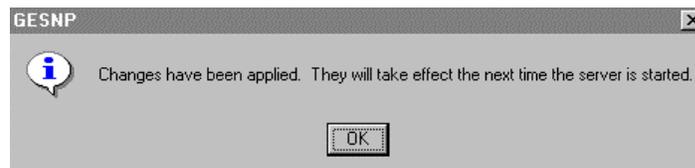
---

**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.

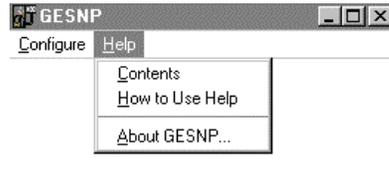
---

**Note** Generally, internal timers in the Series 90 PLCs will shut down the serial communications link when there has been no communication for a preset period (the default setting on the Series 90-70 PLCs is about 30 seconds). If the server poll rate is slower than this timeout setting, the server will report response timeouts in the logger. Recommendation: Disable the default timeouts in the PLC. From the GE programming software, access the I/O Configuration settings on the PCM 711 (Programmable Coprocessor Module) or the CMM 711 (Communications Coprocessor Module). Change the "Port 1" and "Port 2" "Timeout" from its default of "LONG" to "NONE".

---

# Accessing I/O Server Help

The Help menu contains three options 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 GESNP

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 the license viewing utility, see your online “FactorySuite System Administrator’s Guide.”

## Item Names

The GE Fanuc Series 90 Protocol I/O Server supports item/point names that are consistent with the point naming convention used by GE Fanuc PLCs. The server supports a fixed set of Item Names as summarized below:

<u>Memory Type</u>	<u>Item Name</u>
Discrete Inputs	%I
Discrete Outputs	%Q or %O
Discrete Temporaries	%T
Discrete Internals	%M
System Discretes	%SA
System Discretes	%SB
System Discretes	%SC
System Discretes	%S
Genius Global Data	%G (Discrete)
Genius Global Data	%GA
Genius Global Data	%GB
Genius Global Data	%GC
Genius Global Data	%GD
Genius Global Data	%GE
Analog Inputs	%AI
Analog Outputs	%AQ or %AO
Registers (Analog)	%R
Main Program Block Registers	%P $n$ *
SubProgram Block Registers	BLOCKNAME^%L $n$ **

\*  $n$ =The Register Number between 1 and the number of registers specified in the topic description. Value must be 8192 or less.

\*\*The BLOCKNAME must correspond to an existing Blockname within the PLC.  $n$  = The Register number between 1 and the number of registers configured for the block in the topic description. Value must be 8192 or less.

%P and %L require the PLC program name to be correctly configured in the topic description dialog to match the name in the 90-70 PLC.

%S items are read-only.

---

**Note** Any item name may begin with %. Q may be used instead of O in output item names. For example: O1 is the same as Q1.

---

## Special Item/Point Naming

The following are special Item Names for the GE Fanuc Series 90 Protocol I/O Server. These items are all **READ-ONLY**.

### **OVERSWEEP**

Oversweep flag; meaningful only when constant sweep mode is active.

- 1 = Constant Sweep value exceeded
- 0 = No oversweep condition exists

### **CONSWEEP**

Constant sweep mode.

- 1 = Constant Sweep Mode active
- 0 = Constant Sweep Mode is not active

### **NEWFT**

PLC Fault Entry since last read.

- 1 = PLC Fault Table has changed since last read by the server
- 0 = PLC Fault Table is unchanged since last read by the server

### **NEWIOFT**

IO Fault Entry since last read.

- 1 = IO Fault Table has changed since last read by the server
- 0 = IO Fault Table is unchanged since last read by the server

### **FTSTATUS**

PLC Fault Entry present.

- 1 = One or more fault entries in PLC Fault Table
- 0 = PLC fault table is empty

### **IOSTATUS**

IO Fault Entry present.

- 1 = One or more fault entries in IO Fault Table
- 0 = IO fault table is empty

### **PROGATTACH**

Programmer attachment in system flag.

- 1 = Programmer attachment found in system
- 0 = No programmer attachment found in system

### **ENSWITCH**

Front panel ENABLE/DISABLED switch setting.

- 1 = Outputs disabled
- 0 = Outputs enabled

### **RUN**

Front panel RUN/STOP switch setting.

- 1 = Run
- 0 = Stop

### **OEMPROT**

OEM protected bit.

- 1 = OEM protection in effect
- 0 = No OEM protection

**SPRGCHG**

Program changed flag.

- 1 = Program changed
- 0 = No program change  
(90-70 release 2.x and later)

**STATE**

Current PLC State (as opposed to switch settings or commanded state).

- 0 = Run I/O Enabled
- 1 = Run I/O Disabled
- 2 = Stop I/O Disabled
- 3 = CPU stop faulted
- 4 = CPU halted
- 5 = CPU suspended
- 6 = Stop I/O Enabled

**PRIVLEVEL**

Current privilege level of server for accessing memory in the PLC CPU (0-4).

**SWEEPTIME**

The time value from the last completed sweep for the main Control Program task. This value is in 100 microsecond increments.

**SNPID**

CPU Controller ID.

**PROGNAME**

Name of control program resident in PLC.

**SNUM\_PROGS**

Number of control program tasks currently defined for the PLC CPU (only 0 or 1 currently possible).

**SPROG\_FLAGS**

Set of boolean flags indicating which Control Program tasks currently have programmers attached to them.

Bit position 0 corresponds to Control Program 1.

**AUX\_STATUS**

Set of flags giving additional information. Currently only the highest bit is defined; the other bits will be zeroes.

- Bit 7 - Programmer window status (0=Closed; 1=Open)

**LOGIN\_TYPES**

Set of 2-bit codes indicating the type of login associated with each Control Program task. The two-bit field beginning at bit 0 corresponds to Control Program 0.

- 0 - no programmer attached
- 1 - non-dedicated programmer attached
- 2 - serial device attached
- 3 - parallel WSI attached

## Topic Statistics

The following 32-bit items provide statistical information for a given topic:

### **SENDS**

Number of messages sent to the PLC for this topic. Writing any value to this item will cause it to reset to 0.

### **RECEIVES**

Number of messages received from the PLC for this topic. Writing any value to this item will cause it to reset to 0.

### **TIMEOUTS**

Number of communication timeouts for this topic. Writing any value to this item will cause it to reset to 0.

## Signed Numbers

A register can be interpreted as a signed 16-bit value with a range of -32,768 to 32,767 by adding a blank space then **S** following item name.

For example:     **R100 S**

## BCD Numbers

A BCD (Binary Coded Decimal) register can be handled correctly by adding a blank space then **(BCD)** following the item name.

For example:     **R4087 (BCD)**

This will cause the server to convert the register contents from binary to BCD before sending it to the client application. It will convert values from BCD to binary before sending to the PLC.

## Discrete Points

Individual bits in registers can be used as discrete tagnames in InTouch by entering the item name in the following format.

For example:     **Rnn:b**

This will cause the server to extract bit *b* (0-15) of register *nn*. The value will be returned to InTouch as a discrete. The GE Fanuc Series 90 Protocol does not allow the server to write bits in registers.

Examples:	<b>R1:0</b>	Least significant bit of R1
	<b>R1:15</b>	Most significant bit of R1
	<b>R1000:3</b>	Bit 3 of R1000

## Long Integer Numbers

A pair of registers can be interpreted as a long integer (or double precision integer) by adding a blank space then an **L** after the item name.

For example:     **R601 L**

This notation causes the server to treat R601 and R602 as a signed 32-bit number with R601 being the least significant half.

## 32-Bit Floating Point Numbers

A pair of registers can be interpreted as a floating point number by adding a blank space then an **F** to the item name for lower numbered register of the pair.

For example:     **R1001 F**

This notation causes the server to treat R1001 and R1002 as an IEEE 32-bit floating point number.

## ASCII String Items

A series of consecutive registers can be treated as an ASCII character string by adding a blank space then an **M** following the item name.

For example:     **R101-R150 M**

This item name indicates that registers R101 through R150 contain a string of 100 ASCII characters. Each register contains 2 characters with the low order byte first. A zero byte in any register will be treated as the end of the string.

---

**Note** Each ASCII string item can include a maximum of 255 consecutive registers.

---

## Register Arrays (Blocks)

A series of consecutive registers can be treated as a block of numeric values by adding a blank space then an **A** following the item name.

For example: **R501-R510 A**

This item name indicates that registers R501 through R510 should be read and written as a unit. This technique is useful to load a group of registers with a new set of control values (e.g., a recipe).

As usual, registers are assumed to be unsigned unless otherwise specified by adding a blank space then an **S** (signed), an **L** (long integer), **F** (floating point), or **(BCD)** (binary coded decimal).

For example: **R1-R6 A (BCD)**  
**R1000-R1099 A S**

When the client application writes (or **POKEs**) a new value for the Register Array it must be in the form of a character string containing a value for each register. The register values can be separated by any combination of commas, tabs, spaces, carriage returns and line feeds.

For example: if the item was **R1-R6 A**, the value poked would be:  
**1,2,3,4,5,6**  
or, **1<tab>2<tab>3<tab>4<tab>5<tab>6**  
or, **1 2 3 4 5 6**  
etc.

---

**Note** Register Arrays format is compatible with Microsoft Excel ONLY. This format is compatible with Microsoft Excel and makes it possible to POKE a row or column of numbers to a series of consecutive registers in a single operation.

---

When the server returns a new value for a Register Array, it is in the form a character string containing a value for each register separated by a carriage return and a line feed.

For example: If the item was **R1-R6 A**, the value returned will be:  
**50<cr><lf>**  
**17<cr><lf>**  
**0<cr><lf>**  
**5<cr><lf>**  
**1007<cr><lf>**  
**20<cr><lf>**

---

**Note** This format is compatible with Microsoft Excel and makes it possible to read the register values into a column of cells in a worksheet. For more information on the use of Register Arrays with Excel, refer to the “Reading Register Arrays in Excel” and “Writing Register Arrays in Excel” sections later in this user’s guide.

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**Note** Each Register Array item can include a maximum of 255 consecutive registers.

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## 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:

```
=GESNP|Series90!Status
```

where:

<b>GESNP</b>	Is the name of the server application.
<b>Series90</b>	Is the exact topic name defined in the server for the PLC.
<b>Status</b>	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!Series90
```

or

```
=view|IOStatus!Series90
```

where:

<b>view</b>	Is the name of the InTouch application.
<b>[DDE][IO]Status</b>	Built-in topic name used to monitor the status of communications between the server and InTouch.
<b>Series90</b>	The exact topic name defined in the server for the PLC.

---

# 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:

**=GESNP|Series90!R950**

where:

<b>GESNP</b>	Is the name of the server application.
<b>Series90</b>	Is the exact topic name defined in the server for the PLC.
<b>R950</b>	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 **R950** 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.

---

## Reading Register Arrays in Excel

An array or block of consecutive registers can be read into a group of consecutive cells on a spreadsheet by entering a vertical range of cells in a formula that is terminated with **<control><shift><enter>**.

For example:     **=GESNP|Series90!'R1-R7 A'<control><shift><enter>**

To use a horizontal range of cells, the array of registers must first be read into a column of cells elsewhere on the spreadsheet. The results are then moved into the desired display locations.

---

**Note** Refer to the **.XLS** Excel sheet in the directory in which the server was installed.

---

## Writing Register Arrays in Excel

An array or block of consecutive registers can be written (**POKE**ed) from a group of consecutive cells on a spreadsheet via a **POKE** macro.

For example:     **channel=INITIATE("GESNP","Series90")**  
                  **=POKE(channel,"R1-R6 A",B1:B6)**  
                  **=TERMINATE(channel)**  
                  **=RETURN()**

Fill in the values to be written. For more information, see the "Writing Values to the I/O Server from Excel" section in this user's guide. In this case, the column of cells B1 through B6 will contain the values to be written to R1 through R6. Unlike reading arrays, when writing arrays the range of cells may be horizontal or vertical or even rectangular.

---

**Note** Refer to the **.XLM** Excel sheet in the directory in which the server was installed.

---

## Configuring PLC Passwords

GE Fanuc Series 90 PLCs provide a security feature on the programming port which is based on privilege levels and passwords. The improper setup of these passwords can have an adverse effect on the operation of the GESNP I/O Server. This section contains some background information and recommendations for setting up password protection in the PLC to allow for proper operation of the GESNP I/O Server when using the programming port on the PLC CPU for communications.

The Series 90 PLC provides a system security feature which allows different levels of access privilege through the programming port. Four different privilege levels exist. The GE Fanuc Logicmaster configuration software provides the capability of defining or disabling passwords for these levels. The privilege range is from level 4 to 1. Four represents the highest privilege level while 1 represents the lowest. The GESNP I/O Server requires access to privilege levels 1 (read) and 2 (write) for normal operation.

To avoid setting password levels, disable passwords at all privilege levels and the GESNP I/O Server will operate properly. However, to use passwords at certain privilege levels, a complete understanding of the access mechanism used by the server is required.

The general rule to remember about the GESNP I/O Server is it will operate at the highest unprotected privilege level. This means that passwords must be disabled (at the least) in the PLC at privilege levels 1 and 2 to allow the GESNP I/O Server to exercise its full functionality of reads/writes. Setting password at levels 3 and 4 will have no impact on the ability of the server to read or write data. To operate the GESNP I/O Server at a read-only mode, you must have passwords setup at levels 2 through 4. This will cause the server to operate at the read-only mode of privilege level 1. However, any attempted write operations to the PLC will fail in this mode. An error message will be logged to the Wonderware Logger indicating a "major code = 02" error which indicates insufficient privilege for the attempted operation.

# 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) and Windows 2000 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.

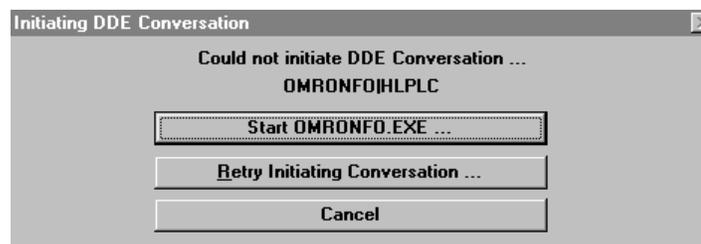
---

**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 and Windows 2000, 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://www.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 **SYTEM.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.

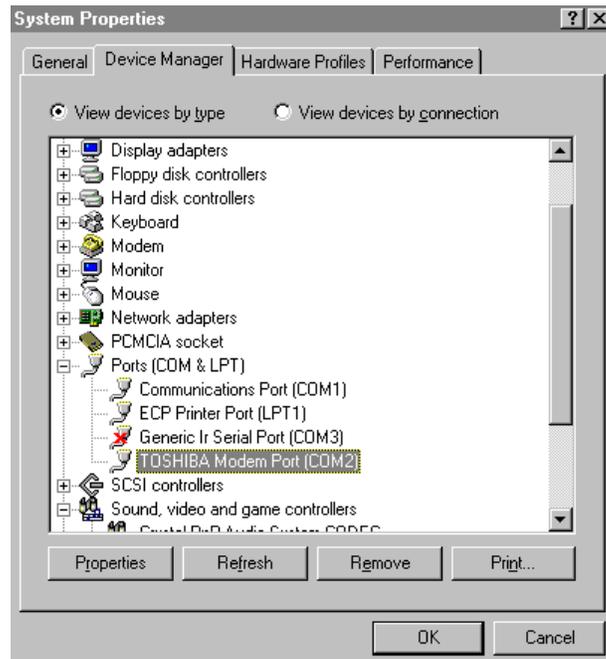
If possible, use an external converter instead of a board-based converter that plugs into a slot in the computer. A board-based converter is difficult to get working for inexperienced users. If a board-based converter is not set up properly, it can conflict with other communication boards in the computer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

---

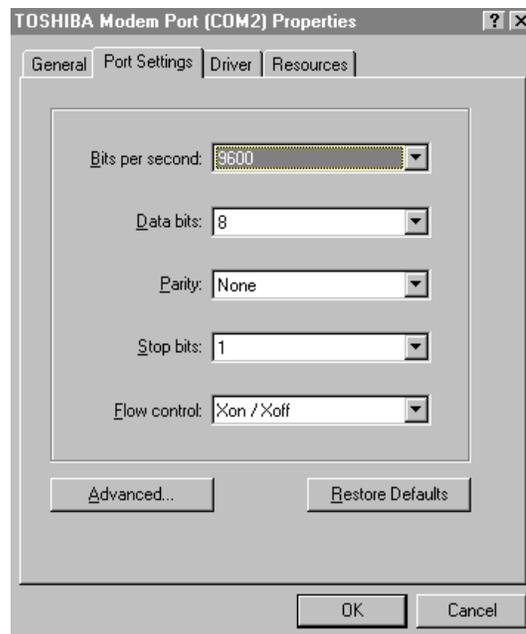
➤ **If you are using the Windows 95 operating system, verify the following:**

4. Click Start on the Windows taskbar. Point to Settings, then click Control Panel in the menu. The Control Panel dialog box will appear.

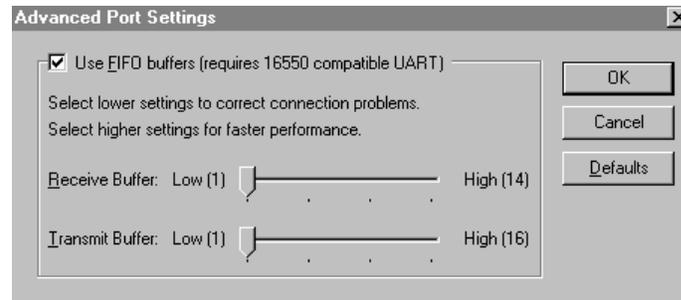
- Double-click the System icon. The System Properties dialog box will appear. Click the Device Manager tab and select the COM port that you are using for the server. For example:



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



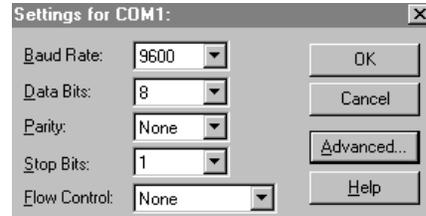
- Click Advanced. The Advanced Port Settings dialog box appears:



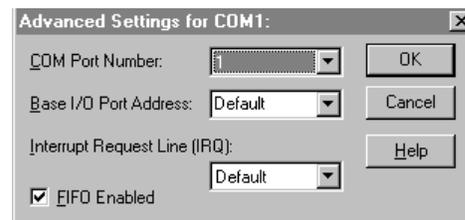
- Lowering the default Receive Buffer and Transmit Buffer settings to their minimum may solve I/O communication problems for portable computers (notebook or laptops) and framing errors for standard computers.
- If using a 16550 UART chip, select the Use FIFO buffers (requires 16550 compatible UART) option. 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:**

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



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



- 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.
- 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.

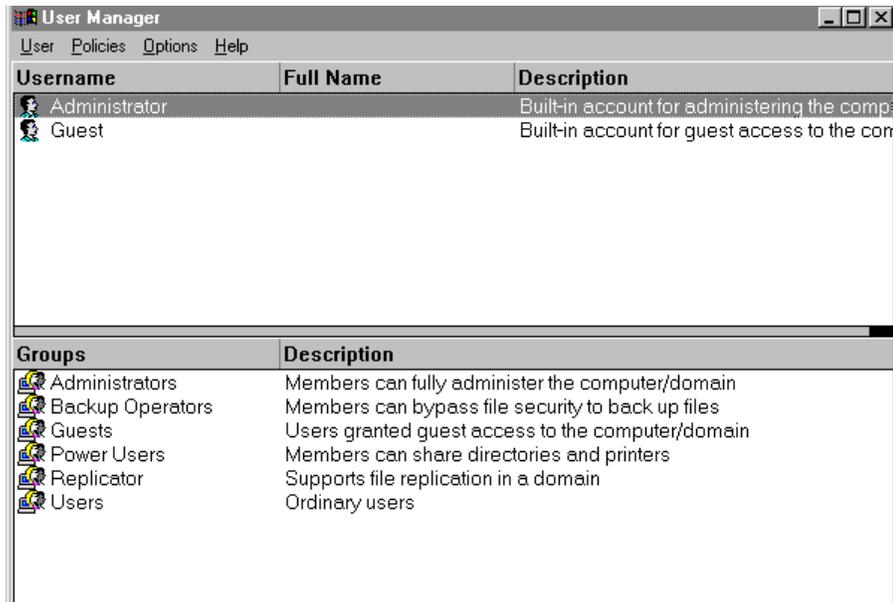
➤ **How long is your RS-232 cable?**

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.

7. 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:



8. Double-click the Username you typed in during log on.
9. If the User Properties dialog box does not appear, you do not have Administrator privileges.
10. 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 configured properly and the cable is good by using the programming software for the PLC.**

Run the programming software and communicate with the server at the same time when testing.

☞ 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://www.wonderware.com>.

- **Moving the I/O Server's configuration file to another location on the computer's hard drive clears all configurations for the I/O Server. The I/O Server must be reconfigured.**

☞ 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:**

11. Select a different PC manufacturer and if this is not possible, try a different PC model from the same manufacturer.
12. 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."