

MatrikonOPC Explorer

User's Manual

MatrikonOPC Explorer

User's Manual

This manual is a product of Matrikon Inc.

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Introduction


MatrikonOPC™ Explorer is a general-purpose OPC client. It is included with all MatrikonOPC servers to ensure that users always have a reliable means with which to test the capabilities of the software.

Who Should Use This Manual

This manual is intended for use by all users of MatrikonOPC Explorer. This manual explains how to install and configure the application, and how to perform common tasks.

Overview of Manual

This document uses icons to highlight valuable information. Remember these icons and what they mean, as they will assist you throughout the manual.

	<p>This symbol denotes important information that must be acknowledged. Failure to do so may result in the software not functioning properly.</p>
<p>BOLD</p>	<p>Font displayed in this color and style indicates a hyperlink to the applicable/associated information within this document, or if applicable, any external sources.</p>

The *User's Manual* has been designed as such so that you can click on references in the document to jump to that referenced point without having to scroll through several pages (in some cases). For example, if you were to see the sentence "Refer to Figure 1 for more information", pressing the **CTRL** key and clicking your mouse on the text "Figure 1" will automatically take you to the location of Figure 1 within the document.

This manual consists of several sections and is structured as follows:

- **Introduction** – this introductory chapter.
- **Getting Started** – provides instructions for installing the application, and how to contact MatrikonOPC's Support team.
- **Configuration** – shows how to start and configure the application, and describes each component in detail, including windows/screens, panels, tabs, and menu commands.
- **Limitations** – provides information on specific performance and operational limitations of the software.
- **Troubleshooting** – provides solutions for common problems that may be encountered, and answers to frequently asked questions.
- **Un-installation** – provides instructions on un-installing software.
- **Appendices:**
 - **A** - DCOM
 - **B** – Standard Data Types
 - **C** – OPC Quality Flags

References

This document references information found within the following documents/sites:

- www.opcfoundation.org
- www.matrikonopc.com
- www.opcsupport.com
- *OPC Data Access Custom Interface Standard v1.0a*
- *OPC Data Access Custom Interface Standard v2.05a*
- *OPC Security v1.0*
- *OPC Alarms and Event Interface Standard v1.0*

Document Terminology

The following terms used interchangeably throughout this document:

- *screen and window*
- *MatrikonOPC Explorer and OPC Explorer*

Table 1 provides a list of definitions for terms used throughout this document.

Term/Abbreviation	Description
A&E	OPC Alarms and Events. Provides access to process alarm and event data.
COM	Component Object Model. A method for organizing software, specifying how to build components that can be dynamically interchanged.
DA	OPC Data Access. Provides access to real-time process data.
DCOM	Distributed Component Object Model. An extension of COM that allows communication between COM components over a network.
DDE	Dynamic Data Exchange. Allows the transfer of data between two running applications.
HDA	OPC Historical Data Access.
HMI	Human Machine Interface. Device that allows interaction between the user and machine. Typically used in process control applications.
Matrikon	Matrikon Inc.
MatrikonOPC	Matrikon's brand name for its OPC servers and clients.
OPC	A communication standard. Refer to www.opcfoundation.org for more information.
PLC	Programmable Logic Controller.

Table 1 - Terms and Definitions

Getting Started

This chapter contains important information about installing the application and how to contact Matrikon's Support team.

The **System Requirements** section shows how to avoid future problems by ensuring that the system meets the minimum software and hardware requirements. Detailed step-by-step instructions in the **Installation** section walks you through the installation process and lists the files that are installed during this process.

Refer to the **Licensing** section in this document for information on licensing this application and any associated server. If any problems are encountered during installation or licensing, refer to the **Contacting Support** section for information about how to contact the MatrikonOPC Support team for assistance.

System Requirements

The software has minimum **Software** and **Hardware** system requirements. These requirements must be met for the software to function properly.

Software Requirements

The server requires the following software:

- Microsoft Windows XP Service Pack 1, or
- Microsoft Windows 2000 Service Pack 2
- Internet Explorer 4.01 Service Pack 1 (or better)



Note: It is recommended that the most current service packs are installed.

Hardware Requirements

The server requires the following hardware:

- Intel® Pentium® 4 Processor
- 512 MB RAM
- 40 GB 7200 RPM hard drive

Installation

Note: Usually, MatrikonOPC Explorer is automatically installed along with your server. However, there may be instances where you need to install MatrikonOPC Explorer by itself. If that is the case, use the steps outlined in the procedure that follows.

Once the system requirements have been met, you are ready to install the software.

To install the software:

1. Insert the MatrikonOPC Explorer CD into the CD drive.
2. If the MatrikonOPC **Welcome** screen does not automatically appear, double-click the *MatrikonOPCExplorer.exe* file. The **InstallAware Wizard** verifies its contents (Figure 1) and then the **License Agreement** screen (Figure 2) appears.

Notes:

- The **Version** number located in the lower left corner indicates the version number of the software that is being installed. The text "X.X.X.X" will be replaced with the specific product version.
- From the **License Agreement** screen, you have the option of selecting the **I reject the license agreement** option. Selecting the **I reject the license agreement** option button disables the **Next** button so your options are to cancel the install by clicking on the **Cancel** button, or select the **I accept the license agreement** option button enabling you to proceed through the install.

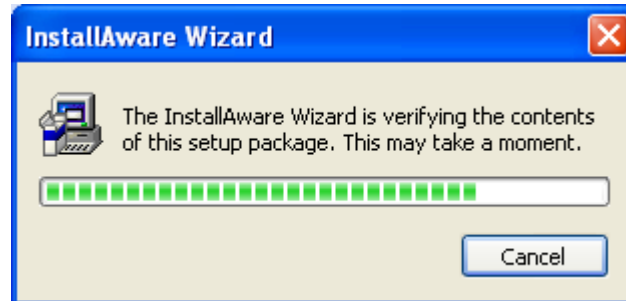


Figure 1 - InstallAware Wizard Verification Window

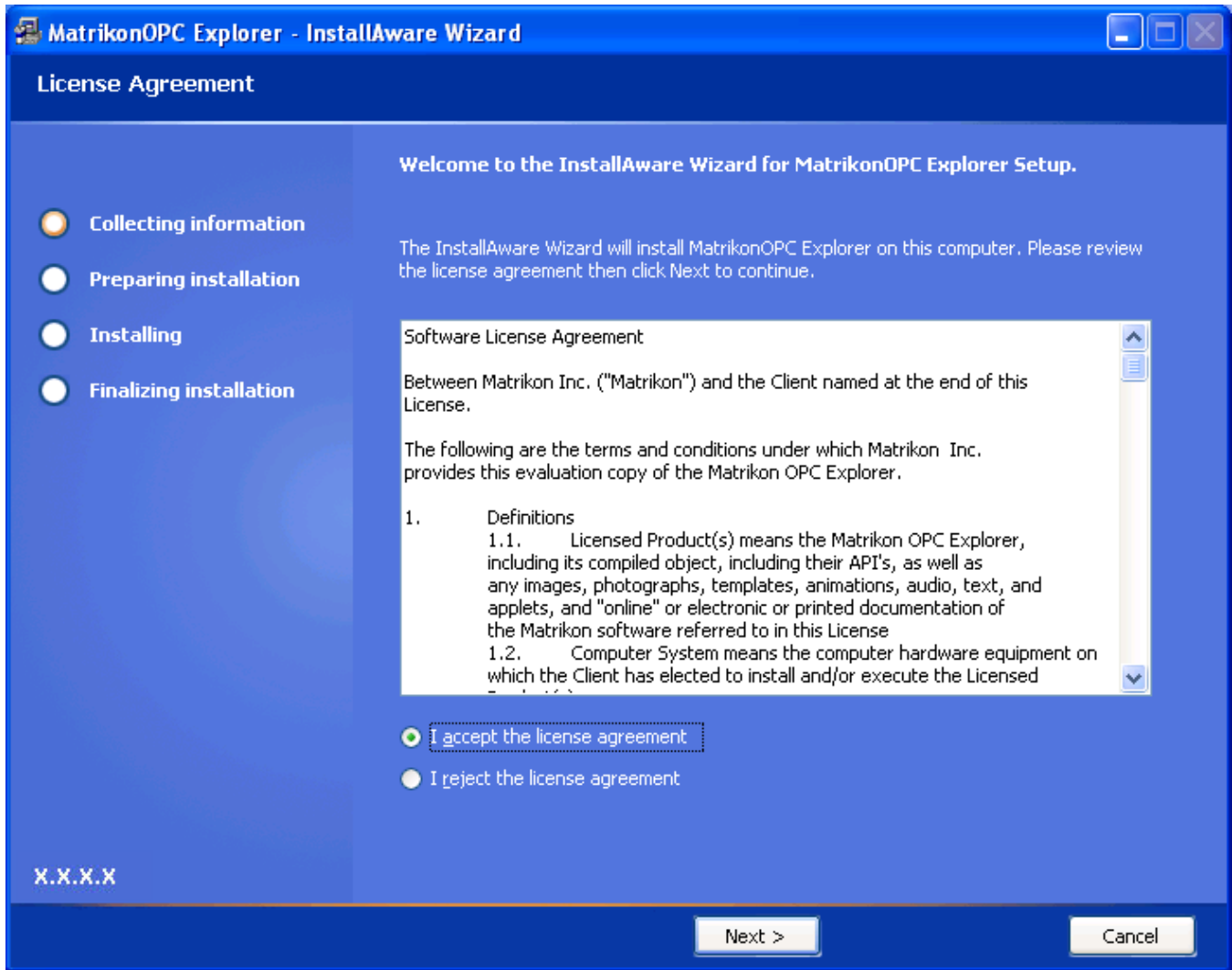


Figure 2 - License Agreement Screen

3. Read the **Software License Agreement**, using the scroll bar to view the entire message.
4. Select the **I accept the license agreement** option button.
5. Click on the **Next** button. The **Destination Folder** screen (Figure 3) appears.

Note: From this point onward, the **Back** button is available allowing you to return to the previous screen or screens.

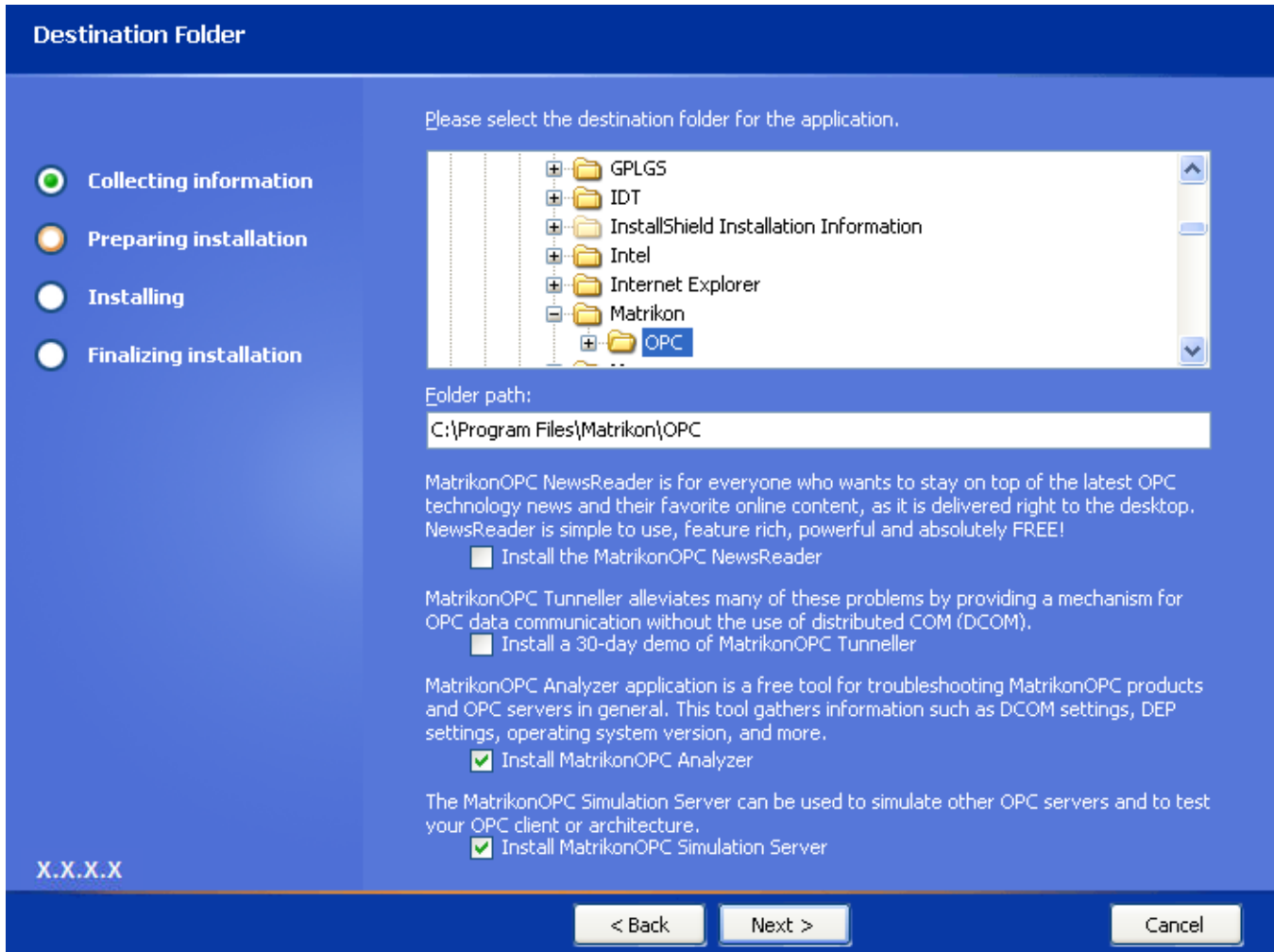


Figure 3 - Destination Folder Screen

6. Select the folder in which to install MatrikonOPC Explorer, or accept the default location displayed in the **Folder path** field.
7. On the **Destination Folder** screen select or clear the checkbox associated with the installation of any or all of the following:
 - **MatrikonOPC NewsReader**
 - **MatrikonOPC Tunneller** (30-day demonstration version)
 - **MatrikonOPC Analyzer** (selected by default)
 - **MatrikonOPC Simulation Server** (selected by default)



Note: As part of the installation process, the **MatrikonOPC Analyzer** tool is installed and used to detect the system settings that affect the use of this software. No information is communicated back to Matrikon. Information is stored on this system **only** for future use by MatrikonOPC Support to assist with troubleshooting, if required.

8. Click on the **Next** button. The **Start Menu** screen (Figure 4) appears.

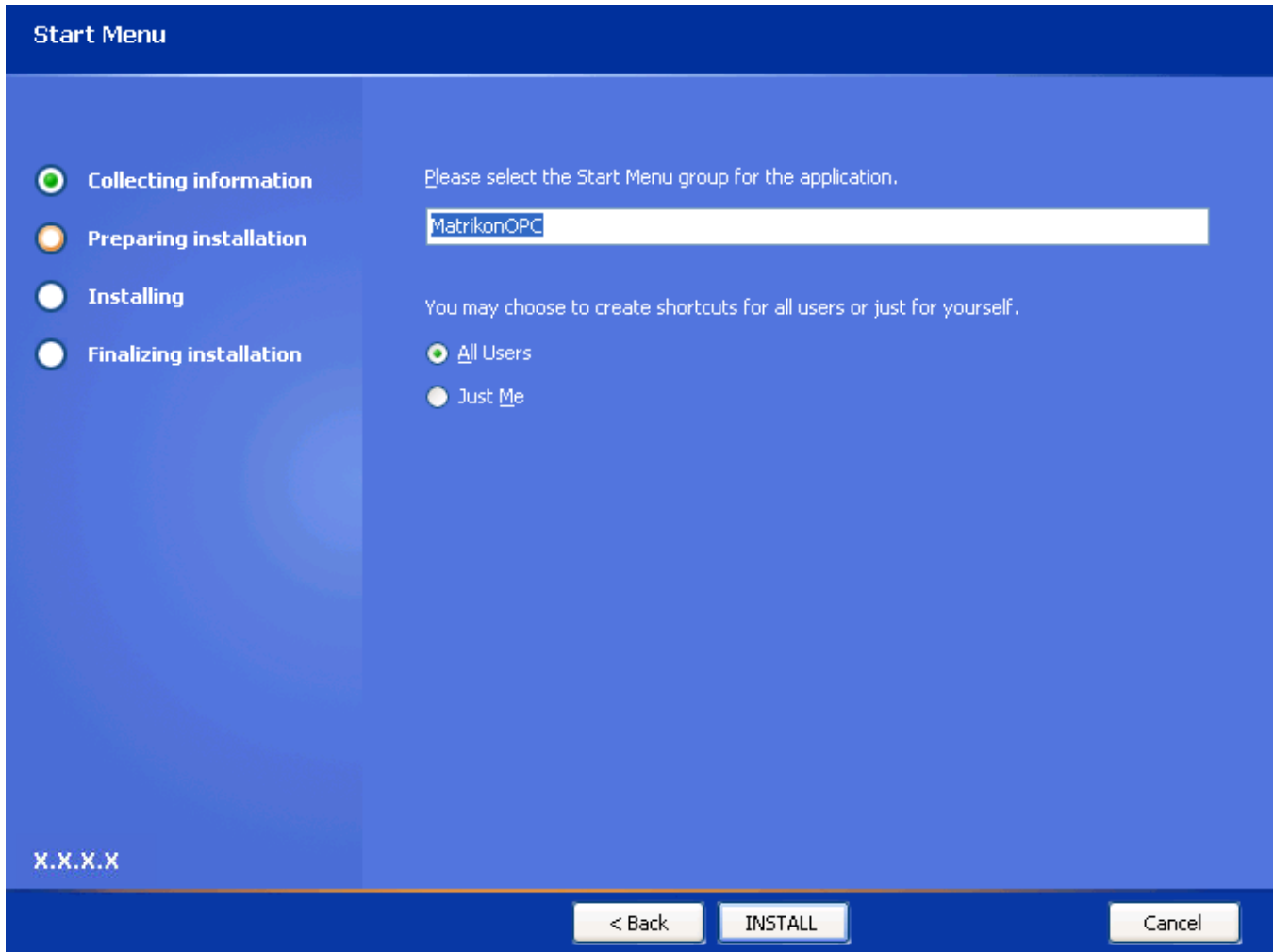


Figure 4 - Start Menu Screen

9. Select the required Start Menu group and then specify whether you want shortcuts created only for yourself, or for all users, by selecting the applicable option button.
10. Click on the **INSTALL** button. The **Installing MatrikonOPC Explorer** screen (Figure 5) appears, installation begins and the server files are copied to the computer.

Note: Prior to starting the installation, you have the option of clicking on the **Back** button to change any of the installation information. Click on the **Cancel** button if you wish to stop or cancel the installation.

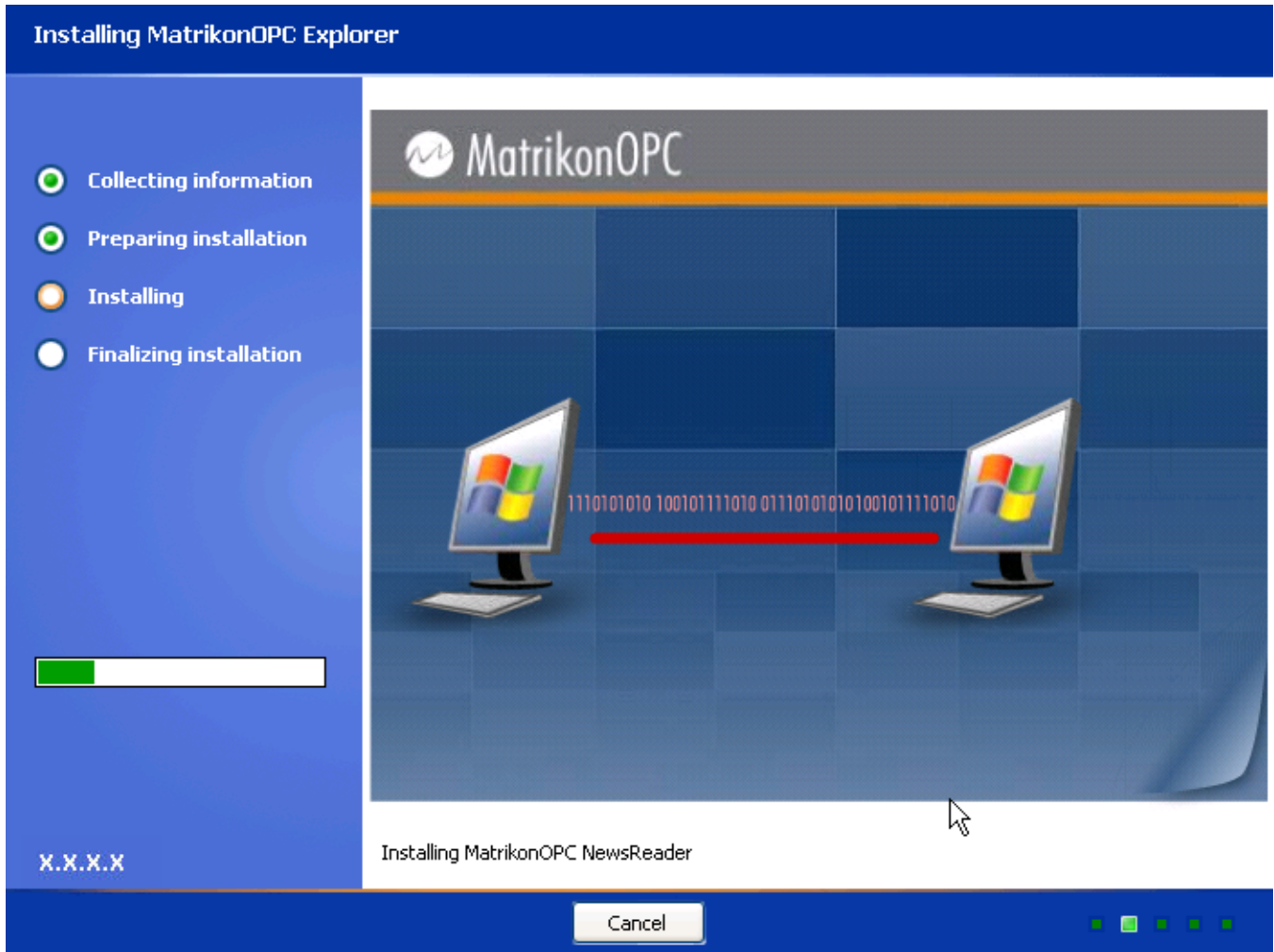


Figure 5 - Installing MatrikonOPC Explorer Screen

11. When the installation has finished, the **MatrikonOPC Explorer Setup Complete** screen (Figure 6) appears stating that MatrikonOPC Explorer has been successfully installed.

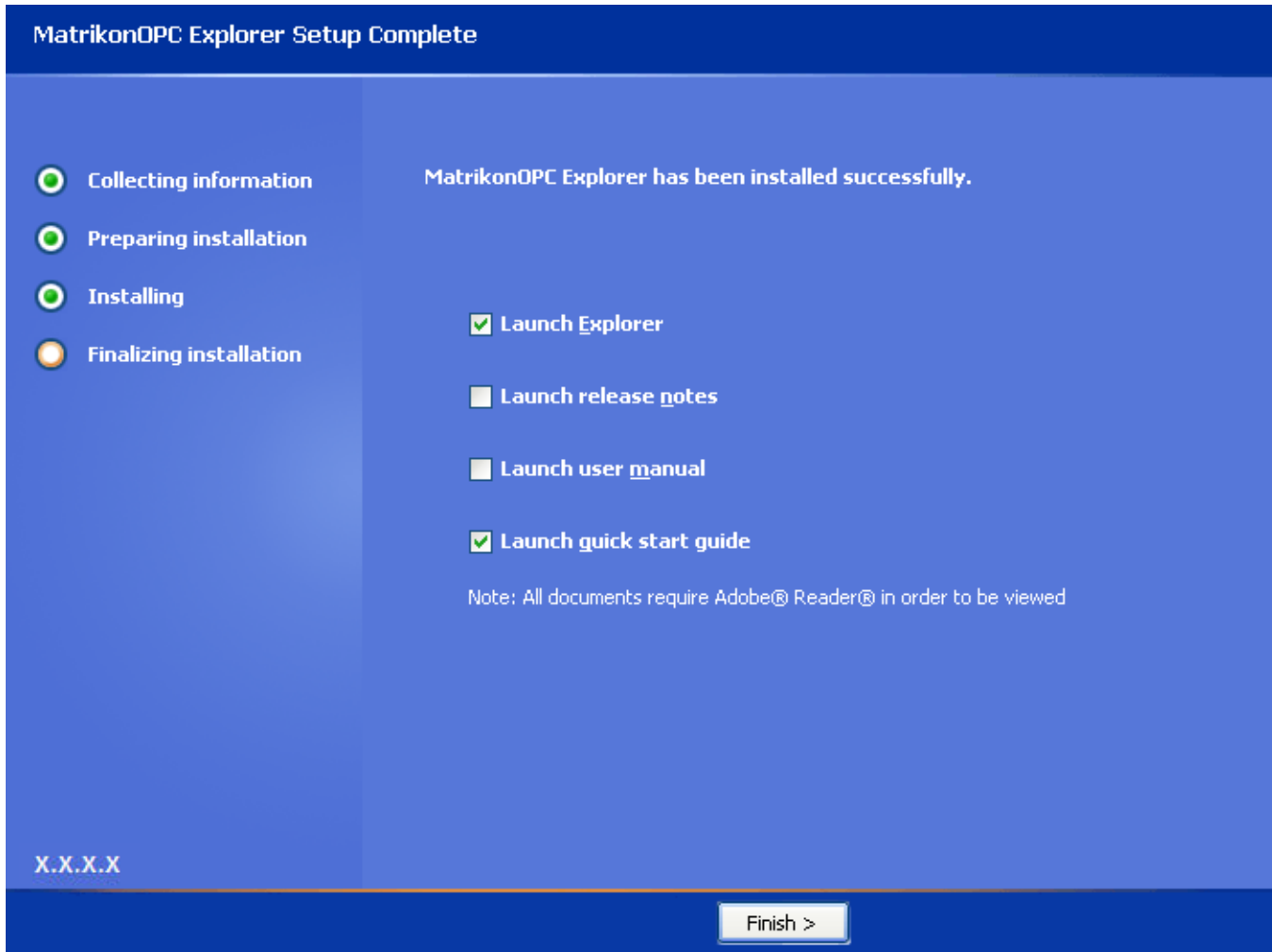


Figure 6 - MatrikonOPC Explorer Setup Complete Screen

12. At this point, you have the option launching any or all of the following by selecting the appropriate checkbox or checkboxes:

- MatrikonOPC Explorer
- *Release Notes*
- *User's Manual*
- *Quick Start Guide*

13. Click on the **Finish** button to complete the installation and exit the Wizard.

14. The necessary files are copied to the target computer, the software components are registered, and shortcut icons are created in the **Start** menu.



Note: At this point, it is recommended that you verify the DCOM settings for your installed servers. Reference to the DCOM configuration can be found in the **DCOM Manual**. This configuration varies for different operating systems.

Installed Files

The installation program copies all necessary files to the target computer and creates shortcut icons in the **Start** menu.

The files listed in Table 2 are installed by default, in the following location:

C:\Program Files\Matrikon\OPC\ Explorer

File Name	Description
eximg.dll	Component of MatrikonOPC Explorer.
Explorerer.wmv	Instructional video demonstrating how to configure MatrikonOPC Explorer.
Explorer EULA.pdf	End-User License Agreement in PDF format.
MatrikonOPC Server for Explorer Quick Start Guide.pdf	Procedural document providing instructions to get you up and running on MatrikonOPC Explorer as quickly as possible.
MatrikonOPC Server for Explorer Release Notes.pdf	<i>Release Notes</i> for this product.
MatrikonOPC Server for Explorer User Manual.pdf	This document.
OPCExplorerer.exe	Product executable.
Project Info.log	Build information specific to the current version of the server.

Table 2 - Files Installed in "Explorer" Folder

The files listed in Table 3 are installed by default, in the following location:

C:\Program Files\Common Files\MatrikonOPC\Common

File Name	Description
OPCAuto.dll	MatrikonOPC Automation Component – enables developers to access OPC data from client applications developed using automation tools such as <i>Visual Basic</i> , <i>VBA</i> , and <i>VB Script</i> .
OPCDAAuto.dll	MatrikonOPC Automation Component – enables developers to access OPC data from client applications developed using automation tools such as <i>Visual Basic</i> , <i>VBA</i> , and <i>VB Script</i> .
opchda_ps.dll	The proxy-stub file that allows OPC clients to make remote connections to an OPC HDA server.
OPCHDAAUTO.dll	MatrikonOPC HDA Automation Component – enables developers to access OPC HDA data from client applications developed using automation tools such as <i>Visual Basic</i> , <i>VBA</i> , and <i>VB Script</i> .

Table 3 - Files Installed in "Common" Folder

Licensing

Most MatrikonOPC products require some form of licensing criteria be met to ensure that it functions successfully. For information about the licensing of the MatrikonOPC server that accompanies this MatrikonOPC Explorer, please refer to the *Licensing* section of the server-specific *User's Manual*.

Contacting Support

The MatrikonOPC Customer Services department (www.opcsupport.com) is available 24 hours a day, seven days a week.

Contact MatrikonOPC Support using the information below, or send an email (support@MatrikonOPC.com).

For Monday to Friday **daytime support** requests, contact MatrikonOPC Support using the regional phone numbers provided in Table 4.

Region	Office Hours	Contact Information
North America UTC/GMT -7 hours (MST)	8:00am-5:00pm	+1-877-OPC-4-ALL
Europe /Africa * UTC/GMT +1 hours (CET)	9:00am-5:00pm	+49-221-969-77-0 (Request OPC Support)
Middle East * UTC/GMT +3 hours	9:00am-5:00pm	+973-174-65363
Australia/Asia * UTC/GMT +10 hours (AEST)	9:00am-5:00pm	+61-2-4908-2198 (Request OPC Support)

* Toll-free regional numbers coming soon!

Table 4 - MatrikonOPC Support Regional Contact Information

For **after-hours support** in all regions, please use either of the following numbers. There is no extra charge from MatrikonOPC for calling their after-hours support numbers.

Region	Contact Information
All	+1-780-231-9480 +1-780-264-6714

Table 5 - After-Hours Support

Configuration

Minimal configuration of MatrikonOPC Explorer is required for the application to function properly, but users can customize its behaviour as required. This chapter shows users how to start and configure the application and describes each component in detail, including the windows, panels, and menu commands.

The **Starting MatrikonOPC Explorer** section of this manual shows users how to start the application, and describes the **MatrikonOPC Explorer window** and **Options** window in detail.

The **Configuration** section describes in detail how to connect to servers and how to add groups and items.


Starting MatrikonOPC Explorer

To launch MatrikonOPC Explorer, you have the following options:

To launch MatrikonOPC Explorer from the Start menu:

1. Click on the Windows **Start** button.
2. Select **Programs -> MatrikonOPC -> Explorer -> MatrikonOPC Explorer**.
3. The **MatrikonOPC Explorer** window (Figure 8) is displayed.

To launch MatrikonOPC Explorer from a MatrikonOPC server Configuration screen:

1. From the toolbar on the main **Configuration** screen of the required server, click on the **View OPC Tags for this Server** icon ().
2. The **MatrikonOPC Explorer's Tag Studio** window (Figure 8) is displayed.

To launch MatrikonOPC Explorer using command-line:

Note: You have the option of passing a configuration file to MatrikonOPC Explorer as a command-line argument. This launches OPC Explorer with a path to the XML file and automatically loads the file. In the following procedure, you would replace *C:\Program Files\Matrikon\OPC\Explorer\test.xml* with the configuration file path of your choice.

1. Use the **Start -> Run** with command **CMD** to bring up a command window.
2. Type the following: **CD C:\Program Files\Matrikon\OPC\Explorer**.
3. Press **Enter**.
4. Type the following: **opcexplorer.exe C:\Program Files\Matrikon\OPC\Explorer\test.xml**.
5. Press **Enter**.
6. MatrikonOPC Explorer is launched with the configuration file (in this example, *test.xml*) automatically loaded.

MatrikonOPC Explorer Window

The information provided in this section describes the **MatrikonOPC Explorer** window, functions, and menus.

Figure 7 shows the **MatrikonOPC Explorer** window prior to selecting and connecting to a server. Figure 8 displays the **MatrikonOPC Explorer** window once a server has been selected in the left navigation pane, and you have connected to that selected server.

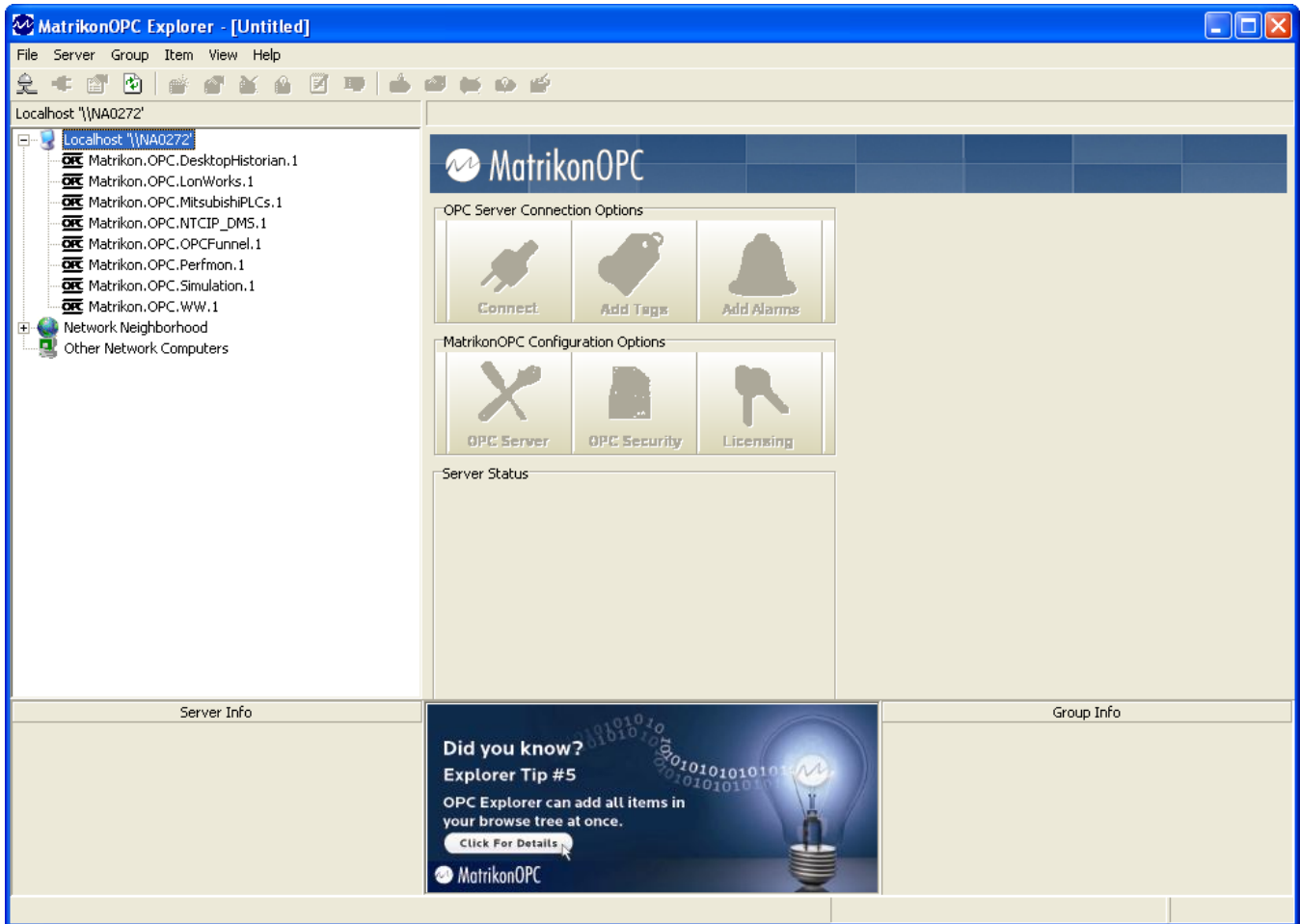




Figure 7 - MatrikonOPC Explorer (Prior to Server Connection)



Figure 8 - MatrikonOPC Explorer (with Connected Server)

Table 6 describes the commands in the **MatrikonOPC Explorer** window.

Command	Description
Main Menu	Provides access to the File , Server , Group , Item , View , and Help menus.
Main Toolbar	Provides shortcut buttons for commands in the Main Menu . Refer to Table 13 for descriptions of these buttons.
Navigation Pane	Displays a tree of configuration objects currently defined in the server. Select an object to display its current settings in the right-hand panel.
Contents	<p>Displays the contents associated with the item selected in the navigation pane on the left side of this screen. The column headings (an example of which can be seen in Figure 24 and are displayed once you have added a group and items to that group) can be used to sort the listed items. Click on the heading of your choice to sort in ascending or descending order, as required. Once you click on a particular heading, a blue triangle appears ( Item ID) and will change direction when you click on the column heading.</p> <p>When you initially access the main Explorer window, the Contents pane (i.e., the pane on the right side of the screen) displays the OPC Server Connection Options and MatrikonOPC Configuration Options which are greyed out, and empty Server Status, Server Info, and Group Info</p>

Command	Description
	<p>screen sections.</p> <p>Once you have selected and connected to a server, the following screen sections are also displayed in the Contents pane: Supported OPC Interfaces, OPC Security. The Server Status and Server Info screen sections now also contain server information. The Group Info screen section is populated once a group is created and selected.</p>
<p>OPC Server Connection Options</p>	<p>Until a ProgID is selected in the navigation pane, these option buttons are greyed out. Once you select a ProgID, the Connect button is enabled. Upon selecting the Connect button, the label then changes to read Disconnect and following buttons are enabled.</p> <ul style="list-style-type: none"> • Connect/Disconnect – connects/disconnects to/from the selected server. • Add Tags – displays the Add Group window (Figure 13). • Add Alarms – displays the Add Subscription window (Figure 14).
<p>MatrikonOPC Configuration Options</p>	<p>Once a ProgID has been selected, the OPC Server, OPC Security (if Security is supported by the selected server) and the Licensing buttons are all enabled allowing you to configure the necessary options (i.e., server, security, licensing).</p> <ul style="list-style-type: none"> • OPC Server – displays the Configuration screen for the selected server. Refer to the <i>Server Configuration</i> section in the <i>User's Manual</i> installed with the selected server. • OPC Security – if enabled, displays an Enter server password window. Use the password set during installation of the selected server. Entering the required password allows you to access the MatrikonOPC Tag Security Configuration Utility screen. • Licensing – displays the MTK Software Authorization screen allowing you to license the selected server. For more information, refer to the <i>Licensing Procedures</i> document installed with the selected server. This option is greyed out if the selected server does not require licensing (e.g., Simulation Server).
<p>Server Status</p>	<p>This screen section is not displayed until a server is selected and connected to. The connected server status information is displayed: Prog ID of the selected server, whether the selected server is connect, server status, number of groups added to the server, total number of items within all groups, current time, and the last update time.</p>
<p>Supported OPC Interfaces</p>	<p>This screen section is not displayed until a server is selected and connected to. Supported OPC interfaces are displayed: DA, HDA, A&E, Security. If the selected server does not support one or more of the interfaces, in the Supported OPC Interfaces screen section, the name of that particular interface appears greyed out with a red X across it (Figure 9).</p> <div>  </div> <p style="text-align: center;">Figure 9 - Supported OPC Interfaces</p>

Command	Description
OPC Security	This screen section is not displayed until a server is selected and connected to. OPC Security Check is displayed. This screen section confirms whether OPC Security is implemented or not. The OPC Security screen section also contains a link to <i>MatrikonOPC Security Gateway</i> information available on the MatrikonOPC website.
Server Info	Displays statistics on the server currently selected in the navigation pane: Server, Connected, State, Groups, Total Items, Current Local Time, Update Local Time.
MatrikonOPC Ads/Tips	Displays ads for MatrikonOPC and a variety of MatrikonOPC Explorer tips.
Group Info/Subscription Info	Displays statistics on the group currently selected in the navigation pane: Group, Connected (Async I/O), Active, Items, Current Update Rate, Percent Deadband, Data Change Rate. Note: In situations where a subscription has been added to a connected server, and that subscription has been selected in the navigation pane, this screen section is then labelled as Subscription Info . In that case, the following statistics are then displayed: Subscription, Active, Alarms, Current Buffer Time, Severity Maximum, Severity Minimum, Max Buffer Size, Event Types.

Table 6 - MatrikonOPC Explorer Window Commands

The following sections describe the menus available from the **MatrikonOPC Explorer** window, and what they are used for.

File Menu

Table 7 describes the **File** menu commands.

Command	Description
New Session	Clears the current session and starts a new one.
Open	Displays the Open Session window allowing you to locate and open a saved session as an XML file.
Save	Saves the current configuration to an XML file. Displays the Save Session window to prompt for a new file name if the configuration is new and has not been saved before.
Save As	Saves the current configuration to an XML file. Displays the Save Session window to prompt for a new file name.
Exit	Closes the current session.

Table 7 - File Menu Commands

Server Menu

Table 8 describes the **Server** menu commands.

Command	Description
Connect	Connects to the selected server.
Disconnect	Disconnects from the selected server.

Command	Description
Add Group	Displays the Add Group window which allows you to define the settings for a new group.
Add Subscription	Displays the Add Subscription window which allows you to define the settings for a new subscription.
Export Groups	Saves an export of all of the currently configured groups in this OPC server. Displays the Export Tags window allowing you to define a new file name (.csv) to identify the export of configured groups. For more information, refer to Exporting Groups, Items, and Alarms .
Logon	If enabled, select this option to display the OPC Security (Private) window where you can enter your logon settings. If the OPC server you are connected to supports the OPC security interface, then this option is available and you can specify a User ID and Password to log onto the OPC server with.
Logoff	If the OPC server you are connected to supports the OPC security interface, then you can log out from your current username and password that was used in the Logon option. This option is enabled only once you have logged on.
Add/Connect Server	Displays the Connecting to an OPC Server window which allows you to manually add another server, and/or connect to another server.
Properties	Displays the Server Properties window which allows you to access general properties associated with the selected server (e.g., Prog ID, vendor, registry settings), server status, as well as required and optional interfaces.

Table 8 - Server Menu Commands

Group Menu

Table 9 describes the **Group** menu commands.

Command	Description
Activate/Deactivate	Activates or deactivates the selected group, as required. If the group is active, the Deactivate menu option is available. If the group is inactive, the Activate menu option is available.
Use Async I/O	Specify whether or not Asynchronous I/O is to be used by the selected group.
Device Read	Specify whether or not to force a Device Read.
Add Items	Displays the Tag Studio allowing you to add items to the selected group.
Export Items	Saves an export of all of the currently configured items in the selected group. Displays the Export Tags window allowing you to define a new file name to identify the export of configured items. For more information, refer to Exporting Groups, Items, and Alarms .
Delete	Enables you to delete the selected group.
Properties	Displays the Group Properties window where you can update general properties and view the associated required and optional interfaces.

Table 9 - Group Menu Commands

Item Menu

Table 10 describes the **Group** menu commands.

Command	Description
Write Values	Displays the Write Values window which allows you to write values to the selected item or items.
Activate/Deactivate	Activates or deactivates the selected item or items. If the item is active, the Deactivate menu option is available. If the item is inactive, the Activate menu option is available.
Delete	Enables you to delete the selected item or items.
Export Items	Saves an export of all of the currently selected items. Displays the Export Tags window for a new file name. For more information, refer to Exporting Groups, Items, and Alarms .
Properties	Displays the Item Properties window where you can update general properties and detailed item properties.

Table 10 - Item Menu Commands

View Menu

Table 11 describes the **View** menu commands.

Command	Description
Advise Log	Displays the MatrikonOPC Explorer Advise Log window.
Error Log	Displays the MatrikonOPC Explorer Error Log window.
Update Speed	Allows you to specify the refresh rate for the value display in OPC Explorer: High, Normal, Low .
Refresh	Refreshes the displayed OPC Explorer and any updates made.
Options	Displays the Options window used to change MatrikonOPC server options: General, Data Transfer, Data Display, COM, and Miscellaneous .

Table 11 - View Menu Commands

Help Menu

Table 12 describes the **Help** menu commands.

Command	Description
MatrikonOPC on the Web	Opens a link to the MatrikonOPC web site.
About	Displays the Welcome screen, which includes information about the product version.

Table 12 - Help Menu Commands

Toolbar Options

Figure 10 displays the **MatrikonOPC Explorer** toolbar. Each toolbar option is described in Table 13.



Figure 10 - MatrikonOPC Explorer Toolbar



Option	Description
Connect to remote OPC Server	Use this button to display the Connecting to an OPC Server window.
Connect to/Disconnect from OPC Server	Select this button to disconnect from (), or connect to (), the selected server.
Properties	Use this button to display the Server Properties window.
OPC Server Refresh	Select this button to refresh the selected server.
Add Group	Use this button to display the Add Group window allowing you to create groups and add them to the selected server.
Group Properties	Use this button to display the Group Properties window.
Delete Group	Select this button to delete selected groups.
Activate/Deactivate Group	Select this button to activate or deactivate selected groups, as required.
Use/Stop using Asynch I/O	Select this button to use or stop using Asynch I/O, as required.
Force Demand Read	Select this button force a Demand Read for the selected group.
Add OPC Items	Use this button to display the Tag Studio allowing you to add tags.
OPC item properties	Use this button to display the Item Properties window.
Delete OPC items	Select this button to delete selected items.
Activate/Deactivate item(s)	Select this button to activate or deactivate selected items, as required.
Write to selected OPC items	Use this button to display the Write Values window allowing you to define a new value for the selected item or items.

Table 13 - MatrikonOPC Explorer Window Toolbar Options

Viewing Available OPC Servers

MatrikonOPC Explorer is an OPC client application. It connects to OPC server applications and displays real-time values as they are received. When OPC Explorer starts up, it searches the registry on the local computer and generates a list of program IDs for available OPC servers. It displays this list in a browser view in the left-hand pane (Figure 11) of the OPC Explorer.

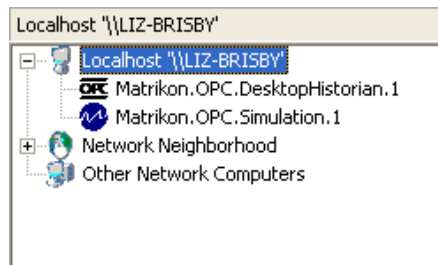


Figure 11 - Server List

Every OPC server has a unique program ID. This is a human-readable text string that is converted to a globally-unique identification number which COM then uses to identify the server. Each server may have a version-specific program ID (with a number appended to the end of the string), a version-independent program ID (no number), or both. All MatrikonOPC servers have both types, but only the version-dependent program ID shows up in the list.

If an error occurs during the communication session between OPC Explorer and an OPC server, a message appears explaining as much. Click on the **Details** button to get a more descriptive explanation of the error. Clear the **Disconnect Server** checkbox to ignore the error and continue without disconnecting from the server. Select the **Error Log** option from the **View** menu to display a log of past errors in the **MatrikonOPC Explorer Error Log** window. For more information, refer to **Error Log**.

Connecting to an OPC Server

To connect to an OPC server:

1. From the main **MatrikonOPC Explorer** window, in the browser view (i.e., navigation pane), select a program ID.
2. In the **OPC Server Connections Options** screen section in the **Contents** pane, click on the **Connect** button, or

From the toolbar, select the **Connect to selected OPC Server** icon () , or

Right-click your mouse on the required ProgID in the navigation pane, and select **Connect** from the displayed menu, or

From the **Server** menu, select the **Connect** option.

Notes:

- The browser pane allows users to choose OPC servers on the **Local** or **Networked** machines. Another option for remote connections is the **Other Network Computers** option. Right-clicking your mouse on this item and selecting **Add/Connect Server** displays the **Connecting to an OPC Server** window (Figure 12) which allows you to manually enter a host name/IP address and OPC Server Prog ID.
- COM will attempt to launch the OPC server if it is not currently running when the first client attempts to connect to it. If the server runs as a local executable, then COM will run it. If the server runs as an NT service, then COM will start it up.
- Similarly, when the last client application disconnects from an OPC server, the server will shut down. MatrikonOPC servers wait for one minute before shutting down to avoid unnecessary processing when client applications connect and disconnect frequently.

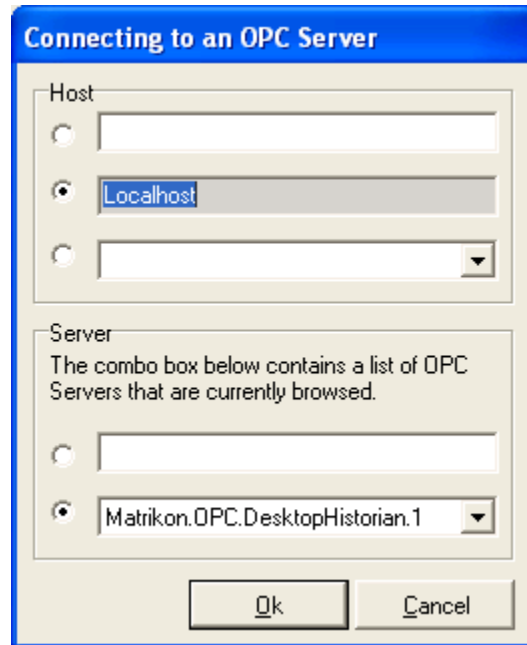



Figure 12 - Connecting to an OPC Server Window (Other Network Computers)

Adding OPC Groups

Note: To add a group or groups to a connected server (for assistance, see [Connecting to an OPC Server](#)), follows the steps outlined in the procedure below.

To add an OPC group:

1. From **MatrikonOPC Explorer**, in the browser view (i.e., navigation pane), select the connected server to which you want to add an OPC group.

2. From the toolbar, click on the **Add Group** button (), or

Right-click your mouse on the required server and select the **Add Group** option from the displayed menu, or

From the **Server** menu, select the **Add Group** option.

Note: You also have the option of adding a group by first clicking on the **Add Tags** button in the **OPC Server Connections Options** screen section of the **Matrikon Explorer** window. The **Tag Studio** then appears allowing you to add items as required (for more information, refer to [Adding OPC Items](#)). Once you close the Tag Studio, a new group is automatically created for you.

3. The **Add Group** window (Figure 13) appears.

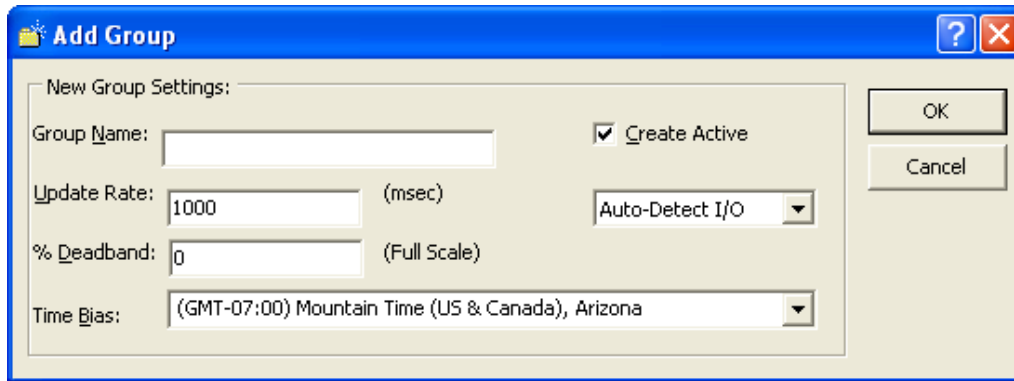



Figure 13 - Add Group Window

4. Enter a name for the group. If the **Group Name** field is left blank, the OPC server will assign a unique name for the group.
5. Change the other settings as desired.
6. Click on the **OK** button.
7. The **Tag Studio** (Figure 19) appears allowing you to add OPC items to your new group (refer to **Adding OPC Items**).
8. After adding items to the group, click on the **OK** button.
9. The newly-created group and associated items now appear in the navigation pane under the selected server.

Changing OPC Groups

To change an OPC group:

1. Select the group for which you want to change settings, and from the **Group** menu either:
 - Select the **Properties** menu option, or
 - From the toolbar, click on the **Group Properties** button () , or
 - Right-click your mouse on the group you wish to change, and select **Properties** from the displayed menu.
2. The **Group Properties** window appears.
3. Change the settings as required. Refer to **Read Real-Time Values** for further explanation of what these settings do.
4. Click on the **Apply** button to submit the changes.
5. Click on the **OK** button to close the **Group Properties** window and return to Matrikon Explorer.

Adding Subscriptions

A subscription is added to a connected server and is used to categorize alarms for that server.

The **Add Subscription** window consists of two tabs:

- **Subscription Settings**
- **Filtering**

Subscription Settings Tab

The **Subscription Settings** tab (Figure 14) is where the subscription's name, update rate, and size are defined. This tab is where you specify whether the subscription is enabled or disabled. Table 14 describes the tab components.

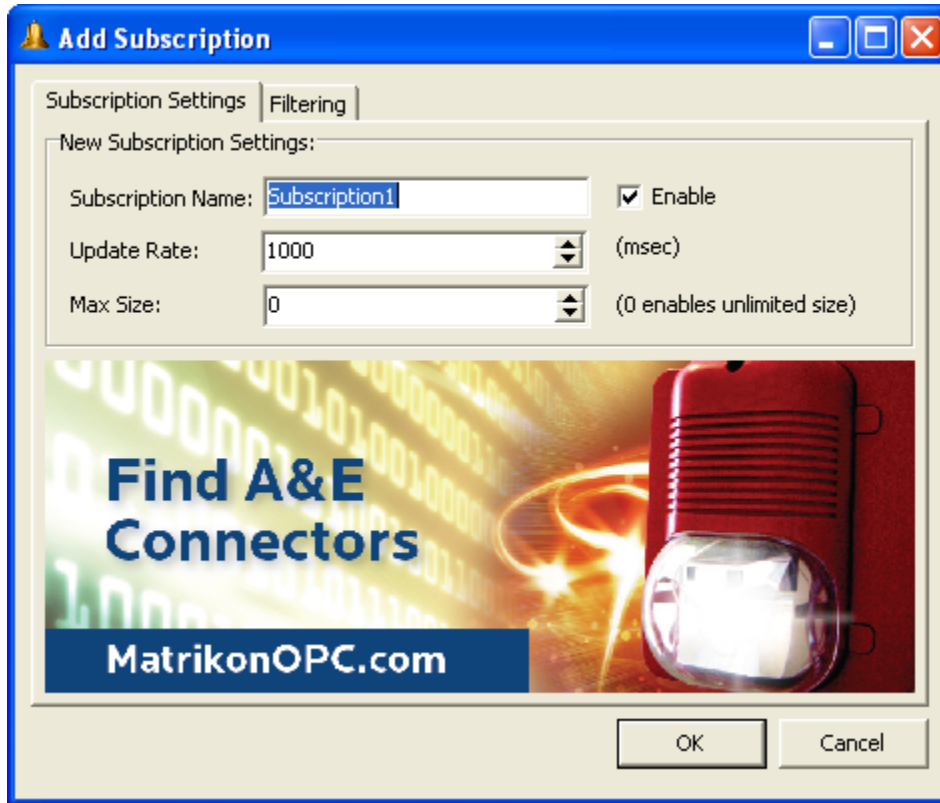


Figure 14 - Add Subscription Window (Subscription Settings Tab)

Option	Description
Subscription Name	Allows you to enter a name for the subscription. If this field is left blank, the OPC server assigns a unique name for the subscription.
Enable	Use this checkbox to enable (i.e., checkbox is selected) or disable (i.e., checkbox is cleared) the subscription. By default, the checkbox is selected.
Update Rate	Allows you to enter or select a value that defines the rate (in milliseconds) at which the subscription is to be updated. Default = 1000 .
Max Size	Allows you to enter or select a value that specifies the maximum size allowed for the current subscription. A value of 0 indicates an unlimited size. Default = 0 .
OK	Select this button to save any changes made and close the window. Note: This information stays consistent across all tabs.
Cancel	Select this button to close the window without saving any changes made.

Option	Description
	Note: This information stays consistent across all tabs.

Table 14 - Add Subscription Window (Subscription Settings Tab) Components

Filtering Tab

The **Filtering** tab (Figure 15) filters the subscription alarms by event type, severity, and categories. Table 15 describes the tab components.

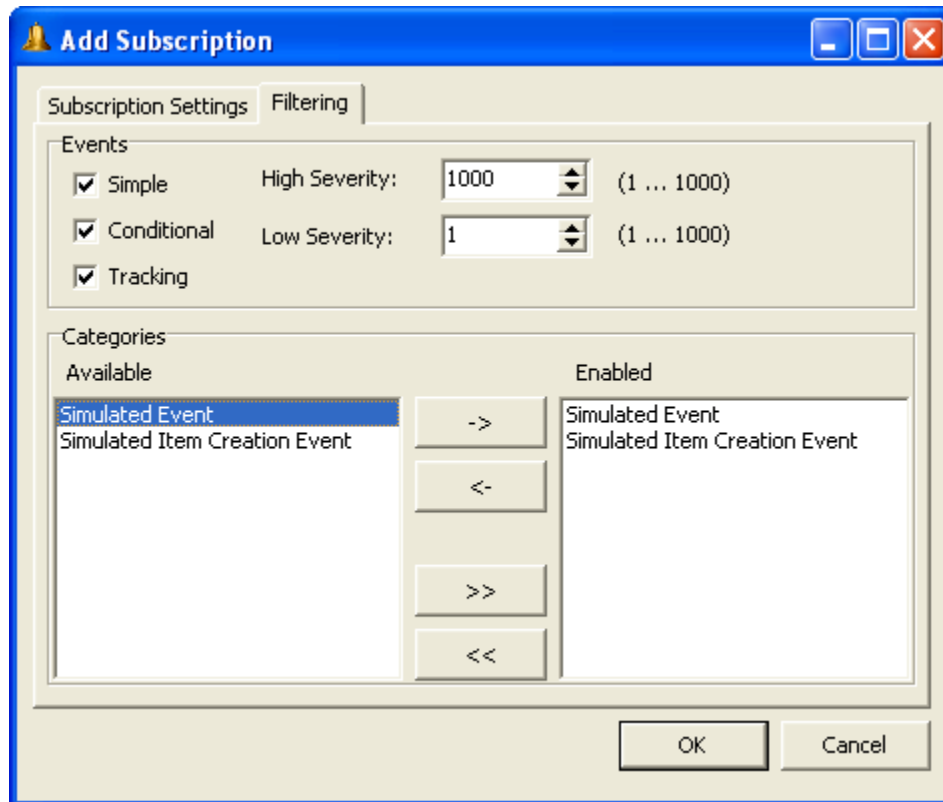


Figure 15 - Add Subscription Window (Filtering Tab)

Option	Description
Events	Allows you to specify what types of events are to be included (i.e., checkbox is selected) in the subscription: Simple , Conditional , and/or Tracking . By default, all checkboxes are selected.
High Severity	Allows you to enter or select a value defining the highest severity allowed for an event within a range of 1 (lowest priority) through and including 1000 (highest priority). Default = 1000 .
Low Severity	Allows you to enter or select a value defining the lowest severity allowed for an event within a range of 1 (lowest priority) through and including 1000 (highest priority). Default = 1 .
Categories	In this screen section, the Available pane lists all of the possible

Option	Description
	different alarms supported by the server. The available alarms depend on the server to which you are connected. If an alarm is not enabled, it is not listed in the Enabled pane.
OK	Select this button to save any changes made and close the window. Note: This information stays consistent across all tabs.
Cancel	Select this button to close the window without saving any changes made. Note: This information stays consistent across all tabs.

Table 15 - Add Subscription Window (Filtering Tab) Components

To add a subscription:

1. From the **MatrikonOPC Explorer** window, in the browser view (i.e., navigation pane), select the connected OPC server to which you want to add a subscription.
2. From the **Server** menu, select the **Add Subscription** option, or
 Right-click your mouse on the server to which you want to add a subscription, and select the **Add Subscription** option from the displayed menu, or
 Click on the **Add Alarms** icon in the **OPC Server Connection Options** screen section.
3. The **Add Subscription** window (Figure 14) appears.
4. With the **Subscription Settings** tab selected, enter a name for the subscription. If the **Subscription Name** field is left blank, the OPC server will assign a unique name for the subscription.
5. Make changes as required.
6. Select the **Filtering** tab (Figure 15) and make any other required changes.
7. Click **OK**.
8. The **Add Subscription** window closes and you are returned to the MatrikonOPC Explorer where the newly-created subscription is now displayed in the navigation pane (Figure 16).

Note: Once a subscription has been created, the properties can only be viewed and cannot be changed.

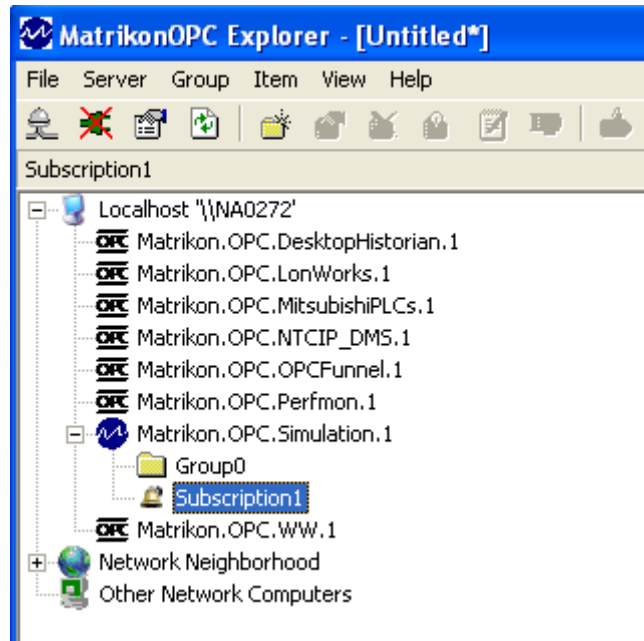


Figure 16 - New Subscription

Subscription Options

Right-clicking your mouse on a subscription in the navigation pane (as an example, refer to Figure 16), the following options are available:

Clear Alarms – clears all alarms associated with the selected subscription.

Export Alarms – displays the **Export Tags** window (Figure 17) allowing you to save the information from the selected alarm or alarms to a .csv file. For more information, refer to [Exporting Groups, Items, and Alarms](#).

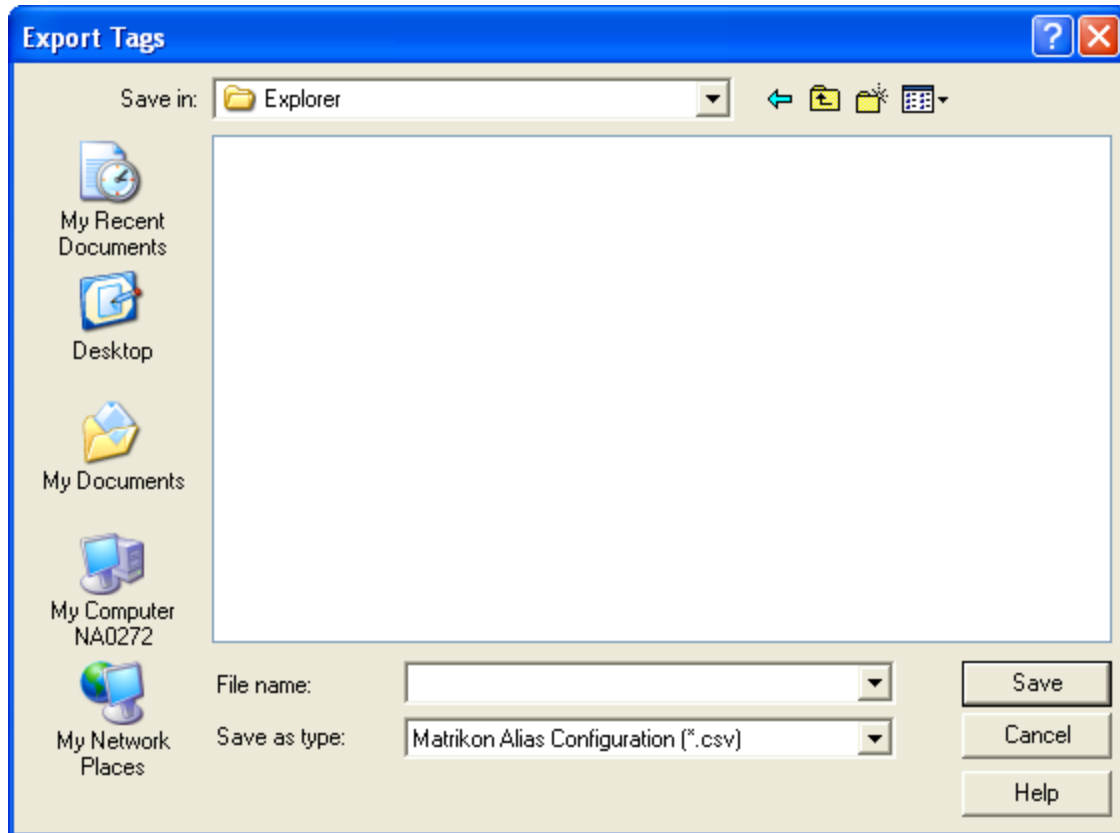


Figure 17 - Export Tags Window

Delete Subscription – allows you to delete a subscription.

Properties – displays the **Subscription Properties** window (Figure 18) which is display only. This window allows you to view the settings applied to the selected subscription.

Note: Once a subscription has been created, the properties can only be viewed and cannot be changed.

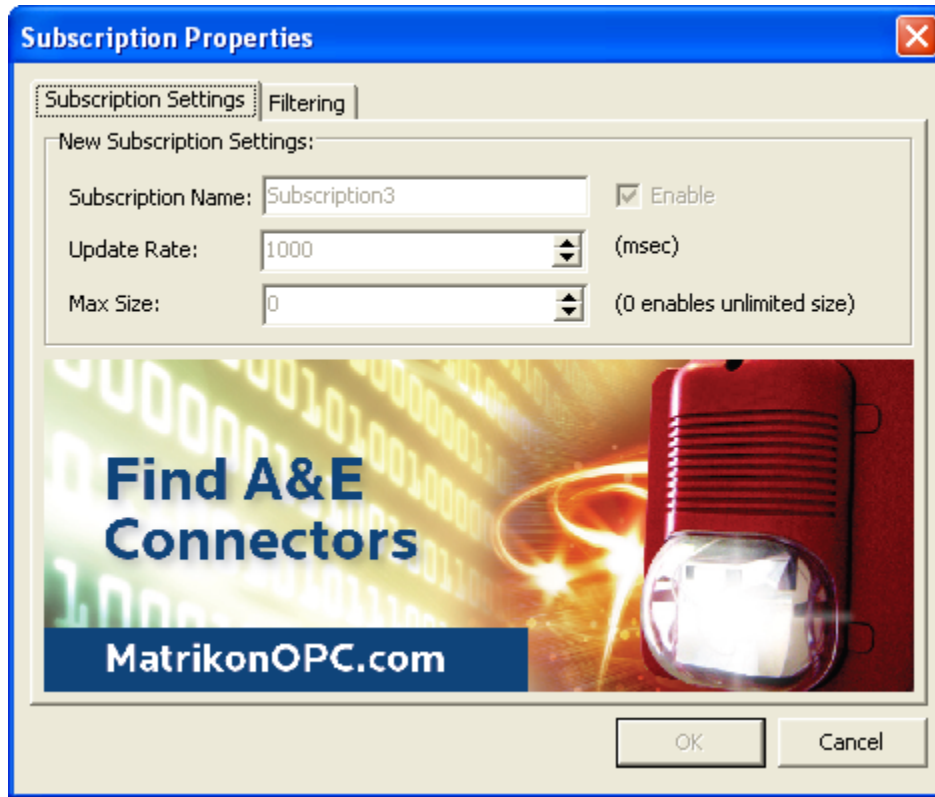


Figure 18 - Subscription Properties Window

Adding OPC Items

An OPC group serves as a logical collection of data items. The **Tag Studio** (Figure 19) is a utility for creating, validating, and adding OPC items.

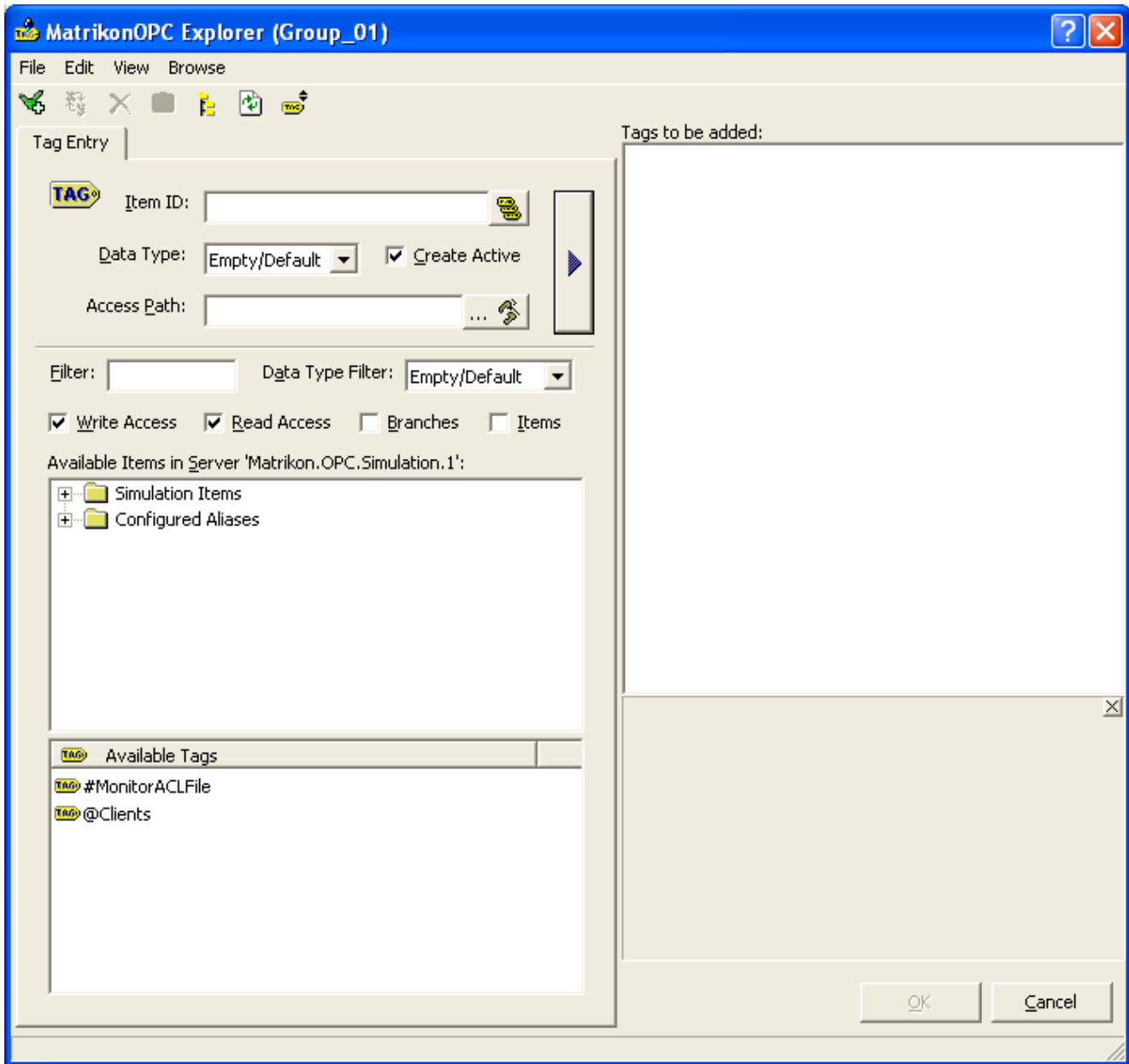


Figure 19 - Tag Studio

Table 16 describes the commands in the **Tag Studio**.

Command	Description
Main Menu	Provides access to the File , Edit , View and Browse menus.
Main Toolbar	Provides shortcut buttons for commands in the Main Menu . Refer to Table 21 for descriptions of these buttons.
Tag Entry	This panel allows you to specify and edit those tags to be added to a group.
Tags to be added	This panel lists the tags to be added to a group, and displays properties for a selected item.

Table 16 - Tag Studio Commands

File Menu

Table 17 describes the **File** menu commands.

Command	Description
Validate Tags	Select this menu option to validate the selected items.
Close	Select this menu option to close the Tag Studio and return to MatrikonOPC Explorer .
Update and return	Select this menu option to update and close the Tag Studio and return to MatrikonOPC Explorer .

Table 17 - File Menu Commands (Tag Studio)

Edit Menu

Table 18 describes the **Edit** menu commands.

Command	Description
Clear Tag List	Select this menu option to clear all tags from the Tags to be added screen section.
Select All	Select this menu option to select all tags listed in the Tags to be added screen section.
Remove Tag	Select this menu option to delete all selected items in the Tags to be added screen section.

Table 18 - Edit Menu Commands (Tag Studio)

View Menu

Table 19 describes the **View** menu commands.

Command	Description
Status Bar	Select this menu option (i.e., checkmark appears next to option) to display a status bar at the bottom of the screen
Server Browser	Select this menu option (i.e., checkmark appears next to option) to display the server browser in the Tag Entry screen section.
Item Info	Select this menu option (i.e., checkmark appears next to option) to display the Item Information screen section (below the Tags to be added section).
Large Icons	Select this menu option (i.e., bullet point appears next to option) and the items listed in the Tags to be added screen section are displayed as large icons.
Small Icons	Select this menu option (i.e., bullet point appears next to option) and the items listed in the Tags to be added screen section are displayed as small icons.
List	Select this menu option (i.e., bullet point appears next to option) and the items listed in the Tags to be added screen section are displayed in a list format.

Table 19 - View Menu Commands (Tag Studio)

Browse Menu

Table 20 describes the **Browse** menu commands.

Command	Description
Refresh	Select this menu option to refresh the Tag Studio .
Flat Browse	Select this menu option (i.e., checkmark appears next to option) to enable flat browsing for available tags.
Hierarchical Browse	Select this menu option (i.e., checkmark appears next to option) to enable hierarchical browsing for available tags.

Table 20 - Browse Menu Commands (Tag Studio)

Toolbar Options

Each **Tag Studio** toolbar option is described in Table 21.








Option	Description
	Select this button to close the item browser and add the selected items.
	Select this button to edit the selected item.
	Select this button to delete selected items.
	Select this button to validate the selected items.
	Select this button to show or hide the browse tree, as required.
	Select this button to refresh the browse tree. This button is available only when the server browser is displayed.
	Select this button to change the view of item list. Items are either listed or appear as icons.

Table 21 - Tag Studio Toolbar Options

Table 22 describes the **Tag Studio** components.


Command	Description
Item ID	Allows you to enter the required item ID.
Data Type	Allows you to select the required data type from the drop-down list. If this field is left empty, the default data type will be used.
Create Active	Select this checkbox if you want the tag to be created in an active state.
Add tag to list	Select this button to add the tag definition to the tag list (i.e., Tags to be added section). Tags in the tag list will be added to the selected group once the OK button is selected.
Access Path	Allows you to enter (or select by using the Browse Access Paths button) the tag's access path. Access paths are optional and may not be used by some servers.
Browse Access Paths	Use this button to display the Browse Access Paths window. If access

Command	Description
	paths are available for the item (not the case for all servers), they are listed for selection in this window. Select a path in this window, click on the OK button. The window closes and the selected access path is displayed in the Access Path field.
Filter	Allows you to enter a filter string to apply to the server.
Data Type Filter	Allows you to select the data type, which is to be used to filter available tags, from the drop-down list. If this field is left empty, the default data type will be used.
Write Access	Select this checkbox to browse only writeable items.
Read Access	Select this checkbox to browse only readable items.
Branches	Select this checkbox to apply the filter to the branches.
Items	Select this checkbox to apply the filter to the items.
Available Items in Server [Server Name]	Allows you to select and expand a grouping to view the items it contains.
Available Tags	Lists the tags associated with the selected item in the Available Items screen section. Allows you to edit item IDs and add one or more tags to the tag list.
Tags to be added	List of those tags selected for addition to the current group. Select a tag to view its properties in the Item Information screen section (i.e., section below Tags to be added). You can double-click on a tag to edit it, if required. Right-clicking your mouse on a tag displays a menu allowing you to write values to the tag, deactivate it, delete it, or view its properties.
Item Information	Lists the properties associated with the tag selected in the Tags to be added screen section.

Table 22 - Tag Studio Components

You can use either of the following methods to add OPC items to a group:

To add an OPC item using the Item ID field:

1. From the **MatrikonOPC Explorer** window, in the browser view (i.e., navigation pane), select the OPC group to which you want to add an item or items.
2. From the **Group** menu, select the **Add Items** option, or
 From the toolbar, click on the **Add OPC Items** button (), or
 Right-click your mouse on the group to which you want to add an item, and select the **Add Items** option from the displayed menu, or
 Double-click your mouse on the group to which you want to add an item.
3. The **Tag Studio** (Figure 19) appears.
4. From the **Tag Studio**, in the **Item ID** field, enter an item ID.
5. Click on the **Add tag to list** (i.e., right-pointing arrow) button. The item then appears in the **Tags to be added** list.
6. Double-click on the item to edit its settings in the **Tag Entry** panel, or

Right-click your mouse on the item and select **Edit** from the displayed menu.

Note: The appearance of the **Add tag to list** button changes to include this graphic  above the arrow on the button.

7. Make changes as required.
8. From the **File** menu, select the **Update and Return** menu option to add the created items to the OPC group and return to the **MatrikonOPC Explorer**.

To add an OPC item from the Available Items screen section:

1. From the **MatrikonOPC Explorer** window, in the browser view (i.e., navigation pane), select the OPC group to which you want to add an item or items.

2. From the **Group** menu, select the **Add Items** option, or

From the toolbar, click on the **Add OPC Items** button (), or

Right-click your mouse on the group to which you want to add an item, and select the **Add Items** option from the displayed menu, or

Double-click your mouse on the group to which you want to add an item.

3. The **Tag Studio** (Figure 19) appears.
4. From the **Tag Studio**, in the **Available Items** screen section, select and expand either the **[Server Name] Items** or **Configured Aliases** nodes.
5. Browse to the desired item or items.
6. Right-click your mouse on the required item and select **Add to Tag List** from the displayed menu, or

Double-click your mouse on the required tag to move it to the **Tags to be added screen** section, or

To add all of the tags listed in the **Available Tags** screen section, right-click your mouse anywhere in that screen section and select **Add All Items to Tag List** from the displayed menu.

7. Double-click on the item to edit its settings in the **Tag Entry** panel, or
Right-click your mouse on the item and select **Edit** from the displayed menu.

Note: The appearance of the **Add tag to list** button changes to include this graphic  above the arrow on the button.

8. Make changes as required.
9. From the **File** menu, select the **Update and Return** menu option to add the created items to the OPC group and return to the **MatrikonOPC Explorer**.

The following sub-sections describe the MatrikonOPC Explorer components and functions in more detail:

- **Item ID**
- **Access Path**
- **Browsing the Server Address Space**
- **Requested Data Type**

- **Active State**
- **Validate the OPC Items**

Item ID

All OPC items must be identified by an item ID. This identifier is a server-specific string of characters that uniquely identifies a source of data to an OPC server. More than one OPC item may refer to the same item ID at the same time.

Note: Items or devices given names containing a period, comma, or hash mark, will not be available in MatrikonOPC Explorer.

On the **Tag Studio**, enter the item ID in the **Item ID** field. Click on the **View tag generator** button (outlined in red in Figure 20) adjacent to the **Item ID** field. The **Tag Generator** window Figure 21 appears.

The **Tag Generator** is a utility used to create large numbers of tags that follow a known pattern.



Figure 20 - View Tag Generator Button

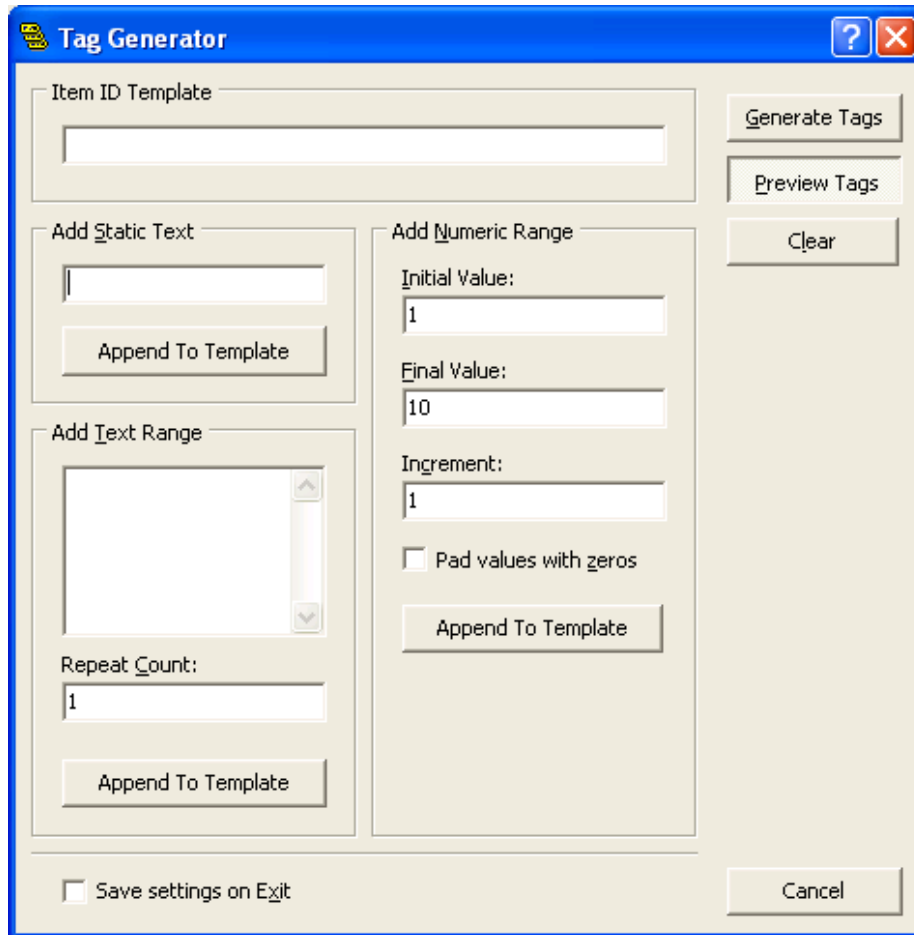


Figure 21 - Tag Generator Window

Some examples of item IDs might be:

- **PLC1.4:0001**

- **North:FIC101/CV**
- **\\ARCSVR:DBTAG001**

Refer to your OPC server's documentation for information about the specific syntax of the item IDs.

Access Path

Some OPC servers may allow clients to specify an access path in addition to an item ID. An access path may suggest to the server how it should get the data for a particular item. For example, it might specify the method of communication to use for accessing the data (i.e., radio, satellite, or modem).

Servers are under no obligation to use the access path, although they will return errors if the access path is invalid. From the **Tag Studio**, click on the **Browse Access Paths** button (outlined in red in Figure 22) to the right of the **Access Path** field to browse the access paths that are available for the selected item ID (if the server supports this feature). MatrikonOPC servers do not use access paths. Leave the **Access Path** field blank if it is not used.



Figure 22 - Browse Access Paths Button

Browsing the Server Address Space

Browsing is supported by some OPC servers as a means of isolating users from the exact syntax of its item IDs. Browsing allows users of OPC clients to view the "contents" of a server to find a particular tag and resolve it into a valid item ID. It is not primarily intended for auto-generating OPC items. If the OPC server supports browsing, then a tree view and list view appear in **Tag Studio**.

The browsing method can be changed from hierarchical to flat by clicking on the **Tag Studio's Browse** menu which gives you the option of selecting **Flat Browse** or **Hierarchical Browse**. When using flat browsing, all items are displayed in the **Available Tags** window.

When using hierarchical browsing, the tree view displays "branches" in the address space, while the list view displays the "leaves" that are available under the selected branch. Each leaf either represents an actual item or else it may provide a hint indicative of available items. For example, if there are thousands of numbered items under a branch, the server might simply provide a single leaf representing the range of numeric addresses available.

While browsing, you may apply a number of filter criteria to search for a particular type of item. The syntax of the filter is vendor-specific, but the algorithm recommended by the OPC Foundation follows the same pattern as the *Visual Basic* "Like" function with respect to item names. For example, **A*** filters out any item names that do not begin with the letter **A**. This filter may also apply to branches.

Items may also be filtered by data type and access rights. Choosing a type other than **Empty/Default** causes the browser to display only those items with the same canonical data type as that selected. Access rights are non-exclusive. For example, selecting write access and de-selecting read access will display only items that can be written to, regardless of their read accessibility. Selecting both should filter nothing out.

Double-click on a leaf and **Tag Studio** will place the fully-qualified item ID for that item in the **Item ID** field. If the item ID is a hint, then change it to a "real" item, following the pattern provided by the hint. Alternatively, right-click on the item and choose **Add to Tag List** to add the item using the previous item's settings. Selecting **Add All Items to Tag List** adds every item under the branch.

Requested Data Type


All OPC items have a native (canonical) data type. That is to say, there is a default format to the data that the server supplies for an item. When creating OPC items, client applications can specify a requested data type for each item. The OPC server will attempt to convert any data from the item to this format, if possible. If the requested and canonical data types are incompatible, the server will fail to validate the item when it is added.

Active State

Like groups, OPC items may be active or inactive. Refer to [Read Real-Time Values](#) for more information about this setting.

Validate the OPC Items

OPC items can be validated using any of the following options:

- From the **Tag Studio**, select **Validate Tags** from the **File** menu, or
- From the toolbar, click on the **Validate Items** button () , or
- Right-click your mouse in the **Tags to be added** screen section and select **Validate Tags** from the displayed menu.

Tag Studio will then query the OPC server to determine whether the items are correct. A small **red X** that appears next to an item indicates that it did not validate properly. A **green checkmark** indicates that the item is valid. A **blue question mark** indicates that the item has not yet been validated.

Read Real-Time Values

Once items are added to an OPC group, MatrikonOPC Explorer continually updates the display for that group with real-time data. The data values appear in the list view on the right-hand side of the **OPC Explorer** window. Each item is listed along with its item ID, access path, active state, value, quality and timestamp.

When there are a number of groups created on an OPC server, use the group list view to navigate between different groups as well as to view the items in those groups.

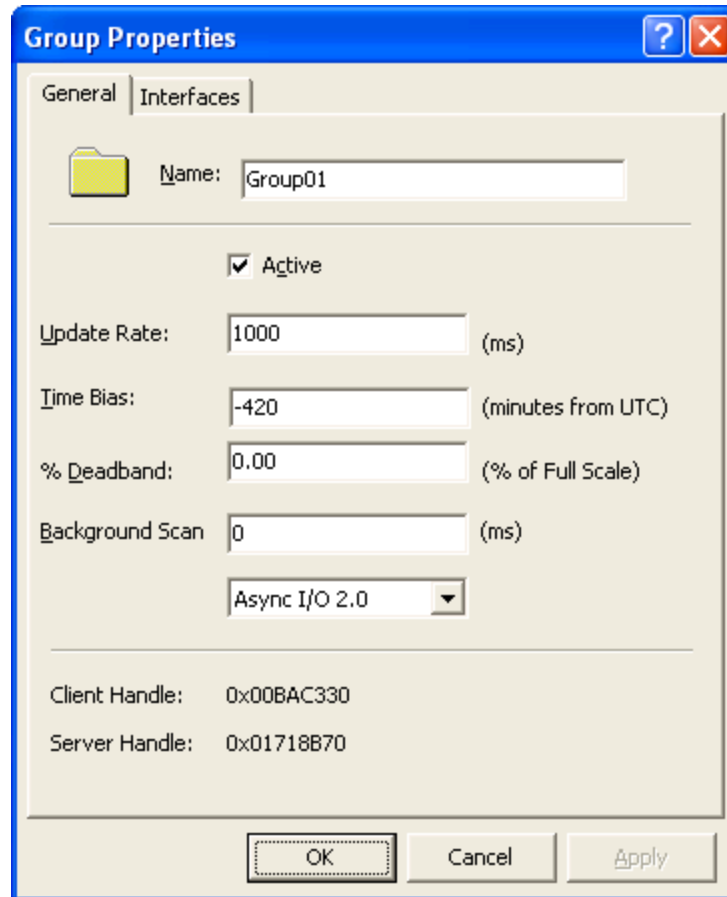


Figure 23 - Group Properties Window

Update Rate

The OPC server tries to keep MatrikonOPC Explorer informed with values for an OPC group at the requested update rate for that group. If the requested update rate is too fast for the server to handle, then it will return a revised update rate that it will use instead. Internally, the server tries to keep the data items at least as “fresh” as indicated by the update rate. However, the server will send values to the client no faster than the update rate to avoid overwhelming it.

Active State

OPC servers only update values for active items in active groups. When an individual item is set inactive, the server stops sending updates for the item. When a group is set inactive, the server stops sending values for any items in that group. Client applications (such as HMI applications) can help to reduce the processing load on an OPC server by deactivating groups and items that are not currently needed.

Choose the **Activate** or **Deactivate** option from the **Group** or **Item** menus at any time to change the active state of an OPC group or individual OPC items.

Time Bias

Some OPC client applications may use the OPC server time bias setting as a storage area for time zone information. This information might be used to display server timestamps in a time zone other than UTC or the local time zone. MatrikonOPC Explorer does not use this information, but allows the user to write the information to the server as a test.

Dead-Band

Some OPC servers support dead-band for updates from analog data sources. The dead-band value is a percentage of full-scale deflection and so the high and low limits for the item must be known ahead of time. Dead-band affects only updates between an OPC client and a server. It has no effect on communication between an OPC server and its respective device or devices.

I/O Method

MatrikonOPC Explorer allows the user to specify the method of communication to use with a group. Synchronous I/O is generally reserved for testing and special operations. OPC Explorer also allows the user to choose between the 1.0a or 2.0 style of asynchronous I/O. The normal recommended setting is **Auto-Detect I/O**, which attempts to use 2.0 first, and then 1.0a if that fails, and finally Synchronous I/O if the previous two fail.

Data Display

Although the OPC server may supply data changes to MatrikonOPC Explorer at the update rate of the group, a global setting specifies the refresh rate for the display in OPC Explorer. Choose the **Update Speed** option from the **View** menu and select one of the available options: **High**, **Normal**, **Low**.

In the item display, the **Value** field shows the real-time value for the item. The **Quality** field indicates whether or not this value is valid, and why (refer to **Appendix C - OPC Quality Flags** for more information). The **Timestamp** field indicates how “fresh” the value is (the time that it was received from the data source).

The **Server** and **Group/Subscription Info** panels at the bottom of the window display status information about the selected server and group or subscription.

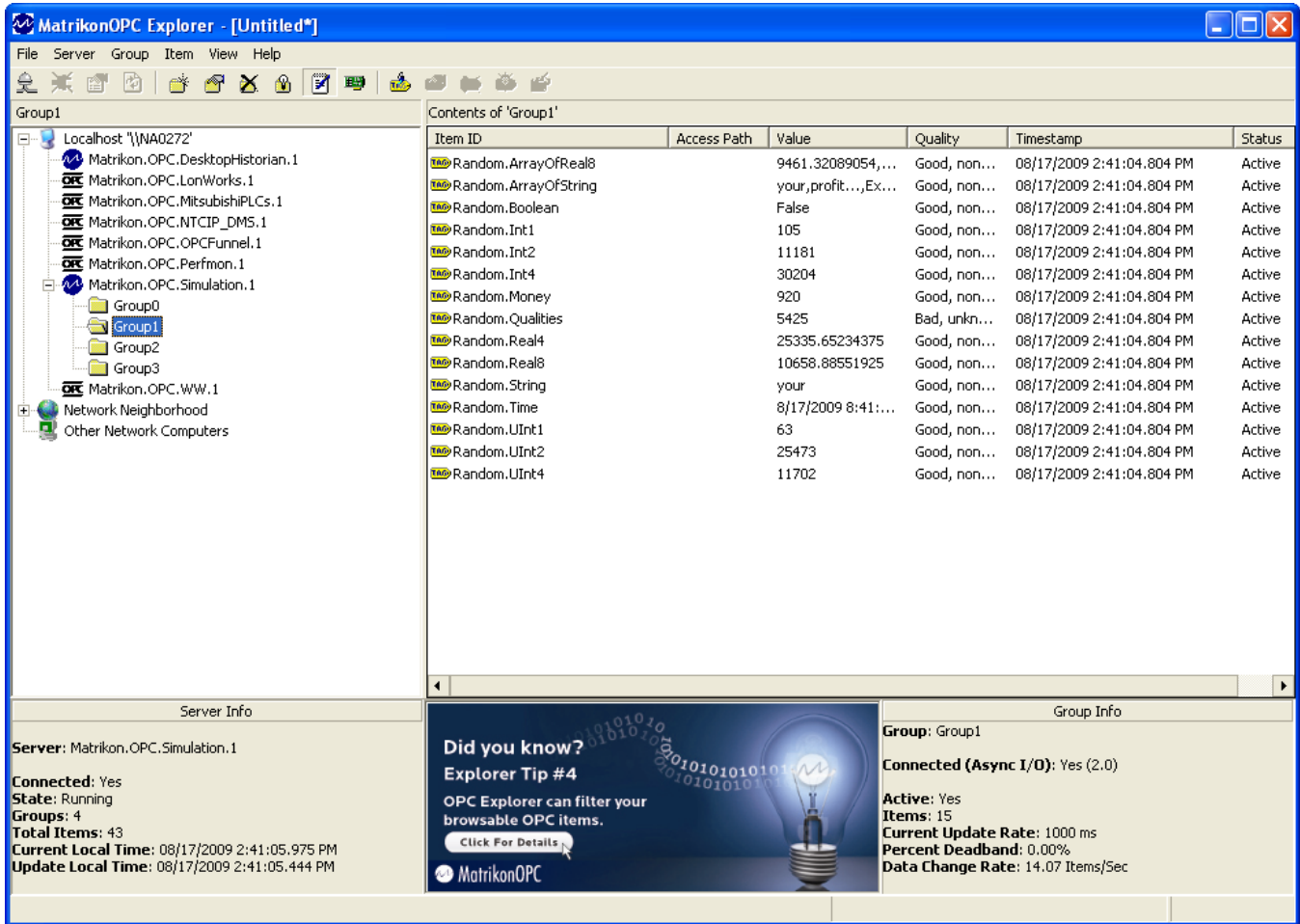


Figure 24 - Data Display

Group Info

Table 23 describes the information displayed in the **Group Info** panel.

Item	Description
Group	Displays the selected group's name.
Connected (Async I/O)	States whether the selected group is using asynchronous reads (i.e., Yes) and to which OPC specification it conforms.
Active	Shows whether the selected group is active (Yes/No).
Items	Shows the number of items in the selected group.
Current Update Rate	Displays the current update rate of the selected group.
Percent Deadband	Displays the percent deadband specified in your group's properties. This parameter is required by the OPC DA specification.
Data Change Rate	Measures the throughput rate of the OPC server, by storing the last 10 updates from the OPC server and averaging them over time.

Table 23 - Group Info Display Information

Subscription Info

Table 24 describes the information displayed in the **Subscription Info** panel.

Item	Description
Subscription	Displays the selected subscription's name.
Active	Shows whether the selected group is active (<i>Yes/No</i>).
Alarms	The number of alarms currently displayed. The maximum number of alarms that can be displayed per subscription is 1000 .
Current Buffer Time	The update rate specified on your subscription. All alarms that are reported within this time frame are reported.
Severity Maximum	All alarms within the range the maximum and minimum severity are reported to the subscription.
Severity Minimum	All alarms between the maximum and minimum severity are reported to the subscription.
Max Buffer Size	The number of alarms that can be reported in a single update.
Event Types	Event types that are currently subscribed to. This can include Simple , Conditional , and/or Tracking event types.

Table 24 - Subscription Info Display Information

Note: For additional information please, refer to the OPC AE 1.0 and DA 2.05A specifications.

Advise Log

The **Advise Log** option displays a log of ongoing I/O transactions.

To view the Advise Log window:

1. From the **MatrikonOPC Explorer** window, select the required group.
2. From the **View** menu, select the **Advise Log** option.
3. The **MatrikonOPC Explorer Advise Log** window (Figure 25) appears displaying the transactions log.

Note: The **Advise Log** window can be re-sized as needed, allowing you to view all log text.

4. Right-clicking your mouse in the **Advise Log** window displays the following menu options:
 - **Clear Log** - clears the log and a new log is started.
 - **Stay On Top** - keeps the log window above all other windows in the desktop.
 - **Follow Last Entry** - keeps the most recent entry visible at all times.
 - **Export Log** – displays the **Export Advise Log** window allowing you to export the current log information to a file (*.log).

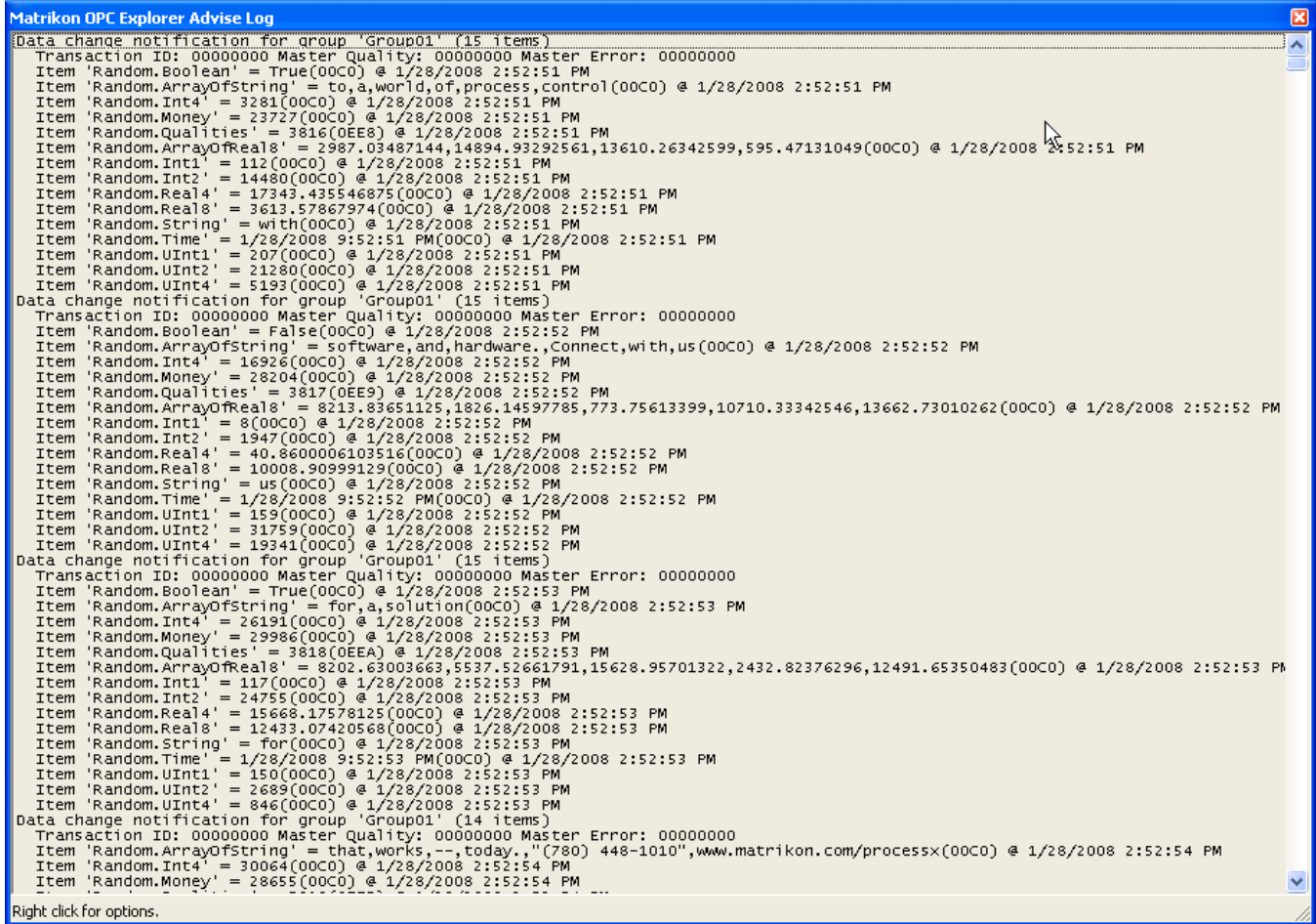


Figure 25 - MatrikonOPC Explorer Advise Log Window

Note: Advise log may take up significant CPU usage if many data updates are occurring.

Error Log

A log of past errors is displayed in the **MatrikonOPC Explorer Error Log** window.

To view the Error Log window:

5. From the **MatrikonOPC Explorer** window, select the **Error Log** option from the **View** menu.
6. The **MatrikonOPC Explorer Error Log** window (Figure 26) appears displaying a log of errors.
7. Right-clicking your mouse in the **Error Log** window displays the following menu options:
 - **Clear Log** - clears the log and a new log is started.
 - **Export Log** – displays the **Export Error Log** window allowing you to export the current log information to a file (*.csv).

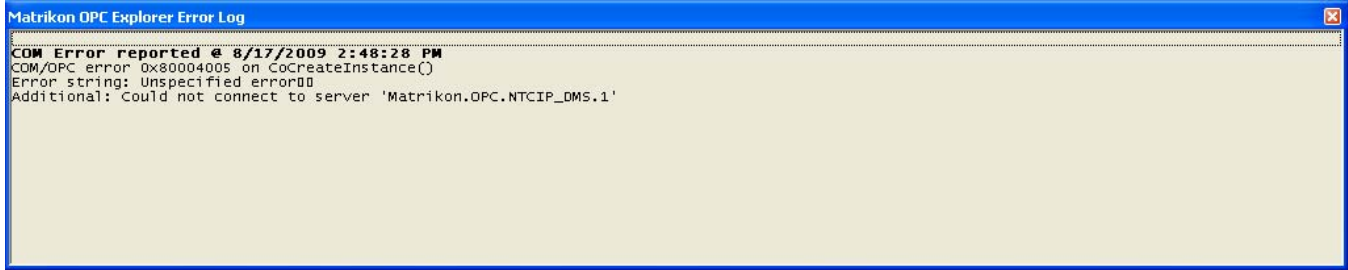



Figure 26 - MatrikonOPC Explorer Error Log Window

Write Control Values

MatrikonOPC Explorer allows you to write control values to items in an OPC group.

To write a control value:

1. Select the desired item or items in the list view of the **Contents** pane.
2. Select the **Write Values** option from the **Item** menu, or
 From the toolbar, click on the **Write to selected OPC items** button (), or
 Right-click your mouse on the required item and select **Write Values** from the displayed menu, or
 Double-click your mouse on the required item.
3. The **Write Values** window (Figure 27) is displayed with the **Multiple Value** tab selected.

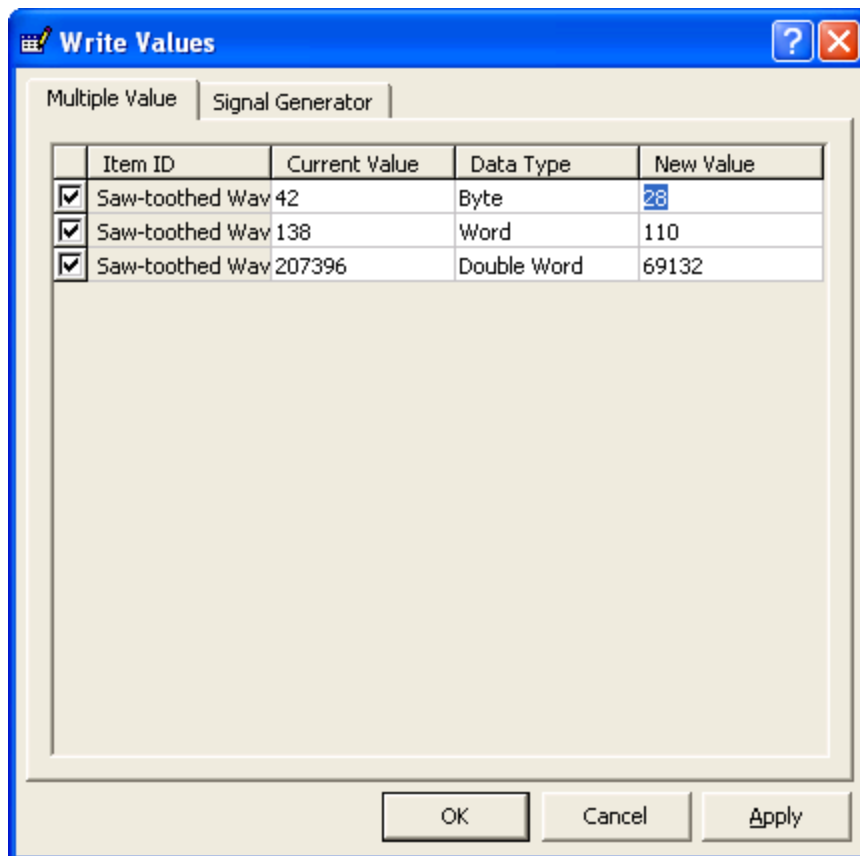


Figure 27 - Write Values Window (Multiple Value Tab)

4. In the **New Value** column, enter the control values to be written to the item.
5. In the **Data Type** column, if required, select the necessary data type from the drop-down list for each item.
6. Select the **Apply** button to perform the write.
7. Select the **OK** button to close the **Write Values** window.

Note: Control values may be written to items regardless of whether they or the group they are in, are active or inactive. If the items and the group containing the items are both active, the written control value should appear when the next update occurs. Also, some OPC servers may contain read-only items. Values written to these items will be discarded.

MatrikonOPC Explorer also contains a **Signal Generator** to write ramping control values to the OPC items.

To write a ramping control value:

1. From the **Write Values** window, select the **Signal Generator** tab (Figure 28).
2. Enter the high and low limits, and the increment factor for the ramp wave.
3. In the **Frequency** field, enter the time period in milliseconds and click on the **Start** button.
4. Select the **Stop** button or close the **Write Values** window to finish writing the ramp wave.

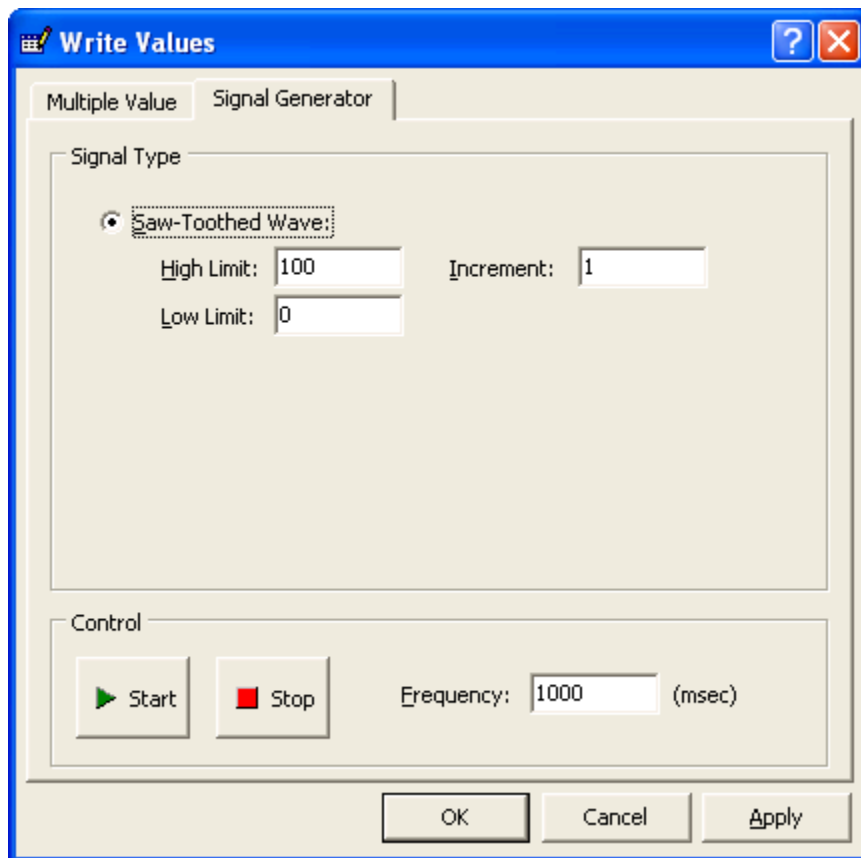


Figure 28 - Write Values Window (Signal Generator Tab)

Options Window

The **Options** window is used to change certain aspects of OPC Explorer's behaviour. This window consists of five tabs:

- **General**
- **Data Transfer**
- **Data Display**
- **COM**
- **Miscellaneous**

The **Defaults** button on the **Options** window can be used to restore the original settings.

Use the **Errors** checkboxes on the **Miscellaneous** tab to specify whether the error window should be displayed when COM or OPC errors occur, or when errors occur for individual items. The sanity check option (also on the **Miscellaneous** tab) ensures that the OPC server keeps track of lists of groups and items properly. At present, session files may only be stored as text files, so the binary format is unavailable.

General Options

This tab allows you to view and edit the way OPC Explorer saves and loads its files, and OPC server and item browsing options.

To view the General options:

1. On the **MatrikonOPC Explorer** window, from the **View** menu, select the **Options** menu item.
2. The **Options** window appears.
3. From the **Options** window, select the **General** tab (Figure 29).

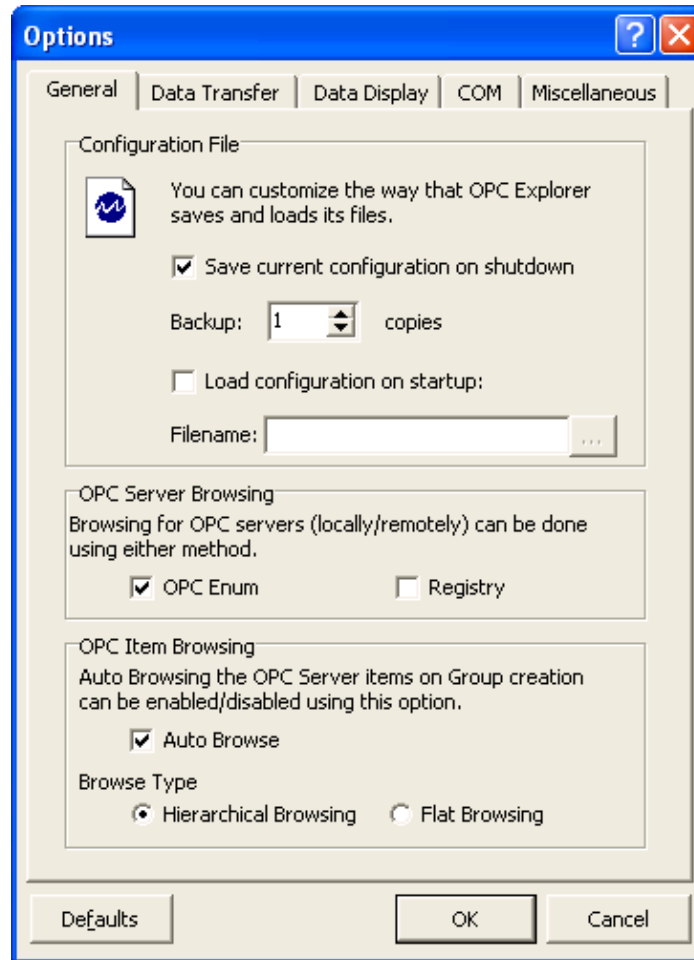


Figure 29 - General Options Tab

Table 25 describes the fields available on the **General** tab.

Field	Description
Save current configuration on shutdown	Automatically saves the current configuration to the specified file before shutting down, if selected.
Backup: X copies	Automatically keeps up to the specified number (i.e., X) of backup copies of the configuration file when saving the configuration.
Load configuration on setup	Automatically loads a configuration from the specified file when starting up, if selected.
Filename	Displays the full path of an existing file for load and save operations. Click on the ellipsis button (...) to display the Open window used to select an existing file name.
OPC Server Browsing	Allows you choose a method by which to browse for OPC servers.
OPC Item Browsing	Allows you to enable or disable the auto-browsing of OPC server items upon group creation. You can also specify hierarchical or flat browsing.

Table 25 - General Options Tab Fields

Data Transfer Options

The **Data Transfer** tab allows you to:

- Select the data source used by MatrikonOPC Explorer.
- Customize the way Asynchronous I/O is performed.
- Customize the way values are written.

To view the Data Transfer options:

1. On the **MatrikonOPC Explorer** window, from the **View** menu, select the **Options** menu item.
2. The **Options** window appears.
3. From the **Options** window, select the **Data Transfer** tab (Figure 30).

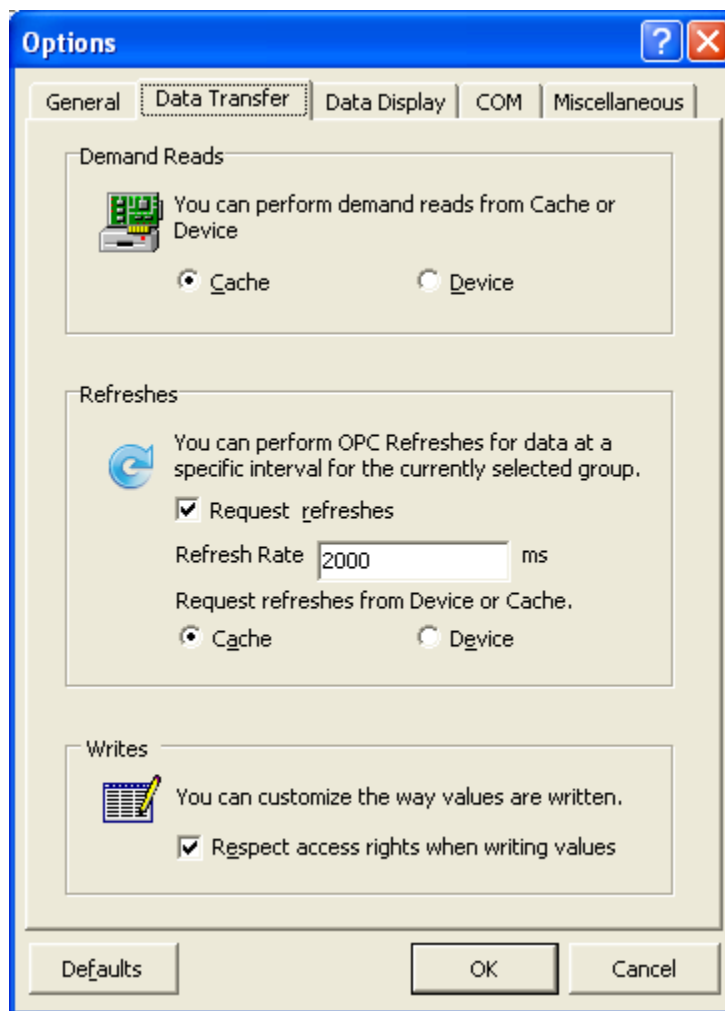


Figure 30 - Data Transfer Options Tab

Table 26 describes the fields available on the **Data Transfer** tab.

Field	Description
Demand Reads	Use this section of the Data Transfer tab to specify the data source that OPC Explorer should use when requesting demand updates from the OPC server.

Field	Description
	The Cache option should be selected for normal operation. Only select the Device option for special testing operations. Device reads yield a serious performance penalty and can prevent OPC servers from functioning properly if they are used too often.
Refreshes	The OPC data of the currently selected group can be updated on a periodic basis to ensure that the data is current. The refresh rate option controls how fast the data will be requested from the end OPC server. The Cache option should be selected for normal operation. Only select the Device option for special testing operations. Device reads yield a serious performance penalty and can prevent OPC servers from functioning properly if they are used too often.
Writes	Select the Respect access rights when writing values checkbox to avoid including read-only items in the Write Values window. Otherwise, OPC Explorer will allow users to write values to any items.

Table 26 - Data Transfer Options Tab Fields

Data Display Options

The **Data Display** tab allows users to view and edit the way value quality and value timestamps are shown.

To view the Data Display options:

1. On the **MatrikonOPC Explorer** window, from the **View** menu, select the **Options** menu item.
2. The **Options** window appears.
3. From the **Options** window, select the **Data Display** tab (Figure 31).

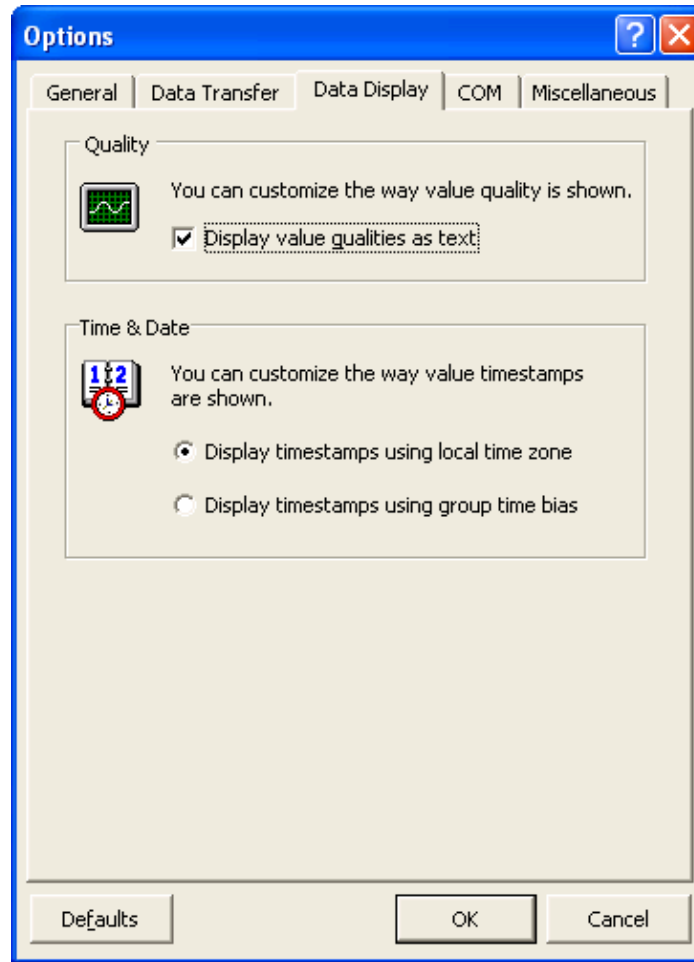


Figure 31 - Data Display Options Tab

Table 27 describes the fields available on the **Data Display** tab.

Field	Description
Quality	Select the Display value qualities as text checkbox to show a text description of the item quality in the Quality field. If the checkbox is cleared, OPC Explorer will display a numeric value. You may want to have the checkbox cleared if the quality value contains vendor-specific information in the upper byte.
Time & Date	Select either the Display timestamps using local time zone option or the Display timestamps using group time bias depending on whether you want timestamps displayed in local time or UTC.

Table 27 - Data Display Options Tab Fields

COM Options

The **COM** tab allows you to view and edit class context flags to be used when OPC Explorer attempts to connect to an OPC server.



IMPORTANT: Do **NOT** clear any of the checkboxes in the **Server Context** section of the **COM** tab **unless absolutely necessary**. Changing these settings may prevent MatrikonOPC Explorer from properly connecting to your server.

To view the COM options:

1. On the **MatrikonOPC Explorer** window, from the **View** menu, select the **Options** menu item.
2. The **Options** window appears.
3. From the **Options** window, select the **COM** tab (Figure 32).

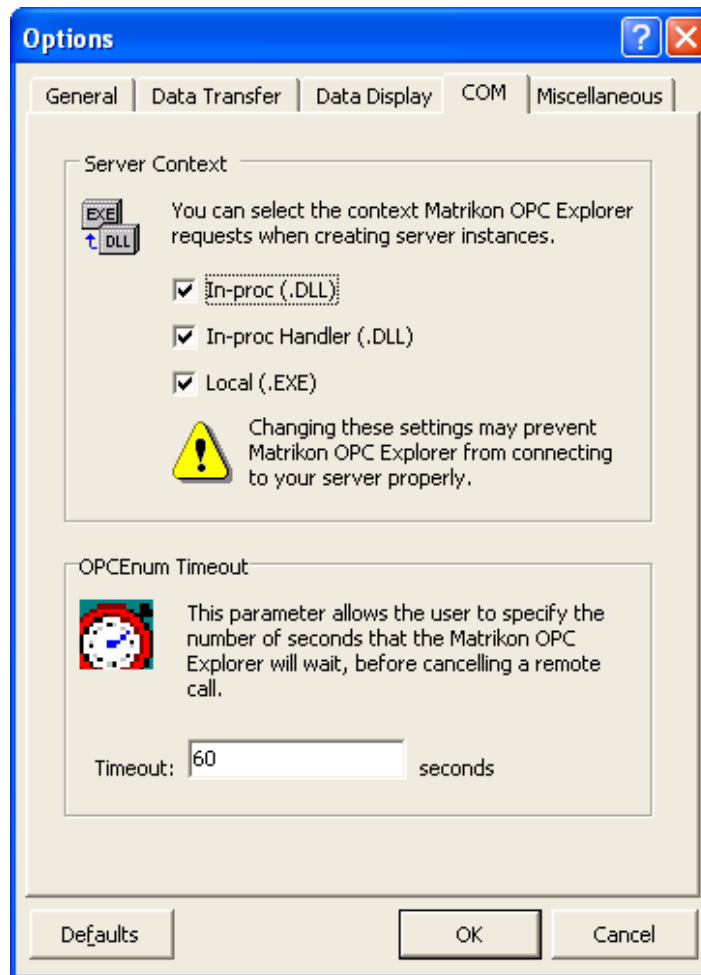



Figure 32 - COM Options Tab

Table 28 describes the fields available on the **COM** options tab.

Field	Description
Server Context	<p>Allows for the selection of context MatrikonOPC Explorer requests when creating server instances.</p> <p> WARNING: Do not clear any of these checkboxes unless absolutely necessary.</p>

Field	Description
OPCEnum Timeout	Allows you to specify the amount of time (in seconds) that the MatrikonOPC Explorer will wait before cancelling a remote call.

Table 28 - COM Options Tab Fields

Miscellaneous Options

The **Miscellaneous** tab allows you to view and edit the following features:

- Browsing network machines on start-up
- Sanity checking
- Error reporting customization
- Auto-adding groups and items

To view the **Miscellaneous options**:

1. On the **MatrikonOPC Explorer** window, from the **View** menu, select the **Options** menu item.
2. The **Options** window appears.
3. From the **Options** window, select the **Miscellaneous** tab (Figure 33).

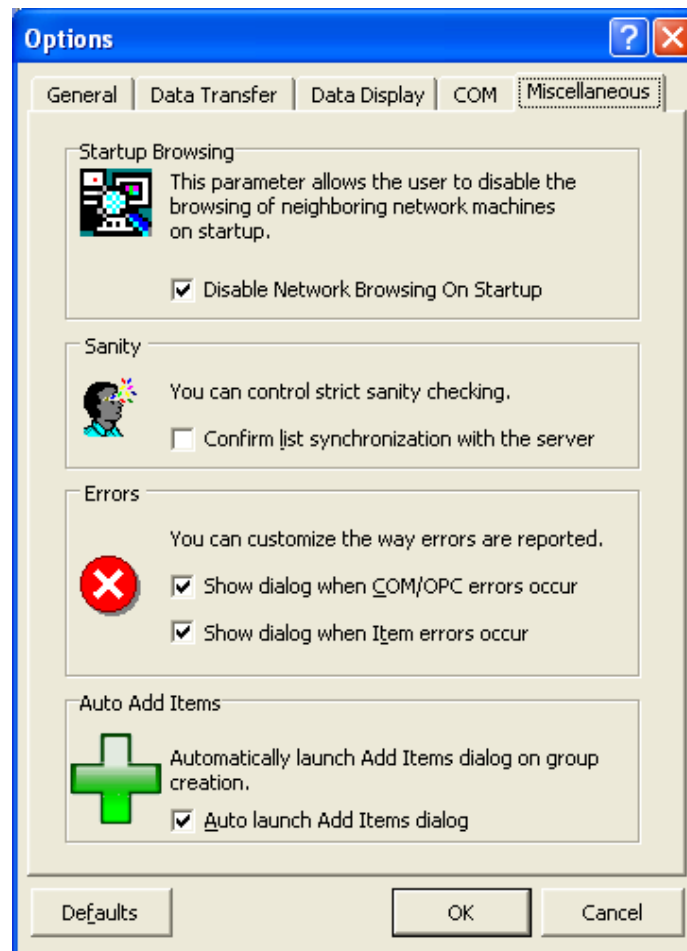


Figure 33 - Miscellaneous Options Tab

Table 28 describes the fields available on the **Miscellaneous** options tab.

Field	Description
Startup Browsing	Select the Disable Network Browsing On Startup checkbox to disable the browsing of neighbouring network machines upon start-up.
Sanity	Allows you to control strict sanity checking by selecting the Confirm list synchronization with the server checkbox.
Errors	Allows you to customize the way in which COM/OPC and/or item errors are reported. Select the checkboxes to display the required errors.
Auto Items	Select the Auto Add OPC items checkbox to automatically add items when you add a group.

Table 29 - Miscellaneous Options Tab Fields

Exporting Groups, Items, and Alarms

MatrikonOPC Explorer allows you the ability to export group, item, and alarm information to files for use at a later time. Each of the following procedures results in the **Export Tags** window (Figure 17) appearing, where you can save the information in a .csv file to the location of your choice.

Exporting Groups

To export a group:

1. From the **MatrikonOPC Explorer** window, with the required server connected, select the **Export Groups** option from the **Server** menu.

Exporting Items

There are various locations from which to export items.

To export items:

1. From the **MatrikonOPC Explorer** window, right-click your mouse on a connected server in navigation pane.
2. Select **Export Items** from displayed menu.

Or,

1. From the **MatrikonOPC Explorer** window, right-click your mouse on a group in the navigation pane.
2. Select **Export Items** from displayed menu.

Or,

1. From the **MatrikonOPC Explorer** window, select a group in the navigation pane.
2. Select **Export Items** from **Group** menu.

Or,

1. From the **MatrikonOPC Explorer** window, once an item or items have been added to a group, right-click on an item in the **Contents** pane.
2. Select **Export Items** from the displayed menu.

Or,

1. From the **MatrikonOPC Explorer** window, right-click your mouse on a connected server in the navigation pane.
2. Select **Export Items** from displayed menu.

Exporting Alarms

To export alarms:

1. From the **MatrikonOPC Explorer** window, right-click your mouse on a subscription in the navigation pane.
2. Select **Export Alarms** from the displayed menu.

Or,

1. From the **MatrikonOPC Explorer** window, once an alarm or alarms have been added to a subscription, right-click on an alarm in the **Contents** pane.
2. Select **Export** from the displayed menu.

Saving a Session

The current session configuration, including all server connections, groups, and items, can be saved to an XML file.

To save a session:

1. From the **File** menu, select either the **Save** or **Save As** menu option.
2. The **Save Session** window appears.
3. Enter a file name if saving the file for the first time.
4. Click **Save**.

Reloading a Session

To reload a session:

1. From the **File** menu, select the **Open** menu option.
2. The **Open Session** window appears.
3. Navigate to the location of the required XML file.
4. Select the required file.
5. Click **Open**.
6. The selected session is loaded.

Clearing a Session

To clear a session:

1. From the **File** menu, select the **New Session** menu option.
2. A message is displayed asking if you want to save the session.
3. Click **No**.
4. The session is cleared.

Limitations

MatrikonOPC Explorer has the following limitation:

1. **Supported specifications** – only the following are supported: OPC DA 1.0a, OPC DA 2.05a, OPC A&E 1.0.
2. **Advise Log** – opening the Advise log while there are many updates for OPC items causes CPU usage to increase dramatically.

Refer to the *MatrikonOPC Explorer Release Notes* for known issues.

Troubleshooting

The following section addresses some of the most common problems encountered, and questions asked, while using this OPC server. Please check the following **Problems/Solutions** section before contacting the MatrikonOPC Support team.

Problems and Solutions

Asynch I/O not adding properly

Problem: When I add an OPC Group using Asynch I/O it does not add properly. However, a Synchronous group works.

Solution: This error is caused by a failure of the OPC client (OPC Explorer in this case) to validate the OPC server when establishing a callback group.

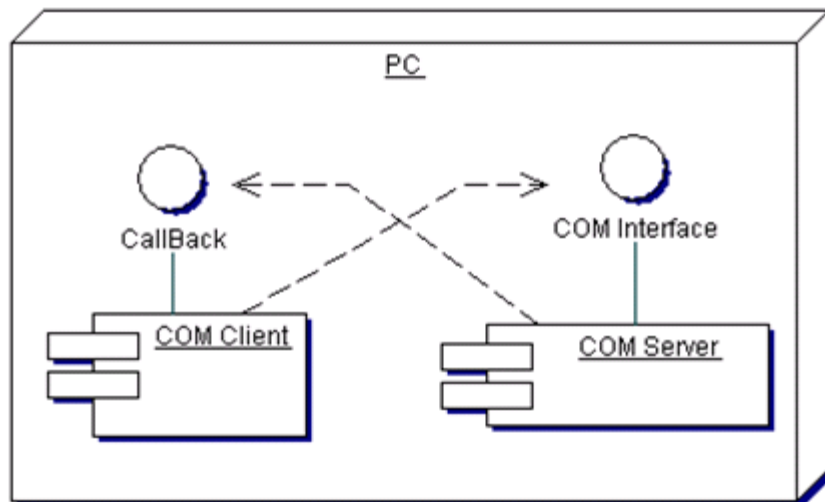


Figure 34 - Callback Group

To resolve this issue:

1. Navigate to the DCOM Configuration window: **Start -> Run** and then enter **dcomcnfg** in the **Run** window. Click on the **OK** button.
2. The **Component Services** window appears. Select and expand the following nodes: **Component Services -> Computers -> My Computer**.
3. Select **DCOM Config** from the expanded **My Computer** node.

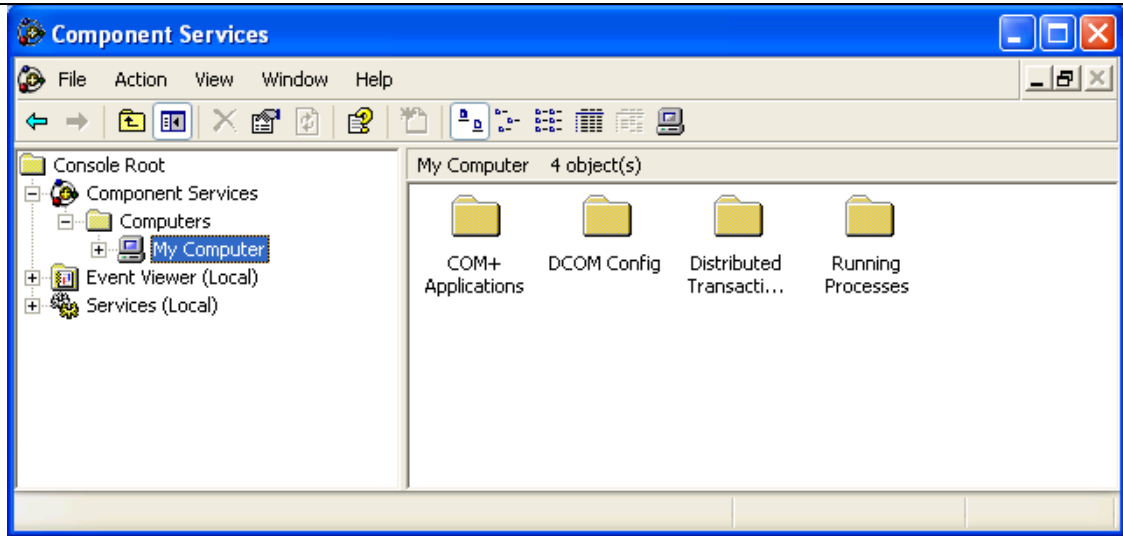


Figure 35 - Component Services Window

4. Once you are in the DCOM configuration window, right-click on **My Computer** and select **Properties**.
5. From the **My Computer Properties** window, select the **Default Properties** tab. Make sure that **Connect** is selected in the **Default Authentication Level** field.
6. Select the **COM Security** tab. Make sure the essential groups of **Everyone**, **Interactive**, **Network**, and **System** are present for both **Access Permissions**, and **Launch and Activation Permissions**.
7. Once you have made the changes, restart your OPC server and OPC Explorer and see if you can now make the connection.

Cannot see desired OPC server in MatrikonOPC Explorer

Problem: I cannot see the OPC server I want, in OPC Explorer.

Solution: MatrikonOPC Explorer depends on OPCEnum for a list of available OPC servers on the destination machine. OPC Explorer can also be configured to manually scrape the registry for OPC servers.

To use registry browsing:

1. From the **MatrikonOPC Explorer** window, select the **Options** menu option from the **File** menu.
2. The **Options** window is displayed.
3. With the **General** tab selected, select the **Registry** option in the **OPC Server Browsing** screen section.
4. Click on the **OK** button to commit the change.

Notes:

- Alternatively, to connect using OPCEnum, the component for OPCEnum will need to be correctly configured for access. This can be done in the **Component Services** control panel by following the detailed instructions provided via the links below. After completing the configuration changes, OPC Enum service will need to be re-started in the **Services** control panel.
 - [Windows 2000 DCOM Configuration](#)
 - [Windows XP DCOM Configuration](#)

"Item definition does not conform to the servers' syntax" error message

Problem: When trying to validate a tag after it has been added to the **Tags to be added** list in the **Tag Studio**, the following error message is displayed: *"Error: Item definition does not conform to the servers' syntax"*.

Solution: In general, the reason for this is because the information in the tag is not correct. However, the tags' syntax is technically correct. That is, the colons and periods and so on, are in the right places, but the names are incorrect or misspelled.

"Item definition does not exist in the address space" error message

Problem: The following error message is displayed: *"Error: Item definition does exist in the address space"*.

Solution: In general, the reason for this error is because the information in the tag is correct, but the colons and periods are in the wrong spots, or you are not pointing the tag to the correct place. This would be an example of not referencing all the device links on some servers.

"0x80070005 Access is denied" error message

Problem: The following error message is displayed: *"0x80070005 Access is denied"*.

Solution: This error message is associated with COM and DCOM. The error likely indicates that your OPC client cannot access the OPC server due to COM or DCOM security settings. To changes these, you will have to access the DCOMCNFG tool and allow this communication. This is true for both a user account and the system account.

To resolve this issue:

1. Navigate to the **DCOM Configuration** window: **Start** -> **Run** and then enter **dcomcnfg** in the **Run** window. Click on the **OK** button.
2. The **Component Services** window appears. Select and expand the following nodes: **Component Services** -> **Computers** -> **My Computer**. Select the **DCOM Config** folder.
3. Browse to your OPC server, right-click on it and select **Properties**.
4. From the **Properties** window, select the **General** tab. Make sure that **Connect** is selected in the **Authentication Level** field.

5. Select the **Security** tab. Under **Launch and Activation Permissions**, select the **Customize** option button and then click on the **Edit** button.
6. Make sure you have allowed permissions to **Everyone**, **Interactive**, **Network**, and **System**. Click **OK**.
7. Under **Access Permissions**, select the **Customize** option button and click on the **Edit** button.
8. Make sure you have allowed permissions to **Everyone**, **Interactive**, **Network**, and **System**. Click **OK**.

Search the *MatrikonOPC Support Knowledge Base* at www.opcsupport.com to find the answers to other commonly-asked MatrikonOPC Explorer questions.

Un-Installation

To successfully un-install MatrikonOPC Explorer, using the **Add or Remove Programs** from the Microsoft Windows **Control Panel** is recommended.

To un-install MatrikonOPC Explorer:

1. Click on the **Start** button and highlight the **Control Panel** item.
2. From the displayed menu, select **Add or Remove Programs**.
3. The **Add or Remove Programs** window is displayed.
4. Scroll through the list of currently installed programs and updates to find and select **MatrikonOPC Explorer**.

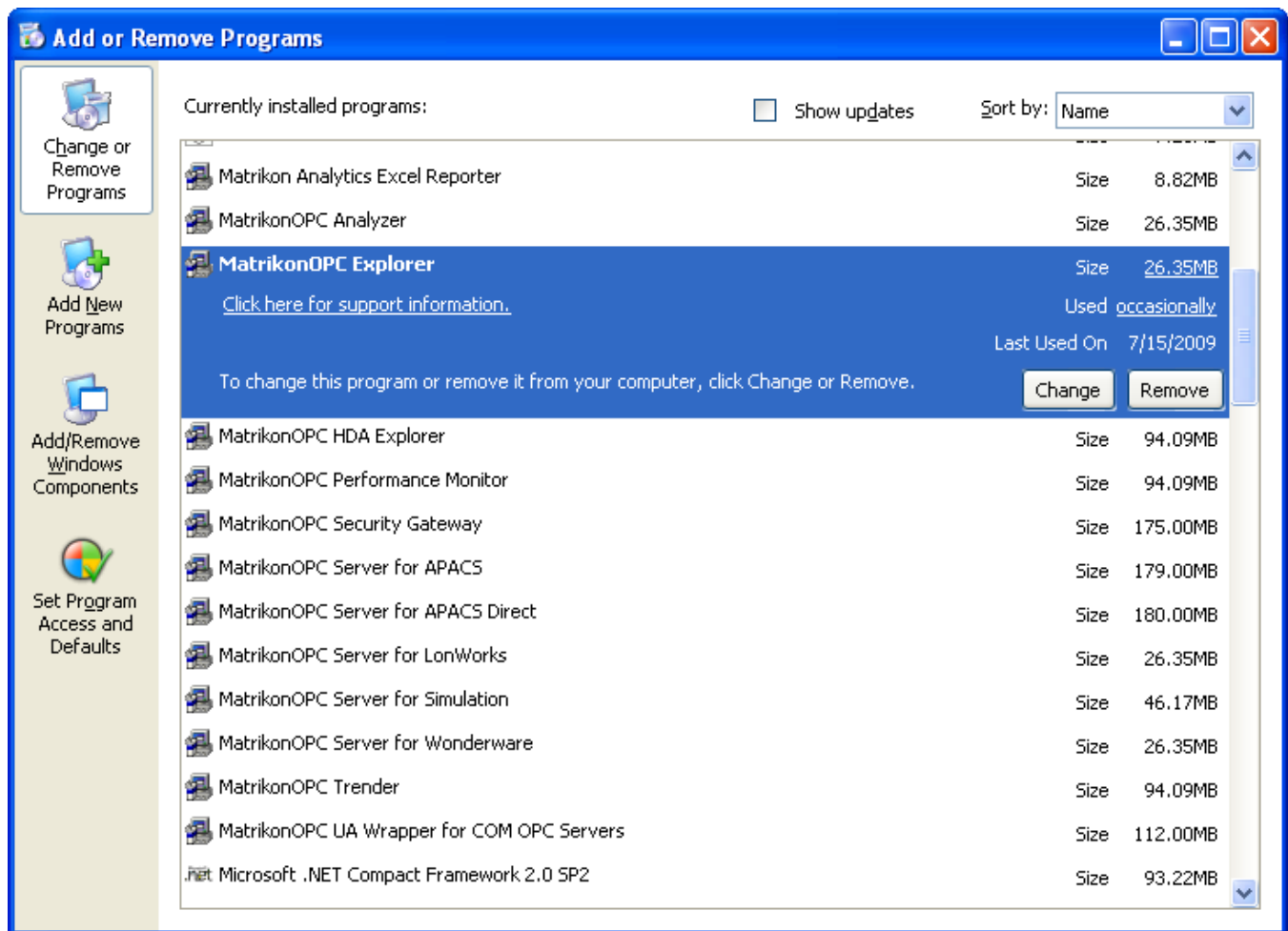


Figure 36 - Add or Remove Programs

5. Click on the **Remove** button associated with the MatrikonOPC Explorer program to initiate the un-install process.
Note: You will need to close any open applications of Matrikon OPC Explorer.
6. The **MatrikonOPC Explorer – InstallAware Wizard** appears and the **Welcome to MatrikonOPC Explorer Maintenance** screen (Figure 37) is displayed.

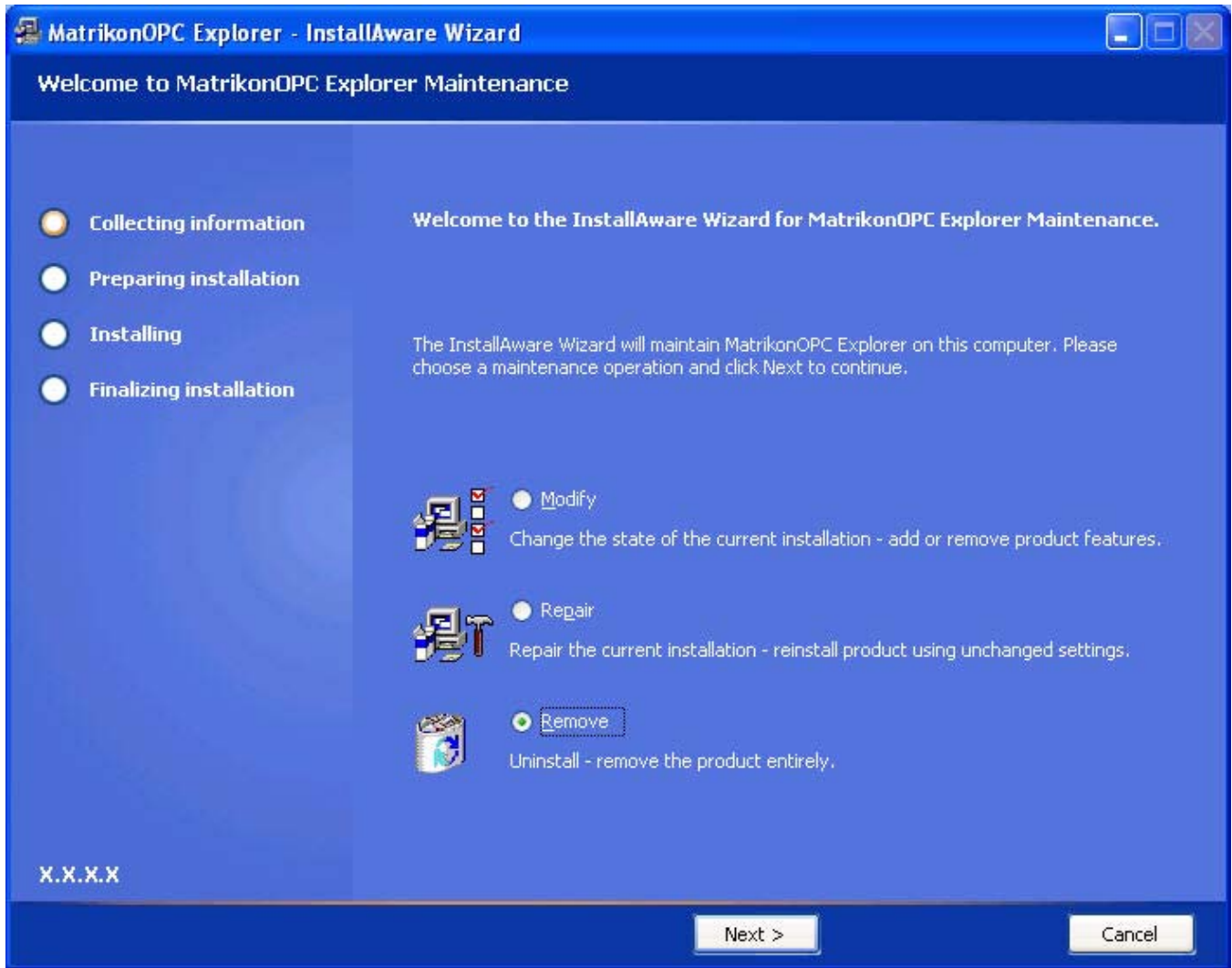


Figure 37 - Welcome to MatrikonOPC Explorer Maintenance Screen

7. Select the **Remove** option button to uninstall MatrikonOPC Explorer entirely.
8. Click on the **Next** button. The **Ready to Uninstall** screen (Figure 38) is displayed.

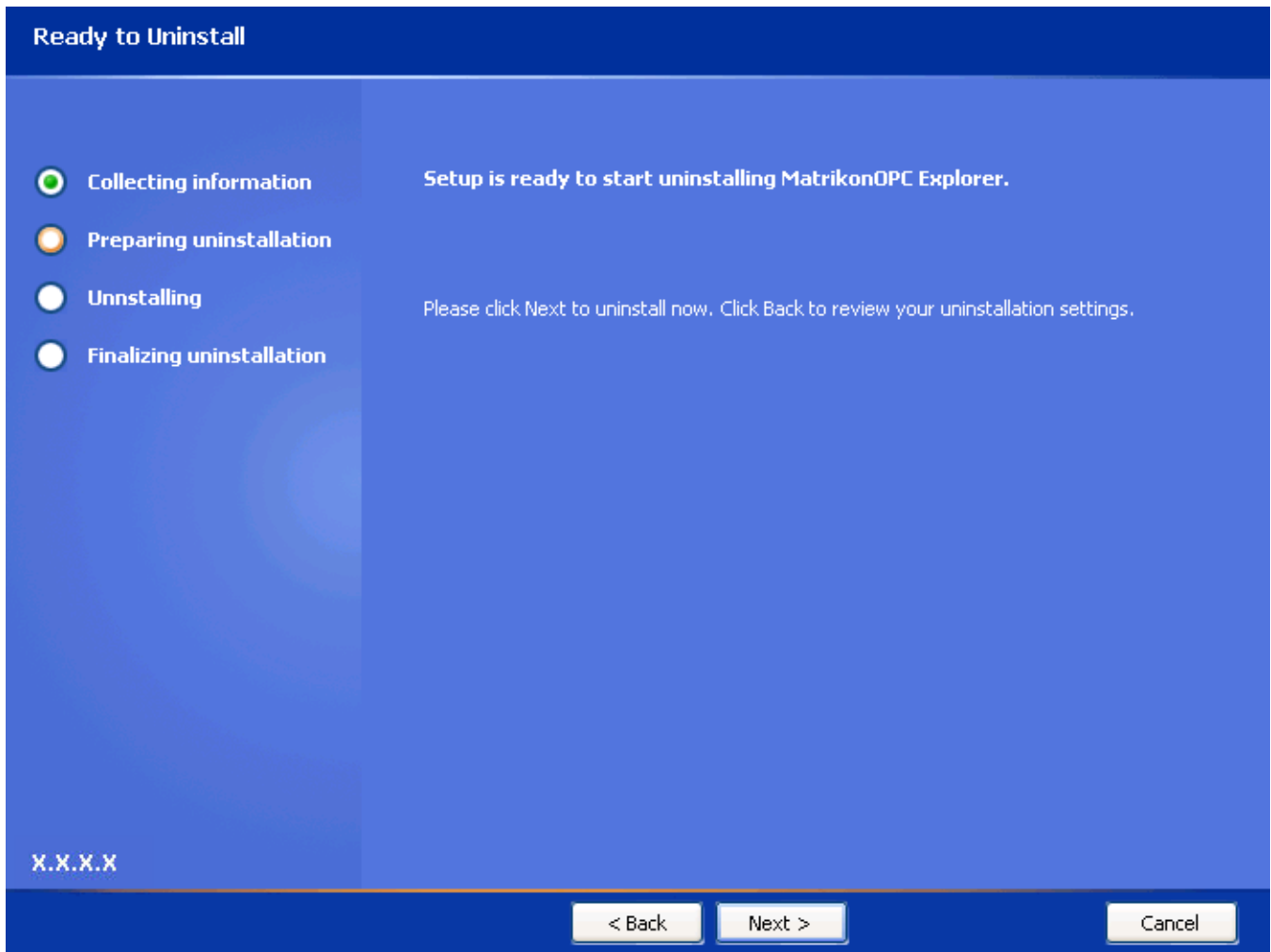


Figure 38 - Ready to Uninstall Screen

9. Click on the **Next** button.
10. The **Uninstalling MatrikonOPC Explorer** screen (Figure 39) appears and the un-install takes place.

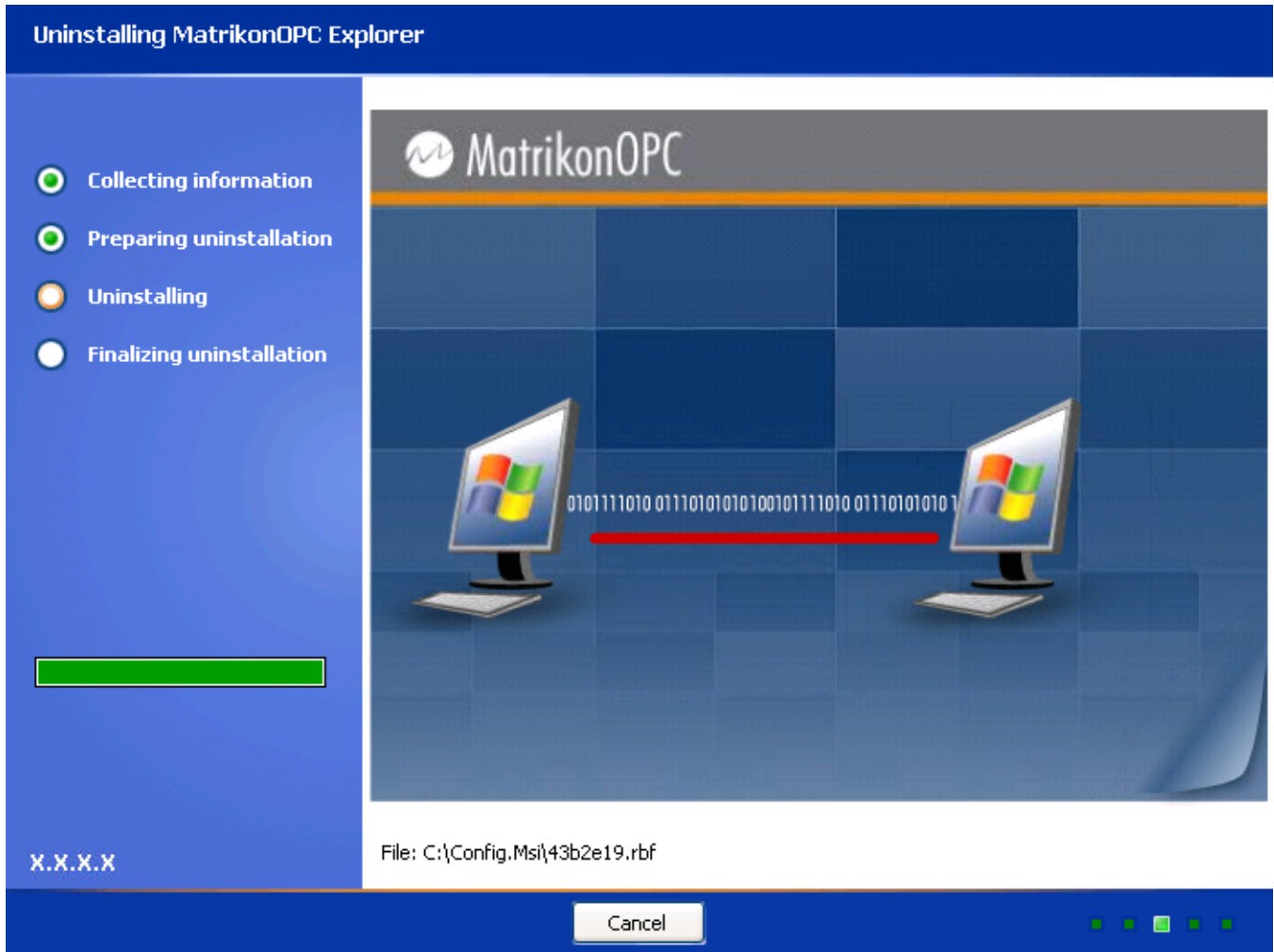


Figure 39 - Uninstalling MatrikonOPC Explorer Screen

11. When the un-install has finished, the **Matrikon Explorer Setup Complete** screen (Figure 40) appears stating that MatrikonOPC Explorer was successfully un-installed.

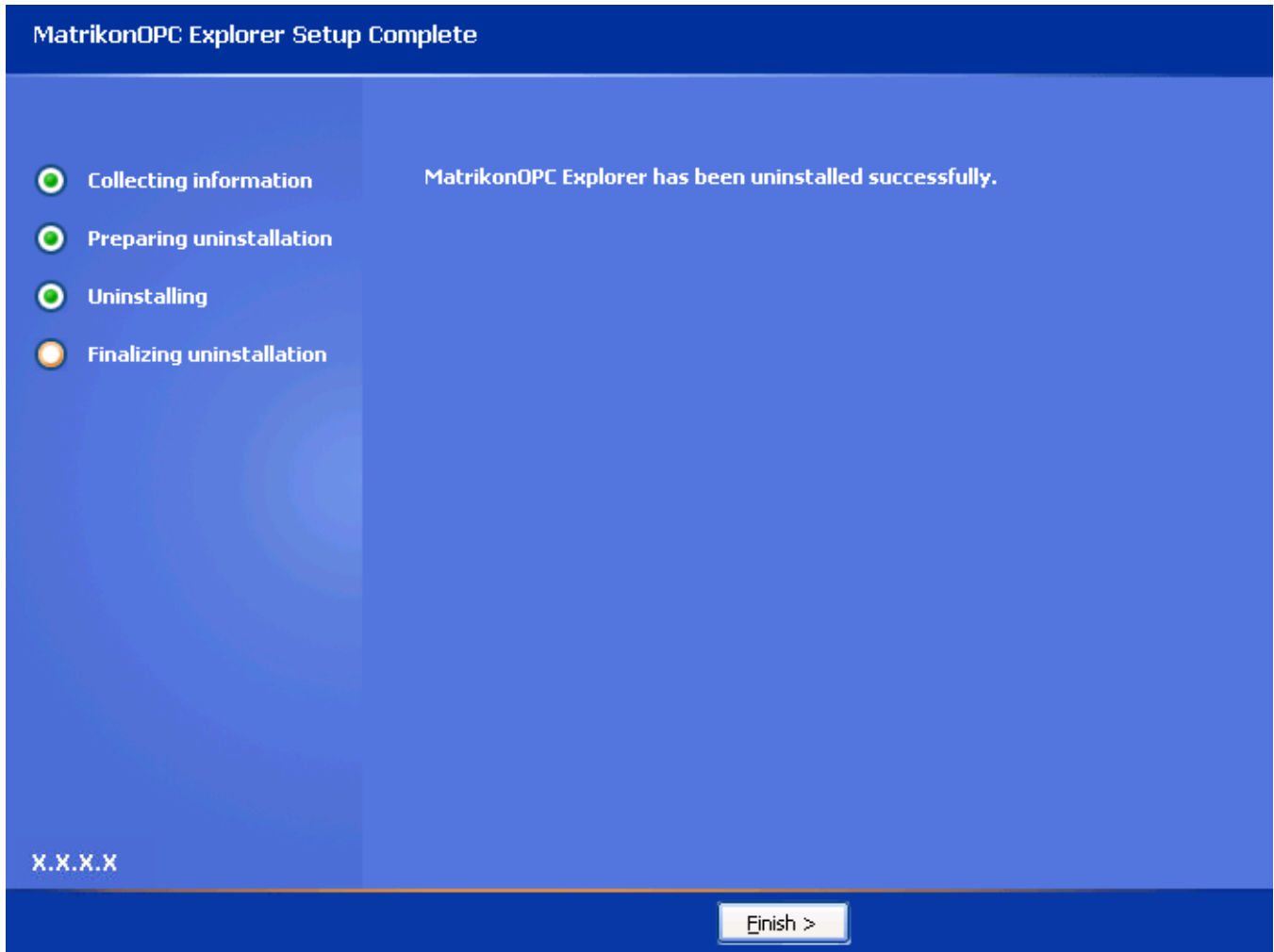


Figure 40 - MatrikonOPC Explorer Setup Complete Screen

12. Click on the **Finish** button to complete the un-install and exit the Wizard.
13. The program no longer appears listed in the **Add or Remove Programs** window.

Appendix A Distributed COM (DCOM)

DCOM is an object protocol that enables COM components (such as OPC clients and servers) to communicate directly with each other across a network. A certain amount of configuration is required on the system where the OPC server is installed to allow remote clients to connect to it over the network.

Readers should be familiar with DCOM and with Windows 2000 security features and security administration. Information regarding Distributed COM and various links to related sites, white papers, specs, etc, can be found at <http://www.microsoft.com/com/default.msp>.

Notes:



- The following steps are suggestions only. Ask your Windows Network Administrator for more information about the settings that you should use, especially between different domains.
- The steps provided in this appendix apply to Windows NT operating systems only. For information on how to configure DCOM settings for newer Windows operating systems, please refer to the MatrikonOPC Online Support page on **DCOM Settings**.

DCOM Configuration Utility

Start the DCOM configuration utility either from the server configuration utility or from the command-line (`DCOMCNFG`). Answer, **yes** to any message boxes that appear (allowing the utility to assign application ID entries to those servers that don't already have them).

The main window for `DCOMCNFG` allows the user to either configure default settings for all COM servers or else to configure settings for a specific server chosen from the list. The former will affect all servers configured to use the default settings. The latter will affect the selected server only.



DCOM settings are stored in the registry and loaded by COM (and OPC) servers at start-up. Therefore, server processes must be shut down and re-started for these changes to take effect.

Default Properties

The **Default Properties** tab contains settings that affect all DCOM communication on the machine.

- First of all, ensure that the **Enable Distributed COM on this computer** is selected in so that the machine is available to others via DCOM.
- Select the **Enable COM Internet Services on this computer** to allow DCOM access to the machine from the Internet (check with your administrator).
- In general, the other settings do not need to be changed.

The **Authentication Level** specifies when COM should authenticate the identity of calling clients (each call, each packet, etc).

- Normally, it should be set to **Connect**, indicating that COM should authenticate clients when they first connect to a server. If it is set to **None**, then COM performs no authentication and ignores any access permission settings.

The **Impersonation Level** specifies whether servers can ascertain the identity of calling clients and whether they can then perform operations on the client's behalf (as if the server is the client).

- Normally, it should be set to **Identify**, allowing the server to identify the calling client to see if it is allowed access to a certain resource but not to actually access any of these resources as the client.
- Select the **Provide additional security for reference tracking** to make even the reference counting on COM objects secure. This setting is not generally required.

Security Permissions

The most important DCOM settings for an OPC server are the security permissions. There are two ways for you to set these:

1. Change the specific settings for the server (recommended).
2. Change the default settings (not recommended) and make sure that the OPC server will use these.

Either way, be certain that the access and launch permissions are correct for the server.

Setting Security Permissions

To set the security permissions for an OPC Server:

1. Open the DCOM configuration utility.
2. Select the OPC server, and then click **Properties**.
3. The **Distributed COM Configuration Properties** window (Figure 41) appears.

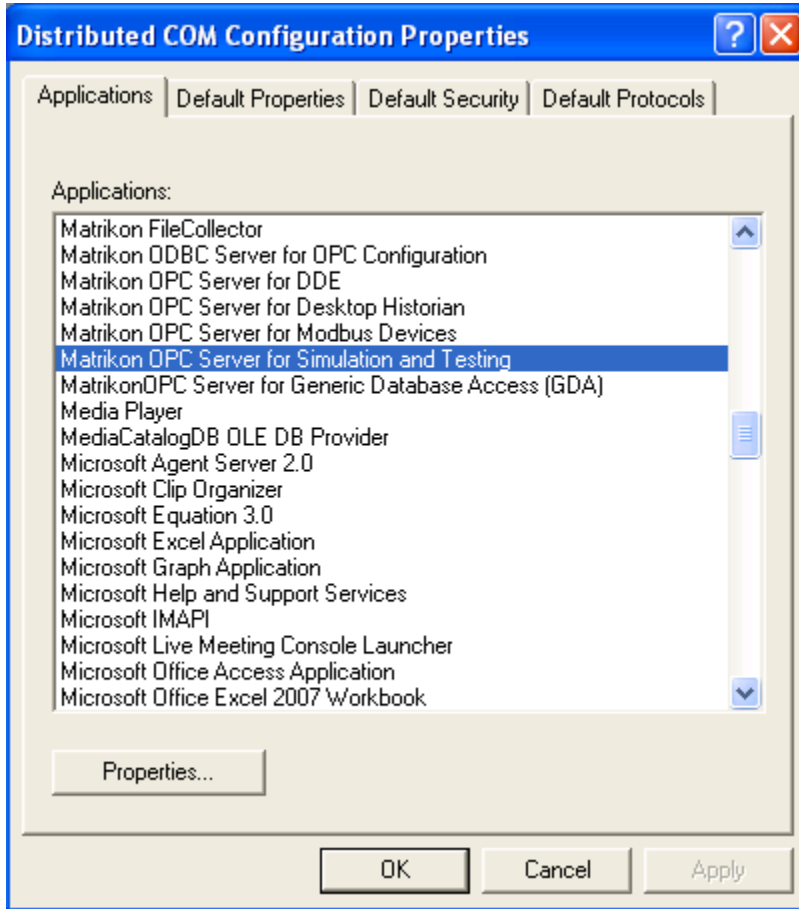


Figure 41 - Distributed COM Configuration Properties Window

4. Click on the **Security** tab to set the security for the server.
5. The **Distributed COM Configuration Security** tab (Figure 42) appears.

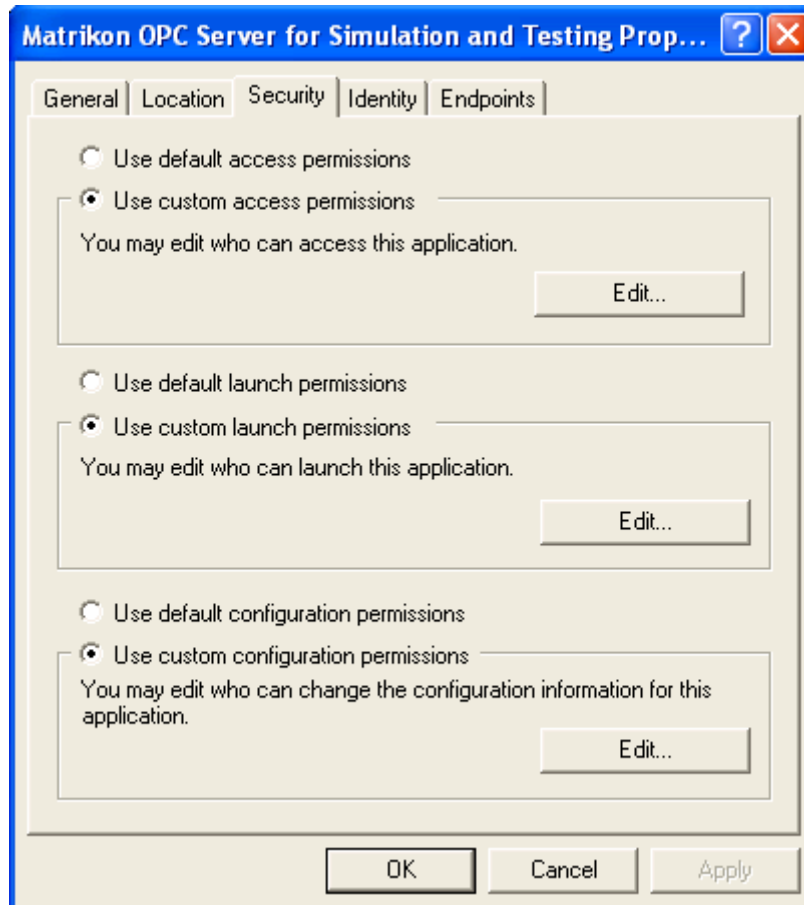


Figure 42 - Distributed COM Configuration Security Tab

Notes:

- The **Access Permissions** contain an *Access Control List* of principals that are allowed to interact with objects supplied by a server.
 - The **Launch Permissions** contain an *Access Control List* of principals that are allowed to start up a server process or service.
6. Include the names of users or user groups from trusted domains that you wish to be able to use the OPC server on this machine. Include the **Everyone** group to allow access to all users on a particular domain.
 7. To set the *Access* permissions, click **Use custom access permissions** and then click **Edit**.
 8. The **Registry Value Permissions** window (Figure 43) appears.

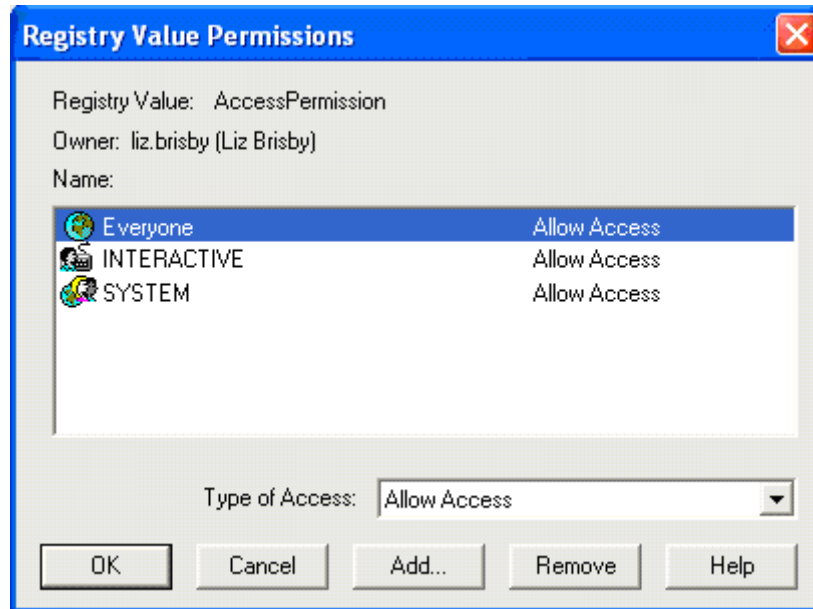


Figure 43 - Registry Value Permissions Window

9. To add users to the list click **Add**.
10. The **Add Users and Groups** window (Figure 44) appears.

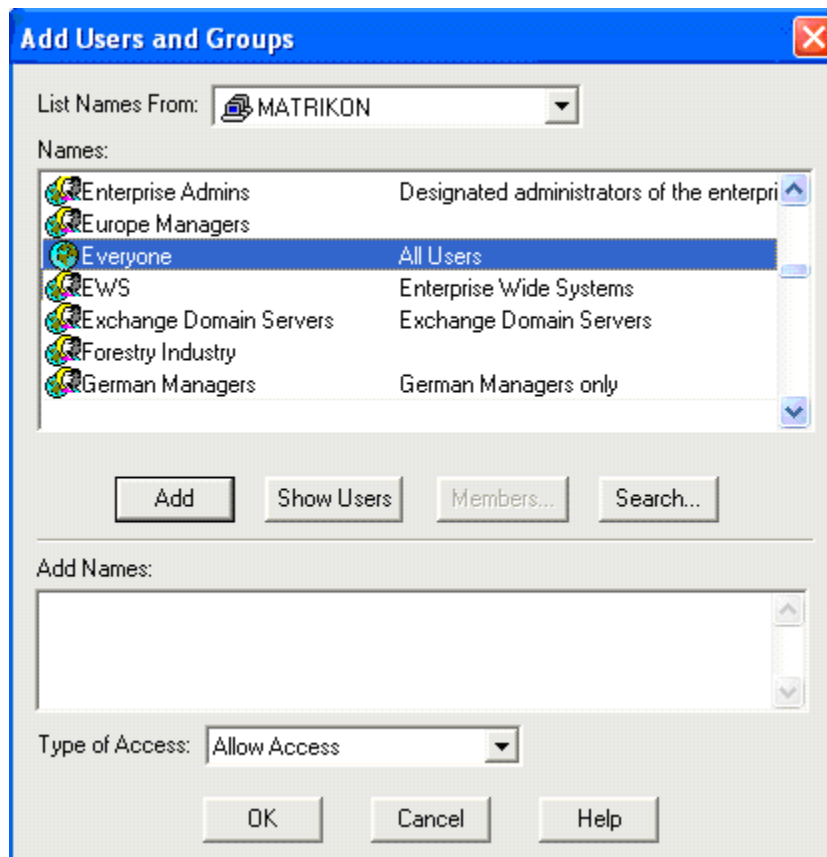


Figure 44 - Add Users and Groups Window

11. To add a user to the list, select the user, and then click **Add**. If the user you wish to add does not appear then click **Show Users**.

12. When you are done adding users, click **OK** to close the **Add Users and Groups** window. You can then choose to **Allow Access** or **Deny Access** for each user.

Notes:

- The procedure to set the launch permissions is similar to the above, but instead of choosing **Allow Access** for a user you would choose **Allow Launch**.
- The Configuration Permissions contain an *Access Control List* of principals that are allowed to modify the configuration information for a server. In other words, it indicates who is allowed to alter the registry entries for installed servers as well as who is able to access the registry for the purposes of installing new servers. It is usually simpler to install and configure servers as a user with local administrative rights.

13. To connect to an OPC server from outside of the domain, create a local user account on both the server and the client machine with identical *username* and *password*. Then, add the local user on the OPC server to the DCOM permissions. Use the local account on the client machine to connect to the OPC server.

Server Identity

The **Identity** tab for a selected COM (or OPC) server specifies the user account that should be used when COM starts up the process. The available settings are different for servers that run as local executables as opposed to those that run as NT services.



It is strongly recommended that OPC servers should be installed to run as NT services if they are going to be accessed by remote clients via DCOM. This ensures that the server can always be accessed even if no one is presently logged on to the machine, and only one server process ever starts up. It also adds a greater degree of security in terms of who is able to shut down the server process.

Servers that run as local executables have the option of running as the launching user (the calling client—this is the default), the interactive user (the one currently logged onto the machine), or a specified user. It is usually best to use the interactive user or a specified user. Otherwise, remote clients might start up multiple separate server processes that are not accessible to others.

Servers that run as NT services should generally run as the local **System** account. Alternatively, the server can be set to run as a specified user, although this is usually done from the **Service Control Manager** applet rather than DCOMCNFG. *Access* and *Launch* permissions are particularly important when installing a server to run as an NT service.

Default Protocols

The **Default Protocols** tab specifies the communication protocols available to DCOM. The order that protocols appear in the list indicates the priority in which they will be used (the topmost having the highest priority).

The more protocols that appear in the list, the better the chances of connecting to an OPC server on an unknown remote machine (such as at an OPC Interoperability Workshop). However, it may also take longer for DCOM to time out if a server machine is not present since it has to try each protocol in turn.

For most situations, it is best to remove all unused protocols from the list and only include those that are necessary for your network. For example, on a TCP/IP network, one would include the **Connection-oriented TCP/IP** protocol. Contact your IT personnel for more information about your network.



Evidence indicates that there are problems with the datagram-oriented protocols (such as UDP/IP) that can cause memory leaks in DCOM. Therefore, it is strongly recommended that these protocols be removed from the list of default protocols. Datagram-oriented protocols are not supported under Windows 2000 at all (although the DCOM configuration utility still allows you to configure them).

Remote Program ID

Before the **OPC Server Browser** became available, OPC client applications had to search the registry to generate a list of available OPC servers. Therefore, some older OPC clients need to have a program ID in the local registry in order to connect to a particular OPC server.

The simplest solution is to install the OPC server software on the client machine even if it is not used. Alternatively, use the following steps to copy a program ID to the client machine.

Note: This method may not work for every OPC client. Please check the client documentation for more information.



WARNING: Any changes made to the registry must be made with **extreme caution!**

1. Back up your registry.
2. On the server machine, run **REGEDIT** as a user that has access rights to the local registry.
3. Expand the **HKEY_CLASSES_ROOT** key.
4. Find the program ID(s) for the desired OPC server(s).
Note: In the case of Matrikon OPC Servers, the ID has the form *Matrikon.OPC.Device*. If you quickly type the first few letters then **REGEDIT** should jump to the location of that key. Some servers may have both a version-specific as well as a version-independent program ID. In this case both IDs should be copied to the client machine.
5. For each program ID, select the key and choose **Export Registry File** from the **Registry** menu. Enter a file name, and then click **Save**. Be careful not to overwrite other export files that you are creating.
6. Copy the exported **REG** files to the client machine.
7. Merge the **REG** files into the registry of the client machine.
Note: This should simply be a matter of double clicking on the file from the desktop of the client machine. Alternatively, run **REGEDIT** on the client machine and choose **Import Registry File** from the **Registry** menu, selecting each file in turn. This must be done as a user who has write access to the local registry.
8. Use **REGEDIT** to check that the program IDs have in fact, been copied.
9. Delete the **REG** files since they are no longer needed.

Appendix B Standard Data Types

The Standard data types and their descriptions are listed in Table 30.

Hex	Dec	Data Type	Description
0000	0	VT_EMPTY	Default/Empty (nothing)
0002	2	VT_I2	2-byte signed integer
0003	3	VT_I4	4-byte signed integer
0004	4	VT_R4	4-byte (single-precision) real
0005	5	VT_R8	8-byte (double-precision) real
0006	6	VT_CY	Currency
0007	7	VT_DATE	Date
0008	8	VT_BSTR	Text (UNICODE)
000A	10	VT_ERROR	Error code
000B	11	VT_BOOL	Boolean (TRUE = -1, FALSE = 0)
0011	16	VT_I1	1-byte signed integer
0012	17	VT_UI1	1-byte unsigned integer
0013	18	VT_UI2	2-byte unsigned integer
0014	19	VT_UI4	4-byte unsigned integer
2002	8194	VT_ARRAY VT_I2	Array of 2-byte signed integers
2003	8195	VT_ARRAY VT_I4	Array of 4-byte signed integer
2004	8196	VT_ARRAY VT_R4	Array of 4-byte (single-precision) real
2005	8197	VT_ARRAY VT_R8	Array of 8-byte (double-precision) real
2006	8198	VT_ARRAY VT_CY	Array of currency values
2007	8199	VT_ARRAY VT_DATE	Array of dates
2008	8200	VT_ARRAY VT_BSTR	Array of text values
200A	8202	VT_ARRAY VT_ERROR	Array of error codes
200B	8203	VT_ARRAY VT_BOOL	Array of Boolean values
2011	8208	VT_ARRAY VT_I1	Array of 1-byte signed integers
2012	8209	VT_ARRAY VT_UI1	Array of 1-byte unsigned integers
2013	8210	VT_ARRAY VT_UI2	Array of 2-byte unsigned integers
2014	8211	VT_ARRAY VT_UI4	Array of 4-byte unsigned integers

Table 30 - Standard Data Types

Appendix C OPC Quality Flags

Note: The following information is taken from the *OPC Data Access Custom Interface Specification v2.05* document.

These flags represent the quality state for an item's data value. The low eight bits of the Quality flags are currently defined in the form of three-bit fields: **Quality**, **Substatus**, and **Limit** status. The eight Quality bits are arranged as follows: **QQSSSSL**.

The high eight bits are available for vendor-specific use. If these bits are used, the standard OPC Quality bits must still be set as accurately as possible to indicate what assumptions the client can make about the returned data. In addition, it is the responsibility of any client interpreting vendor-specific quality information to make sure that the server providing it uses the same "rules" as the client.

Details of the OPC standard Quality bits are as follows.

Quality BitField

QQ	Bit Value	Definition	Description
0	00SSSSL	Bad	Value is not useful for reasons indicated by the Substatus.
1	01SSSSL	Uncertain	The quality of the value is uncertain for reasons indicated by the Substatus.
2	10SSSSL	N/A	Not used by OPC.
3	11SSSSL	Good	The quality of the value is Good .

Table 31 - Quality BitField Values

A server that supports no quality information must return **3 (Good)**. It is also acceptable for a server to simply return **BAD** or **GOOD** (0x00 or 0xC0) and to always return **0** for **Substatus** and **Limit**.

It is recommended that clients minimally check the **Quality Bit** field of all results (even if they do not check the **Substatus** or **Limit** fields).

Even when a **BAD** value is indicated, the contents of the **Value** field must still be a well-defined VARIANT even though it does not contain an accurate value. This is to simplify error handling in client applications. For example, clients are always expected to call VariantClear() on the results of a Synchronous Read. Similarly, the IAdviseSink needs to be able to interpret and "unpack" the Value and Data included in the stream even if that data is **BAD**.

If the server has no known value to return then some reasonable default should be returned such as a NULL string or **0** numeric value.

Substatus BitField

The layout of this field depends on the value of the **Quality** field.

Substatus for BAD Quality

SSSS	Bit Value	Definition	Description
0	00000LL	Non-specific	The value is bad, but no specific reason is known.

SSSS	Bit Value	Definition	Description
1	000001LL	Configuration Error	There is some server-specific problem with the configuration. For example, the item in question has been deleted from the configuration.
2	000010LL	Not Connected	The input is required to be logically connected to something, but is not. This quality may reflect that no value is available at this time reasons such as the value may have not been provided by the data source.
3	000011LL	Device Failure	A device failure has been detected.
4	000100LL	Sensor Failure	A sensor failure had been detected (the Limit field can provide additional diagnostic information in some situations).
5	000101LL	Last Known Value	Communications have failed. However, the last known value is available. Note that the “age” of the value may be determined from the TIMESTAMP in the OPCITEMSTATE .
6	000110LL	Comm Failure	Communications have failed. There is no last known value available
7	000111LL	Out of Service	The block is off scan or otherwise locked. This quality is also used when the active state of the item or the group containing the item is Inactive .
8-15		N/A	Not used by OPC.

Table 32 - Substatus – BAD Quality

Servers which do not support Substatus should return **0**. Note that an “old” value may be returned with the **Quality** set to **BAD (0)** and the **Substatus** set to **5**. This is for consistency with the *Fieldbus Specification*. This is the only case in which a client may assume that a **BAD** value is still usable by the application.

Substatus for UNCERTAIN Quality

SSSS	Bit Value	Definition	Description
0	010000LL	Non-specific	There is no specific reason why the value is uncertain.
1	010001LL	Last Usable Value	Whatever was writing this value has stopped doing so. The returned value should be regarded as “stale”. Note that this differs from a BAD value with Substatus 5 (Last Known Value). That status is associated specifically with a detectable communications error on a “fetched” value. This error is associated with the failure of some external source to “put” something into the value within an acceptable period of time. Note that the age of the value can be determined from the TIMESTAMP in OPCITEMSTATE .
2-3		N/A	Not used by OPC.

SSSS	Bit Value	Definition	Description
4	010100LL	Sensor Not Accurate	Either the value has “pegged” at one of the sensor limits (in which case the limit field should be set to 1 or 2) or the sensor is otherwise known to be out of calibration via some form of internal diagnostics (in which case the Limit field should be 0).
5	010101LL	Engineering Units Exceeded	The returned value is outside the limits defined for this parameter. Note that in this case (per the <i>Fieldbus Specification</i>) the Limit field indicates which limit has been exceeded but does NOT necessarily imply that the value cannot move farther out of range.
6	010110LL	Sub-Normal	The value is derived from multiple sources and has less than the required number of good sources.
7-15		N/A	Not used by OPC.

Table 33 - Substatus – UNCERTAIN Quality

Servers which do not support Substatus should return **0**.

Substatus for GOOD Quality

SSSS	Bit Value	Definition	Description
0	110000LL	Non-specific	The value is good. There are no special conditions.
1-5		N/A	Not used by OPC.
6	110110LL	Local Override	The value has been overridden. Typically, this means the input has been disconnected and a manually-entered value has been “forced”.
7-15		N/A	Not used by OPC.

Table 34 - Substatus – GOOD Quality

Servers which do not support Substatus should return **0**.

Limit BitField

The **Limit** field is valid regardless of the Quality and Substatus. In some cases, such as Sensor Failure, it can provide useful diagnostic information.

LL	Bit Value	Definition	Description
0	QQSSSS00	Not Limited	The value is free to move up or down.
1	QQSSSS01	Low Limited	The value has “pegged” at some lower limit.
2	QQSSSS10	High Limited	The value has “pegged” at some high limit.
3	QQSSSS11	Constant	The value is a constant and cannot move.

Table 35 - Limit BitField Values

Servers which do not support Limit should return **0**.

Symbolic equates are defined for values and masks for these BitFields in the QUALITY section of the OPC header files.