# GE Ethernet Device Driver Help

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# GE Ethernet Device Driver Help

Help version 1.023

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## Overview

The GE Ethernet Device Driver was designed specifically for use with 32 bit OPC server products running on Intel microprocessor based computers. For operating system (OS) requirements, please refer to the OPC server help documentation.

This driver is intended for use with GE Programmable Logic Controllers that may be accessed via an Ethernet module.

**See Also:** Device Setup

## Device Setup

### Supported Devices

Series 90-30 311/313, 331/341, 350,360
Series 90-70 731/732, 771/772, 781/782
GE OPEN (Wide range model support)
Horner OCS (Horner's Operator Control Stations)
PACSystems RX3i, RX7i
VersaMax family

### Communication Protocol

Ethernet; using Winsock V1.1 or higher.
Supported Communication Parameters

### Connection Timeout

This is the time the driver will wait for a connection to be made with a device. Depending on network load the connect time may vary with each connection attempt. The default setting is 3 seconds. The valid range is 1 to 60 seconds.

### Request Timeout

This is the time the driver will wait on a response from the device before giving up and going on to the next request. Longer timeouts only affect performance if a device is not responding. The default setting is 1000 milliseconds. The valid range is 50 to 30000 milliseconds.

### Retry Attempts

The Retry Attempts setting determines the number of times the driver will retry a message before giving up and going on to the next message. The default setting is 3 retries. The valid range is 1 to 10.

### TCP/IP Port Number

Specifies the TCP/IP port number the remote device is configured to use. The default port number is 18245.

### Maximum Bytes per Request

Maximum Bytes per Request refers to the number of bytes that may be requested from a device at one time. To refine the performance of this driver, the request size may be configured to one of the following settings: 32, 64, 128, 256, 512, 1024, or 2048 bytes. The default value is 256 bytes.

### Device IDs

Up to 1024 devices may be defined on a given channel. Each device on the channel must be uniquely identified by its own IP address. The LogicMaster 90 TCP software supplied by GE can be used to configure the IP address of an Ethernet module. In general the Device ID has the following format YYY.YYY.YYY.YYY, where YYY designates the device IP address (each YYY byte should be in the range of 0 to 255).

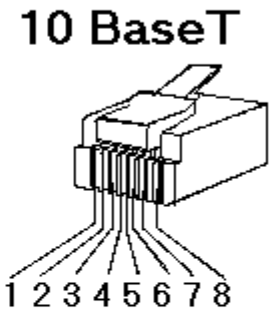
### Automatic Tag Database Generation

**GE Ethernet Variable Import Settings**

### Cable Diagrams

Patch Cable (Straight Through)

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




Crossover Cable

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

**See Also:** **PLC Settings**

## Variable Import Settings

### Tag Import File

Enter the exact location of the variable import file (.snf or .csv file extension) or Logic Developer variable import file (txt or other file extension) you wish to import variables from. It is this file that will be used when Automatic Tag Database Generation is instructed to create the tag database. All tags will be imported and expanded according to their respective data types.

### Display Descriptions

Check this option in order to import tag descriptions. If necessary, a description will be given to tags with long names stating the original tag name.

**See Also:** **Automatic Tag Database Generation**.

## PLC Settings

### Program Name

The Program Name is required if program block registers (P) or subprogram block registers (L) are to be accessed. The program name, also referred to as the control program task name, can be obtained by accessing _PROGNAME or from the following programming packages:

*VersaPro*
Program Name is referred to as the Folder Nickname which is located under PLC->Status Info.

*Proficy Machine Edition - Logic Developer*
*Cimplicity Machine Edition - Logic Developer*
Program Name is referred to as the PLC Target Name which is located under Target properties (Inspector).

The name must be 7 characters or less in length. The name will default to upper-case.

**See Also:** **Special Items**

## Automatic Tag Database Generation

### Introduction

The Automatic OPC Tag Database Generation features of this driver have been designed to make the setup of your OPC application a Plug and Play operation. This driver can be configured to automatically build a list of OPC tags within the OPC Server that correspond to device specific data. The automatically generated OPC tags can then be browsed from your OPC client. The OPC tags that are generated are dependent upon the nature of the driver.

The Device Driver generates its tags offline and is based on variables imported from a text file. It is offline in the sense that no connection to the device is required to generate tags. The text file (variables to import) can originate from one of the following applications:

1. Proficy Machine Edition - Logic Developer
2. Cimplicity Machine Edition - Logic Developer
3. VersaPro

There are two parts to Automatic Tag Database Generation. The first is to create a variable import file from the application in use. The second is to generate tags based on this variable import file, from the OPC Server. This help topic discusses the second part; it provides an overview of Automatic Tag Database Generation and a detailed look at configuring the OPC Server for Automatic Tag Database Generation. For information on creating variable import files, see **Importing VersaPro Tags**, **Importing Proficy Logic Developer Tags** or **Importing Cimplicity Logic Developer Tags**. **It is recommended that users become familiar with the second part before dealing with the first part.**

### Overview

If the target device supports its own local tag database the driver will read the device's tag information and use this data to generate OPC tags within the OPC Server. If the device does not natively support its own named tags, the driver will create a list of tags based on information specific to the driver. An example of these two conditions may be as follows:

1. If a **data acquisition system** supports its own local tag database, the driver will use the tag names found in the device to build the server's **OPC tags**.

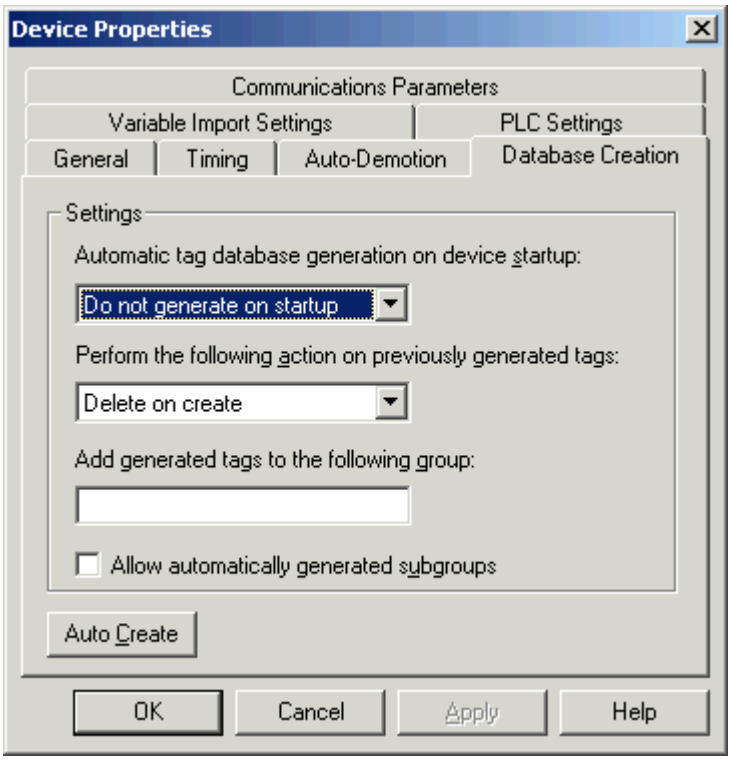
2. If an **Ethernet I/O system** supports detection of its own available **I/O module types**, the driver will automatically generate OPC tags in the server that are based on the types of I/O modules plugged into the Ethernet I/O rack.

The OPC tags generated are given meaningful names in the OPC Server and are based on the variables imported. These tags are also placed in meaningful tag groups to provide a structured and manageable interface to the tags. The end result is a well-organized OPC Server project that directly reflects the variable import file.

| For further information on... | See.. |
|---|---|
| OPC Tag/Group layout in OPC Server | Tag Hierarchy |
| OPC Tag/Group name creation in OPC Server | Tag Hierarchy<br>Import File-To-Server Name Conversions |
| Variable name alteration to meet OPC Server name requirements. | Import File-To-Server Name Conversions |

### OPC Server Configuration for Automatic Tag Database Generation

The mode of operation for automatic tag database generation is completely configurable. The following dialog is used to configure how the OPC Server and the associated communications driver will handle automatic OPC tag database generation:




The **Automatic tag database generation on device startup**setting is used to configure when OPC tags will be automatically generated. There are three possible selections:

- **Do not generate on startup**, the default setting, will prevent the driver from adding any OPC tags to the tag space of the server.
- **Always generate on startup** will cause the driver to always evaluate the device for tag information and to add OPC tags to the tag space of the server each time the server is launched.
- **Generate on first startup** will cause the driver to evaluate the target device for tag information the first time this project is run and to add any OPC tags to the server tag space as needed. When the automatic generation of OPC tags is selected, any tags that are added to the server's tag space must be saved with the project. The project can be configured to auto save from the **Tools|Options** menu.

When Automatic Tag Generation is enabled, the server needs to know what to do with OPC tags that it may have added from a previous run or with OPC tags that you may have added or modified after the communications driver added

them. The **Perform the following action** setting is used to control how the server will handle OPC tags that were automatically generated and currently exist in your project. This feature prevents automatically generated tags from accumulating in the server. For example, using the Ethernet I/O example mentioned above, if you continued to change the I/O modules in the rack with the server configured to always generate new OPC tags on startup, new tags would be added to the server every time the communications driver detected a new I/O module. If the old tags were not removed, many unused tags could accumulate in the server's tag space. **Perform the following action** can be used to tailor the server's operation to best fit the application. Descriptions of the selections are as follows:

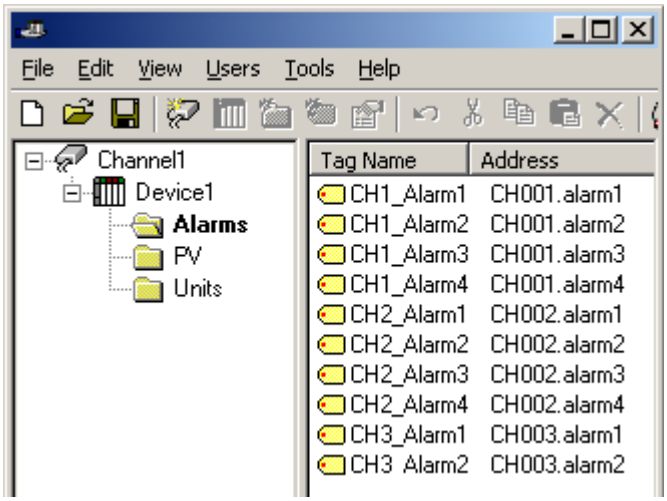
1. **Delete on create**, the default condition, deletes any tags that had previously been added to the tag space before the communications driver adds any new tags.

2. **Overwrite as necessary** instructs the server to remove only those tags that the communications driver is replacing with new tags. Any tags that are not being overwritten will remain in the server's tag space.

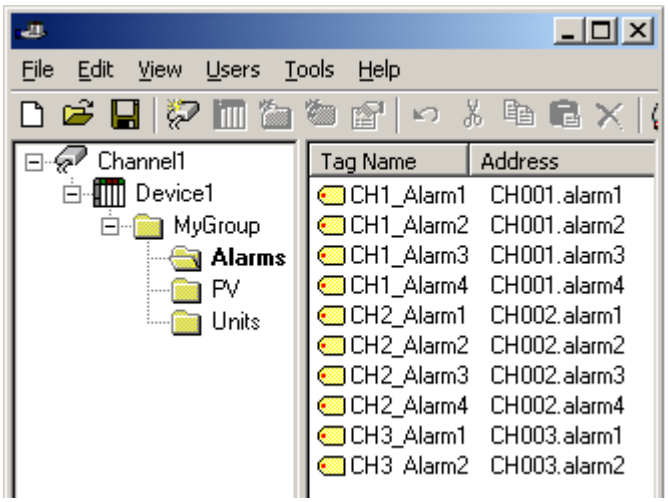
3. **Do not overwrite** prevents the server from removing any tags that had been previously generated or may have already existed in the server. With this selection, the communications driver can only add tags that are completely new.

4. **Do not overwrite, log error** has the same effect as **Do not overwrite**, but it also posts an error message in the server's event log when a tag overwrite occurs.

The parameter, **Add generated tags to the following group**, can be used to keep automatically generate tags from mixing with tags entered manually. This parameter can be used to specify a sub group that will be used when adding all automatically generated tags for this device. The name of the sub group can be up to 31 characters in length. The following displays demonstrate how this parameter effects where automatically generated tags are placed in the server's tag space. As shown here, this parameter provides a root branch to which all automatically generated tags will be added:

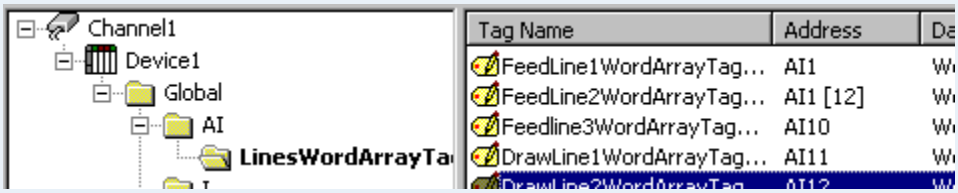
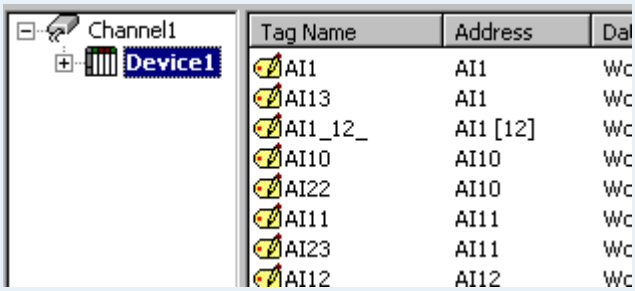



**No sub group specified.**




**Sub group named MyGroup specified.**

**Allow automatically generated subgroups** controls whether or not the server will automatically create subgroups for the automatically generated tags.

| Allow automatically generated subgroups | |
|---|---|
| Checked (default) | The server will automatically generate the device's tags and organize them into subgroups.<br><br>In the server project, the resulting tags will retain their tag names.<br>  |
| Unchecked | The server will automatically generate the device's tags in a simple list without any subgrouping.<br><br>In the server project, the resulting tags will be named with the address value; i.e., tag names coming through the import file will not be retained. In the example shown below, note how the Tag Name and Address values are the same.<br>  |

**Auto Create** can be used to manually initiate the creation of automatically generated OPC tags. It can also be used to force the communications driver to reevaluate the device for possible tag changes after the device's configuration is modified. Auto Create can be accessed from the System Tags for this device, thus allowing the OPC client application to initiate tag database creation.

### Generating Tag Database While Preserving Previously Generated Tag Databases

Under certain circumstances, multiple imports into the server are required to import all tags of interest. This is the case with importing VersaPro System variables and non-System variables into the same OPC Server project. Recall the selection Perform the following action in the Database Creation dialog under Device Properties. The options available are Delete on create, Overwrite as necessary, Do not overwrite, and Do not overwrite, log error. After the first OPC Server import/database creation is done, check that the action is set to Do not overwrite or Do not overwrite, log error for future imports. This will allow tags to be imported without deleting or overwriting tags that were previously imported.

## Tag Hierarchy

The tags created via Automatic Tag Generation follow a specific hierarchy.

The root level groups (or subgroup levels of the group specified in **Add generated tags to the following group)** are determined by the variable addresses (i.e. R, G, M, etc.) referenced. For example, every variable that is of address type "R", will be placed in a root level group called "R". Each array tag is provided in its own subgroup of the parent group. The name of the array subgroup provides a description of the array. For instance an array R10[6] defined in the import file would have a subgroup name "R10_x"; x signifies dimension 1 exists.

### Tags in "R10_x" Group

| Tag Name | Tag Address | Comment |
|---|---|---|
| R10_x | R10[6] | Full array |
| R10_10 | R10 | Array element 1 |
| R10_11 | R11 | Array element 2 |
| R10_12 | R12 | Array element 3 |
| R10_13 | R13 | Array element 4 |
| R10_14 | R14 | Array element 5 |
| R10_15 | R15 | Array element 6 |

Symbolic variable tags (PACSystems only) are placed in a group called **Symbolic**. Symbolic variable arrays are not broken out into individual element tags and will not be placed in a separate group. A single array tag will be generated for each symbolic variable array in the Symbolic group. For example, if a 2x3 array of symbolic variables named "MySymbolicArray" is defined in the import file, then a single tag with name "MySymbolicArray" and address "!MySymbolicArray"[2][3] would be generated in the Symbolic group.

**See Also:** **Symbolic Variables**

## Import File-to-Server Name Conversions

**Leading Underscores, Percents, Pound, and Dollar Signs**

Leading underscores (**_**) in tag names will be replaced with **U_**. This is required since the server does not accept tag/group names beginning with an underscore.

Leading percents (**%**) in tag names will be replaced with **P_**. This is required since the server does not accept tag/group names beginning with a percent sign.

Leading pound signs (**#**) in tag names will be replaced with **PD_**. This is required since the server does not accept tag/group names beginning with a pound sign.

Leading dollar signs (**$**) in tag names will be replaced with **D_**. This is required since the server does not accept tag/group names beginning with a dollar sign.

**Invalid Characters in Name**

The only characters allowed in the server tag name are A-Z, a-z, 0-9, and underscore (_). As mentioned above, a tag name cannot begin with an underscore. All other invalid characters encountered will be converted to a sequence of characters that are valid. Below is a table showing the invalid character and the sequence of characters that it is replaced with when encountered in the import file variable name.

| Invalid Char. | Replaced With |
|---|---|
| $ | D_ |

| | |
|---|---|
| % | P_ |
| + | PL_ |
| - | M_ |
| # | PD_ |
| @ | A_ |
| < | L_ |
| > | G_ |
| = | E_ |

**Long Names**
The GE Ethernet driver is limited to 31 character group and tag names. Therefore, if a tag name exceeds 31 characters, it must be clipped. Names are clipped as follows.

| **Non-Array** |
|---|
| 1. Determine a 5-digit unique id for this tag. |
| 2. Given a tag name: ThisIsALongTagNameAndProbablyExceeds31 |
| 3. Clip tag at 31: ThisIsALongTagNameAndProbablyEx |
| 4. Room is made for the unique id: ThisIsALongTagNameAndProba##### |
| 5. Insert this id: ThisIsALongTagNameAndProba00000 |

| **Array** |
|---|
| 1. Determine a 5-digit unique id for this array. |
| 2. Given an array tag name: ThisIsALongTagNameAndProbablyExceeds31_23 |
| 3. Clip tag at 31 while holding on to the element values: ThisIsALongTagNameAndPr_23 |
| 4. Room is made for the unique id: ThisIsALongTagName#####_23 |
| 5. Insert this id: ThisIsALongTagName00001_23 |

## Importing VersaPro Tags

The device driver uses files generated from VersaPro called Shared Name Files (SNF) to generate the tag database. Certain aspects of the Automatic Tag Database Generation process are specific to the application from which variables are imported. The following topics are VersaPro specific. In order to import tags from an application other than VersaPro, refer to **>Automatic Tag Database Generation** to see if the application is supported.

### How do I create a VersaPro variable import file (*.SNF)?

See **VersaPro Import Preparation: VersaPro Steps**

### How do I configure the OPC Server to use this import file for Automatic Tag Database Generation?

See **VersaPro Import Preparation: OPC Server Steps**

### How do I import System Variables since they are not included with All Variables?

See **Generating Tag Database While Preserving Previously Generated Tag Databases**

### How do I highlight variables in VersaPro?

See **Highlighting VersaPro Variables**

### How are VersaPro array variables imported?

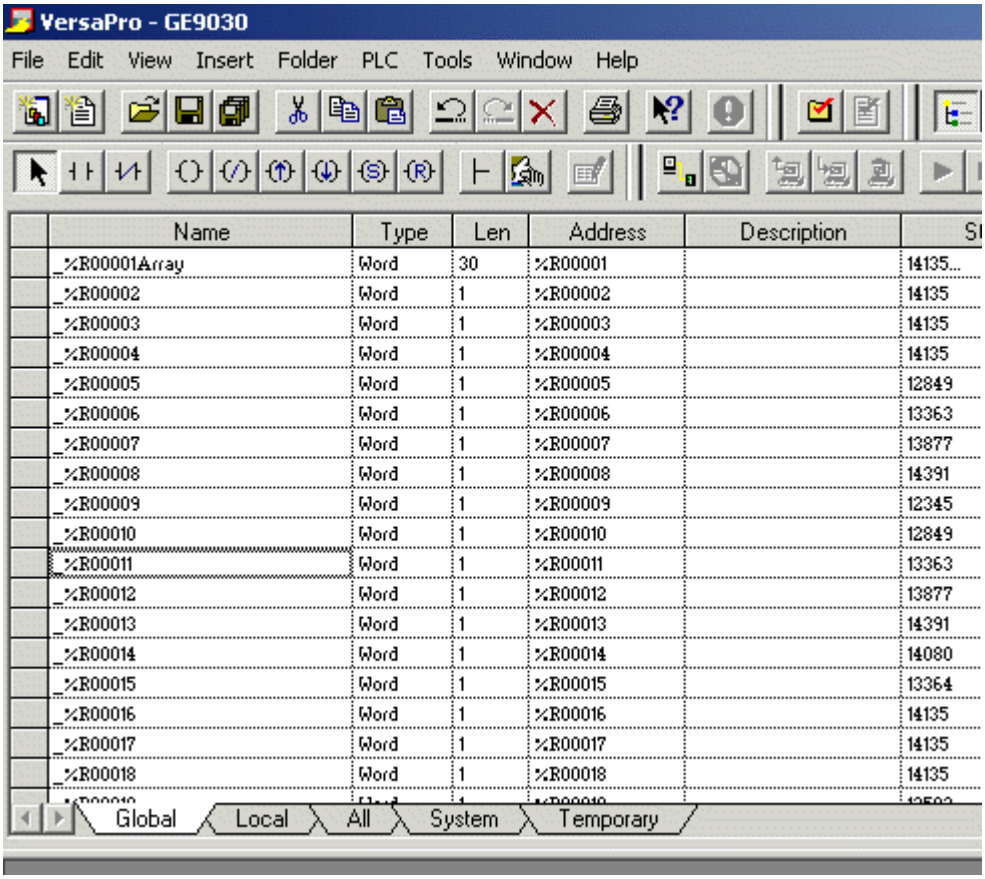
See **VersaPro Array Tag Import**

## VersaPro Import Preparation: VersaPro Steps

1. Open the VersaPro project containing the tags (variables) that will be ported to the OPC Server.

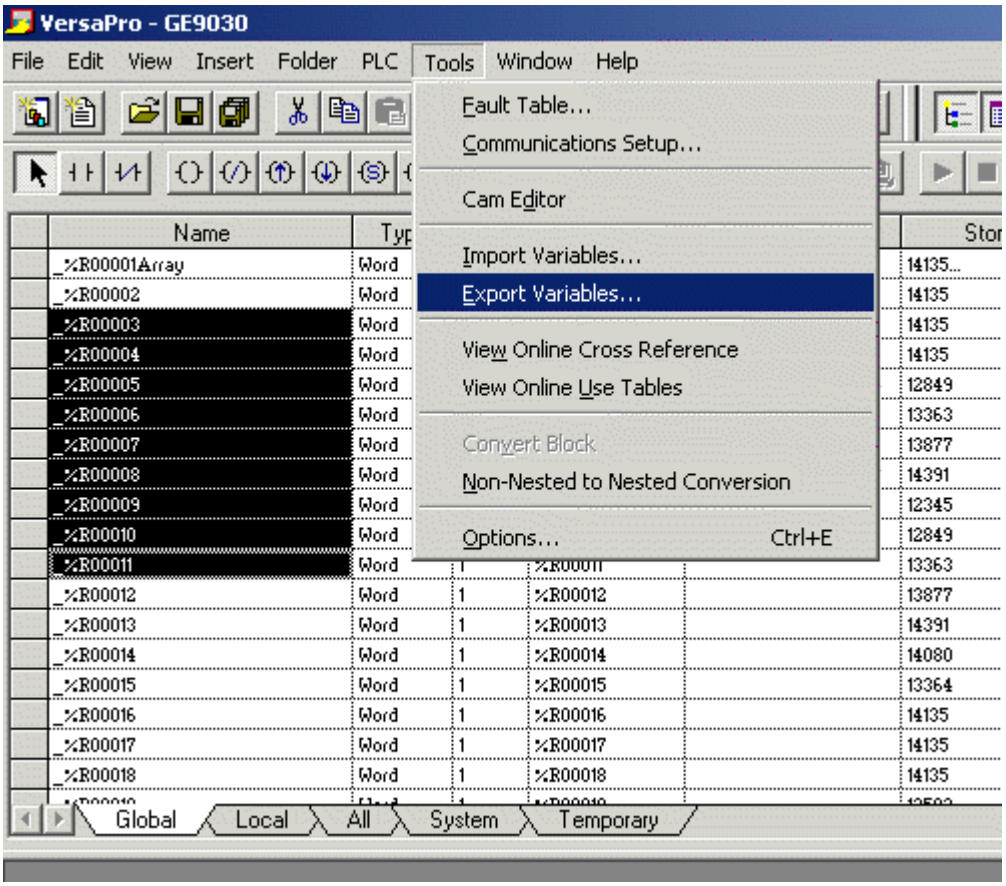
2. If the **Variable Declaration Table** is not already open, click **View** | **Variable Declaration Table**.

3. Next, specify which Group the tags of interest belong to. The default groups available are **Global**, **Local**, **All**, **System**, and **Temporary**. Note that the group **All** does not include the variables from the System group. Multiple Imports, or multiple SNF files, are required to import System variables and Global/Local/All variables.




4. Click on the group's tab to bring its variables to the front. Then, **highlight** the tags of interest using either the mouse or menu.

5. Next, click **Tools** | **Export Variables**.




6. When prompted, select **Shared Name File (*.snf)** and specify a name. VersaPro will export the project's contents into this SNF file.

## VersaPro Import Preparation: OPC Server Steps

1. Open Device Properties in the device of interest for which tags will be generated.

2. Select the **Database Settings** tab.

3. Enter or browse for the location of the **VersaPro SNF file** newly created.

4. Select the **Database Creation** tab and utilize as instructed above.

5. The OPC Server will state in the event log that it is attempting to perform a tag import, when finished, it will state that the tag import has completed. All variable exported out of VersaPro will appear in the OPC Server in the layout discussed in **Tag Hierarchy**.

**See Also:** **VariableImport Settings**

## Highlighting VersaPro Variables

Highlighting variables in VersaPro can be performed in following ways.

### Single Variable Selecting

Left-click on a variable of interest while pressing CTRL.

### Pick-n-Choose

N/A.

### Selecting a Range of Variables

Left-click on the first variable in the range of interest. Then, press SHIFT while left-clicking on the last variable in the range. All variables in the range will be highlighted.

### Selecting All Variables

Left-click on a variable within the group of interest in the Variable Declaration Table. The variable chosen is irrelevant. Next, click **Edit** | **Select All**. All variables will be highlighted with that group.

## VersaPro Array Tag Import

Variables in VersaPro have a **Length** specification. Length is the number of elements for the given array variable. In the device driver, this element count can be used to create tags in two ways. The first is to create an array tag with data in a row x column format. The second is an expanded group of tags, Length in number. The following applies for variables with a Length > 1.

### Array Tag

Since VersaPro arrays are 1-dimensional, the number of columns is always 1. Thus an array tag would have the following syntax: <array variable>[#rows = Length]. This single array tag would retrieve Length elements starting at the base address defined in <array variable>. The data will come back formatted in array form for use in HMI's that support arrays.

### Individual Elements

Element tags are simply the base address + element number. This has the following form, where n = Length - 1.
<array variable><base address + 0>
<array variable><base address + 1>
<array variable><base address + 2>
...
<array variable><base address + n>

These tags are not array tags; they are just the reference tags for the <array variable>. Think of it as a listing of all the addresses being referenced in the <array variable>.

### Example

Variable Imported:
MyArrayTag, Length = 10, Address = R1

Result as Array Tag:
MyArrayTag [10]

Result as Individual Elements:
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10

**Note:** Variables of type BIT array cannot be accessed as an array tag, only as an expanded group of tags.

## Importing Cimplicity Logic Developer Tags

The device driver uses user-generated ASCII text files from Logic Developer to generate the tag database. Certain aspects of the Automatic Tag Database Generation process are specific to the application from which variables are imported. The following topics are Logic Developer specific. In order to import tags from an application other than Logic Developer, refer to **Automatic Tag Database Generation to see if the application is supported.**

### How do I create a Logic Developer variable import file (*.TXT)?

See **Cimplicity Logic Developer Import Preparation: Logic Developer Steps**

### How do I configure the OPC Server to use this import file for Automatic Tag Database Generation?

See **Cimplicity Logic Developer Import Preparation: OPC Server Steps**

### How do I highlight variables in Logic Developer?

See **Highlighting Cimplicity Logic Developer Variables**

### How are Logic Developer array variables imported?

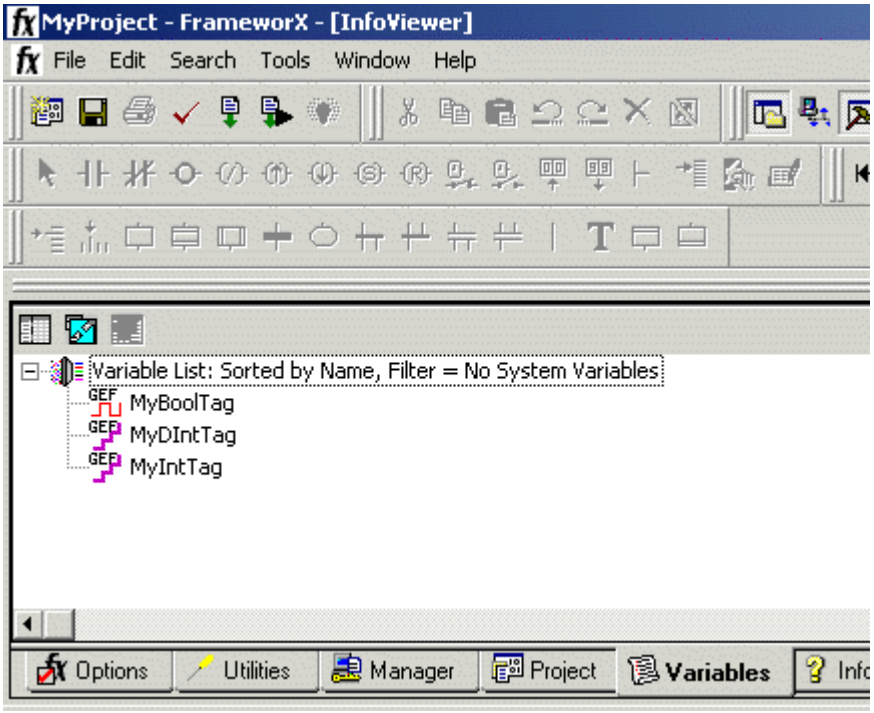
See **Cimplicity Logic Developer Array Tag Import**

## Cimplicity Logic Developer Import Preparation: Logic Developer Steps

1. Open the **FrameworX** project containing the tags (variables) that will be ported to the OPC Server.

2. Open the **Navigator** window by pressing **Shift+F4**.

3. Click on the **Variables** tab and select **Variable List View**.

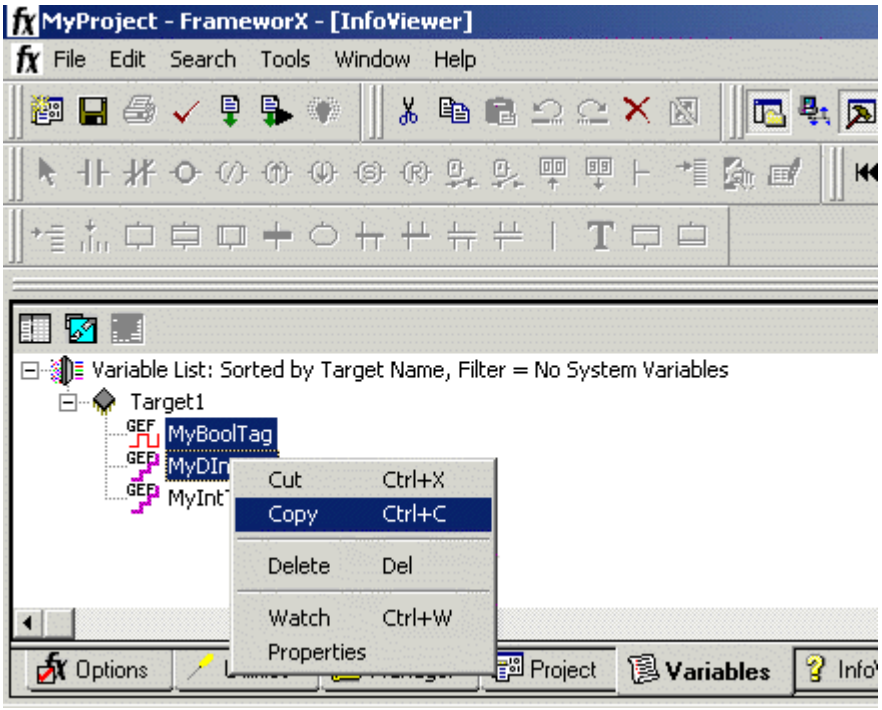



**Note:** Each FrameworX project contains one or more targets, which essentially is the device on which the application will run. Variables are created on the target-level, so a target of interest must be chosen in order to specify the variables that will be exported. In order for the target variables to be imported, the variables must have **GE FANUC PLC** as the **Data Source**. Verify this by left-clicking on the variable and then looking at its Data Source property in the **Inspector** window. Internal variables will not be imported.

5. Sort the variables by target. To do so, right-click on the **Variable List** and click **Sort** | **Target**.

6. Highlight the tags of interest in the Target of interest.

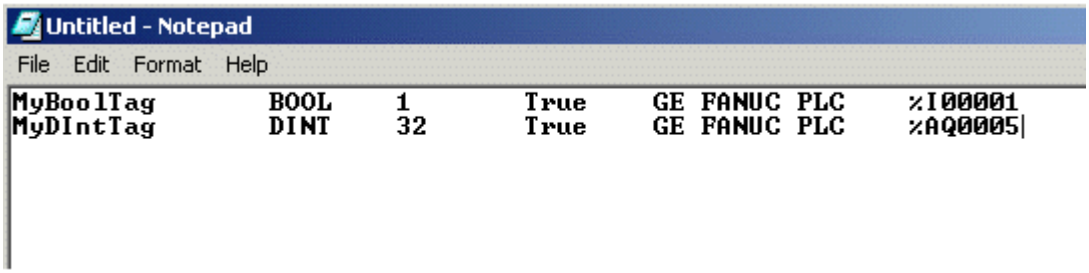
7. Next, click **Edit** | **Copy**.




8. With the highlighted variables now copied to the Clipboard, open a word processing program like Notepad or Wordpad.

9. In Notepad/Wordpad, click **Edit** | **Paste**.

10. The variables on the Clipboard will now be pasted to the document, TAB delimited. Do not modify the contents. Modifications may cause the import to fail.




11. Save the text document with the **TXT extension (.txt) in ANSI form.**

12. The variables are now contained within the text document an can be imported into the OPC Server.

## Cimplicity Logic Developer Import Preparation: OPC Server Steps

1. Open Device Properties in the device of interest for which tags will be generated.

2. Select the **Database Settings** tab.

3. Enter or browse for the location of the **Logic Developer TXT file** newly created.

4. Select the **Database Creation** tab and utilize as instructed above.

5. The OPC Server will state in the event log that it is attempting to perform a tag import; when finished, it will state that the tag import has completed. All variable exported out of Logic Developer will appear in the OPC Server in the layout discussed in **Tag Hierarchy**.

**See Also:** Variable Import Settings

## Highlighting Cimplicity Logic Developer Variables

Variables in Logic Developer can be highlighted in the following ways.

### Single Variable Selecting

Left-click on a variable of interest.

### Pick-n-Choose

Left-click on the first variable of interest. Then, press CTRL while left-clicking on each successive variable of interest. Do this until all variables of interest are highlighted.

### Selecting a Range of Variables

Left-click on the first variable in the range of interest. Then, press SHIFT while left-clicking on the last variable in the range. All variables in the range will be highlighted.

### Selecting All Variables

Left-click on a variable within the target of interest in the Variable List View. The variable chosen is irrelevant. Next, click **Edit** | **Select All**. All variables will be highlighted within that target.

## Cimplicity Logic Developer Array Tag Import

Array tags, or individual element breakdowns of array variables, are not supported when importing from Cimplicity Logic Developer.

## Importing Proficy Logic Developer Tags

The device driver uses user-generated ASCII text files from Proficy Logic Developer to generate the tag database. Certain aspects of the Automatic Tag Database Generation process are specific to the application from which variables are imported. The following topics are specific to Proficy Logic Developer. In order to import tags from an application other than Proficy Logic Developer, refer to **Automatic Tag Database Generation to see if the application is supported.**

### How do I create a Proficy Logic Developer variable import file (*.snf or*.csv)?

See **Proficy Logic Developer Import Preparation: Logic Developer Steps**

### How do I configure the OPC Server to use this import file for Automatic Tag Database Generation?

See **Proficy Logic Developer Import Preparation: OPC Server Steps**

### How do I highlight variables in Proficy Logic Developer?

See **Highlighting Proficy Logic Developer Variables**

### How are Proficy Logic Developer array variables imported?

See **Proficy Logic Developer Array Tag Import**

## Proficy Logic Developer Import Preparation: Logic Developer Steps

1. Open the Proficy Logic Developer project containing the tags (variables) that will be ported to the OPC Server.

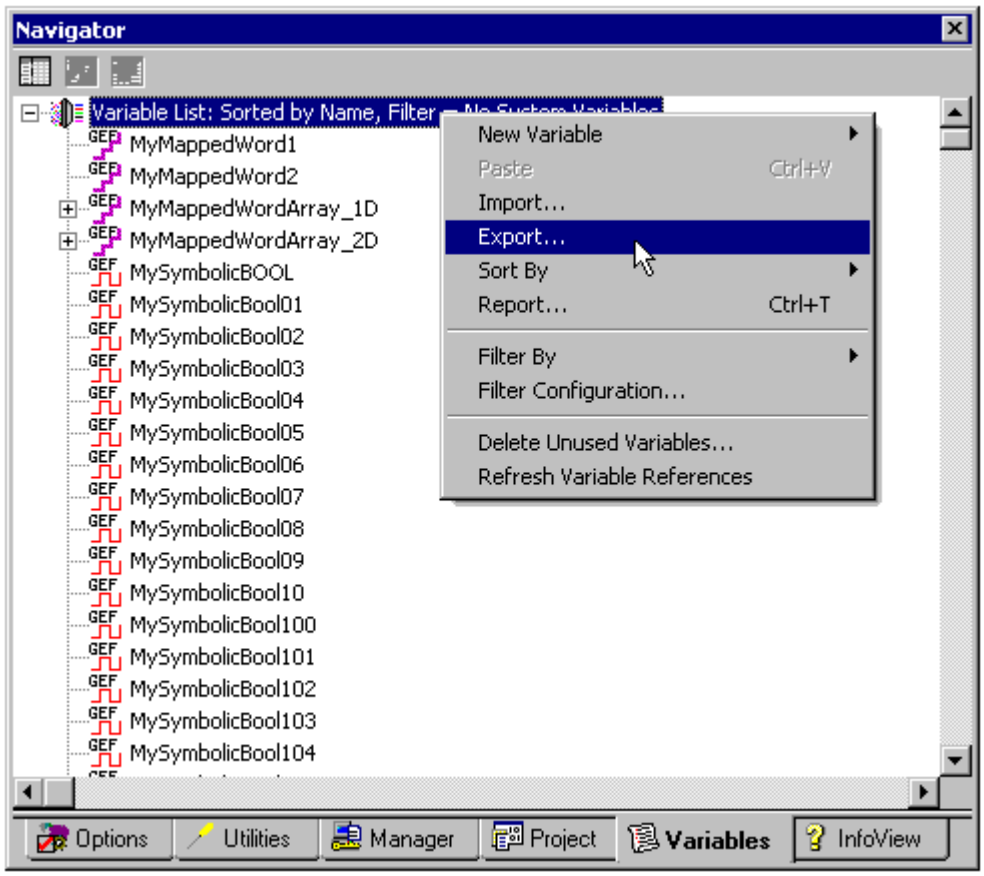
2. Open the **Navigator** window by pressing Shift-F4 (unless it is already open).

3. Click on the **Variables** tab in order to bring the project's variables to the front. Then, click **Variable List View**.

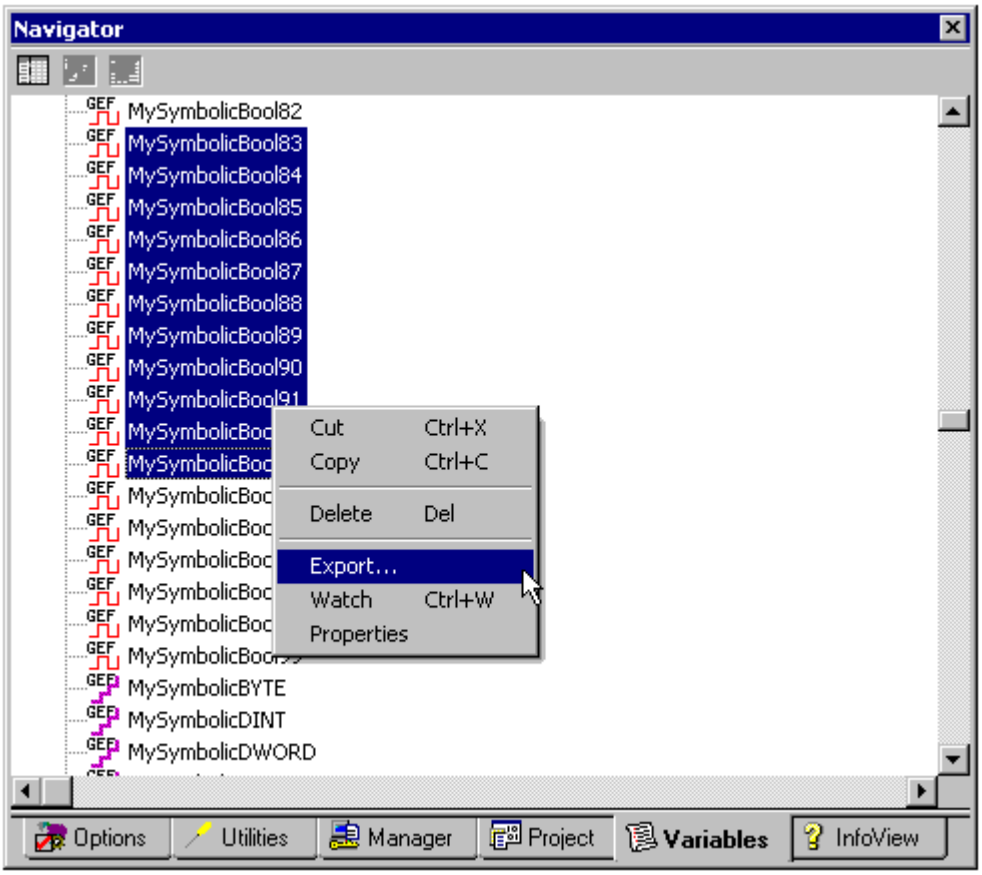
**Note:** Each Logic Developer project contains one or more targets. A target is essentially the device on which the application will run. Because variables are created on the target-level, the target of interest must be specified beforehand in order to specify the variables to export. Furthermore, the target variables must have **GE FANUC PLC** chosen as the **Data Source** in order to be imported. Verify these settings by left-clicking on the variable and then looking at its Data Source properties in the **Inspector** window. Internal variables will not be imported.

4. Next, sort the variables by target by right-clicking on the **Variable List** header and selecting **Sort** | **Target**.

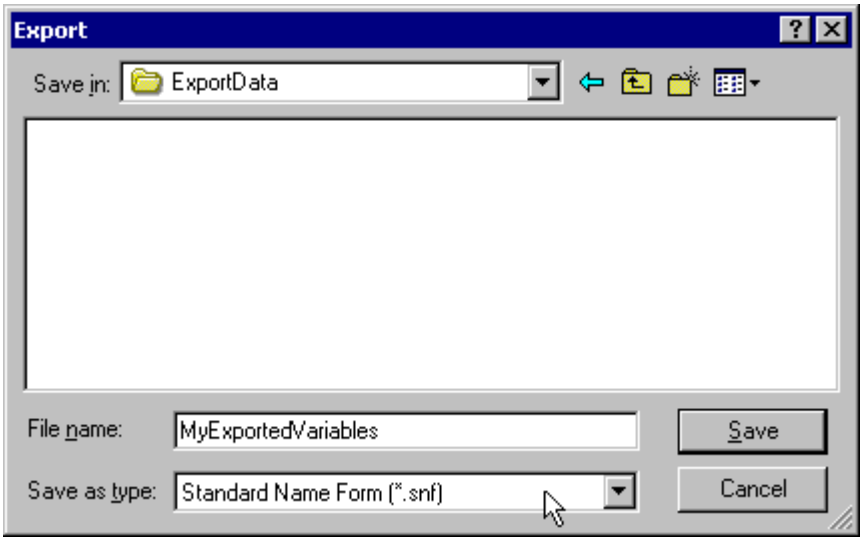
5. To export all of the variables, right-click on the **Variable List** and click **Export...**.

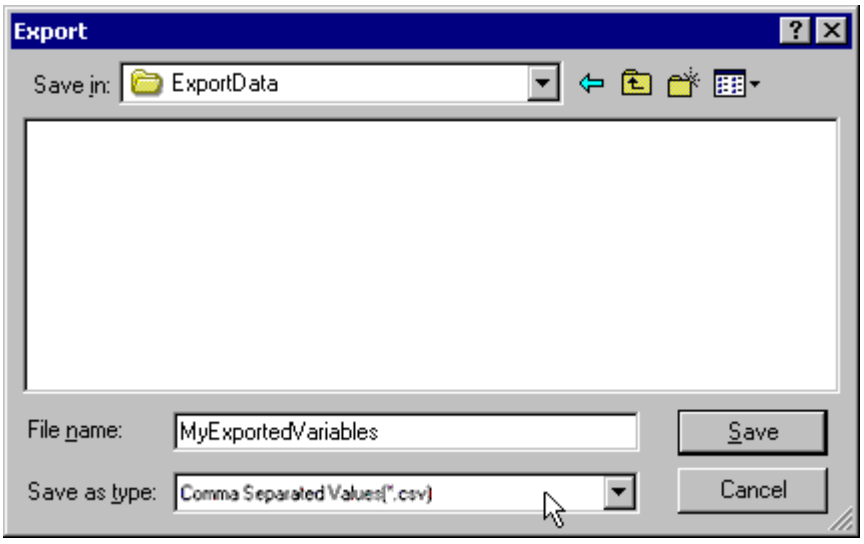



6. To export only selected variables, **Highlight** the tags of interest in the target of interest. Then, right-click on one of the selected variables and click **Export...**.




7. In the **Save as Type** drop-down list, select the export file type: either **Standard Name Form (*.snf)** or **Comma Separated Variable (*.csv)**. The dialogs should appear as shown below.






## Proficy Logic Developer Import Preparation: OPC Server Steps

1. Open up the Device Properties in the device of interest for which tags will be generated.

2. Select the **Variable Import Settings** tab.

3. Enter or browse for the location of the export file newly created (*.snf or*.csv).

4. Select the **Database Creation** tab and then click **Auto Create** to import variables. Alternatively, other settings in that dialog can be selected to automatically create the database later.

5. The OPC Server will state in the event log that it is attempting to perform a tag import. When finished, it will state that the tag import has completed. All variables exported out of Logic Developer will appear in the OPC Server in the layout discussed in **Tag Hierarchy**.

## Highlighting Proficy Logic Developer Variables

Variables in Logic Developer can be highlighted in the following ways.

### Single Variable Selecting

Left-click on a variable of interest.

### Pick-n-Choose

Left-click on a variable of interest. Then, press CTRL while left-clicking on each successive variable of interest. Do this until all variables of interest are highlighted.

### Selecting a Range of Variables

Left-click on the first variable in the range of interest. Then, press SHIFT while left-clicking on the last variable in the range. All variables in the range will be highlighted.

### Selecting All Variables

Left-click on a variable within the target of interest in the Variable List View. The variable chosen is irrelevant. Next, click **Edit** | **Select All**. All variables will be highlighted with that target.

## Proficy Logic Developer Array Tag Import

Arrays of referenced variables and arrays of symbolic variables will be imported differently.

**Referenced Variable Arrays**
Arrays of referenced variables will be imported as described in **VersaPro Array Tag Import**. **A group will be created for each array. Each group will contain a single array tag, plus a number of tags addressing the**

**individual array elements.**

**Symbolic Variable Arrays**
A single array tag will be generated for each symbolic variable array in the import file. All symbolic variable array tags will be placed in the Symbolic group along with all other symbolic variable tags. The driver will not generate tags for BOOL and STRING symbolic variable arrays.

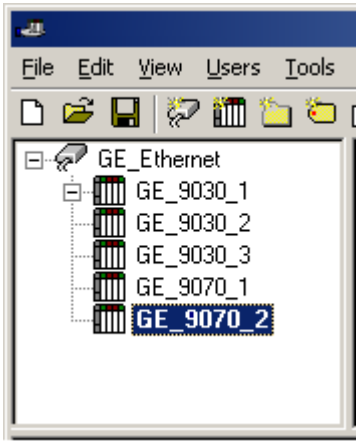
**Note on importing array elements (index):**When importing array elements (e.g., MyArrayTag[1,2]) into the driver, the characters '[' and ']' are replaced with '{' and '}' respectively for internal reasons ('[' and ']' are reserved by this driver for array notation). However, at runtime while communicating with the PLC, the replacement will be reversed by the driver to comply with the standard GE syntax.

**See Also:** **Note on addressing array elements (index)** **and** **Symbolic Variables**.

## Optimizing Your GE Ethernet Communications

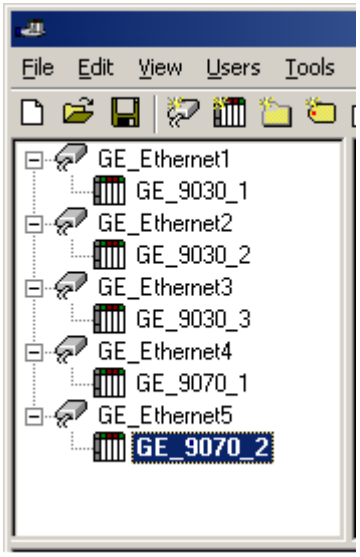
The GE Ethernet driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the GE Ethernet driver is fast, there are a couple of guidelines that can be used in order to control and optimize the application and gain maximum performance.

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




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

If the GE Ethernet driver could only define one single channel, then the example shown above would be the only option available; however, the GE Ethernet driver can define up to 256 channels. Using multiple channels distributes the data collection workload by simultaneously issuing multiple requests to the network. An example of how the same application may appear when configured using multiple channels to improve performance is shown below.




Each device has now been defined under its own channel. In this new configuration, a single path of execution is dedicated to the task of gathering data from each device. If the application has 256 or fewer devices, it can be optimized exactly how it is shown here.

The performance will improve even if the application has more than 256 devices. While 256 or fewer devices may be ideal, the application will still benefit from additional channels. Although by spreading the device load across all channels will cause the server to move from device to device again, it can now do so with far less devices to process on a single channel.

**Note for PACSystem Models:** It is recommended that referenced (mapped) variables and symbolic variables be placed on separate devices. For more information, refer to **Symbolic Variables**.

Block Size, available on each device, can also affect the performance of the GE Ethernet driver. Block Size refers to the number of bytes that may be requested from a device at one time. To refine the performance of this driver, configure Block Size to one of the following settings: 32, 64, 128, 256, 512, 1024, or 2048 bytes. Depending on the specific GE device, the block size setting can have a dramatic effect on the application. We recommend a default value of 256 bytes. If the application consists of large requests for consecutively ordered data, try increasing the block size setting.

## Data Types Description

| Data Type | Description |
|---|---|
| Boolean | Single bit |
| Byte | Unsigned 8 bit value<br><br>bit 0 is the low bit<br>bit 7 is the high bit |
| Word | Unsigned 16 bit value<br><br>bit 0 is the low bit<br>bit 15 is the high bit |
| Short | Signed 16 bit value<br><br>bit 0 is the low bit<br>bit 14 is the high bit<br>bit 15 is the sign bit |
| DWord | Unsigned 32 bit value<br><br>bit 0 is the low bit<br>bit 31 is the high bit |
| Long | Signed 32 bit value<br><br>bit 0 is the low bit<br>bit 30 is the high bit<br>bit 31 is the sign bit |

| | |
|---|---|
| BCD | Two byte packed BCD<br><br>Value range is 0-9999. Behavior is undefined for values beyond this range. |
| LBCD | Four byte packed BCD<br><br>Value range is 0-99999999. Behavior is undefined for values beyond this range. |
| Float | 32 bit floating point value.<br><br>The driver interprets two consecutive registers as a floating point value by making the second register the high word and the first register the low word. |
| String | Null terminated ASCII string<br>Support includes HiLo LoHi byte order selection. |

## Address Descriptions

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



## PACSystems Addressing

The default data types for dynamic tags are **bold**.

| Device Address | Range | Data Type | Access |
|---|---|---|---|
| Discrete Inputs | I00001 to I32768<br>I00001 to I32761<br>I00001 to I32753<br>(every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read/Write |
| Discrete Outputs | Q00001 to Q32768<br>Q00001 to Q32761<br>Q00001 to Q32753 (every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read/Write |
| Discrete Globals | G00001 to G7680<br>G00001 to G7673<br>G00001 to G7665 (every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read/Write |

| | | | |
|---|---|---|---|
| Internal Coils | M00001 to M32768<br>M00001 to M32761<br>M00001 to M32753 (every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read/Write |
| Temporary Coils | T0001 to T1024<br>T0001 to T1017<br>T0001 to T1009 (every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121<br>S001 to S113 (every 8th bit) | **Boolean**<br>Word, Short, BCD<br>Byte | Read Only |
| Register References | R1.0 to R32640.15<br>R00001 to R32640<br>R00001 to R32639 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI32640.15<br>AI00001 to AI32640<br>AI00001 to AI32639 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ32640.15<br>AQ00001 to AQ32640<br>AQ00001 to AQ32639 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |

**See Also:** Symbolic Variables

## Symbolic Variables

A variable is a named storage space for data in the PLC. A **reference variable** is a variable that is **mapped** to a specific I/O or internal register location in the PLC (I00001, R00100, etc). A **symbolic variable** is a variable that is **not mapped** to a specific register. The PLC will allocate memory for symbolic variables, as needed, from its managed memory area. This driver has the ability to read and write to symbolic variables defined in the PLC.

**Note:** Symbolic variables are available in PAC Systems PLCs only.

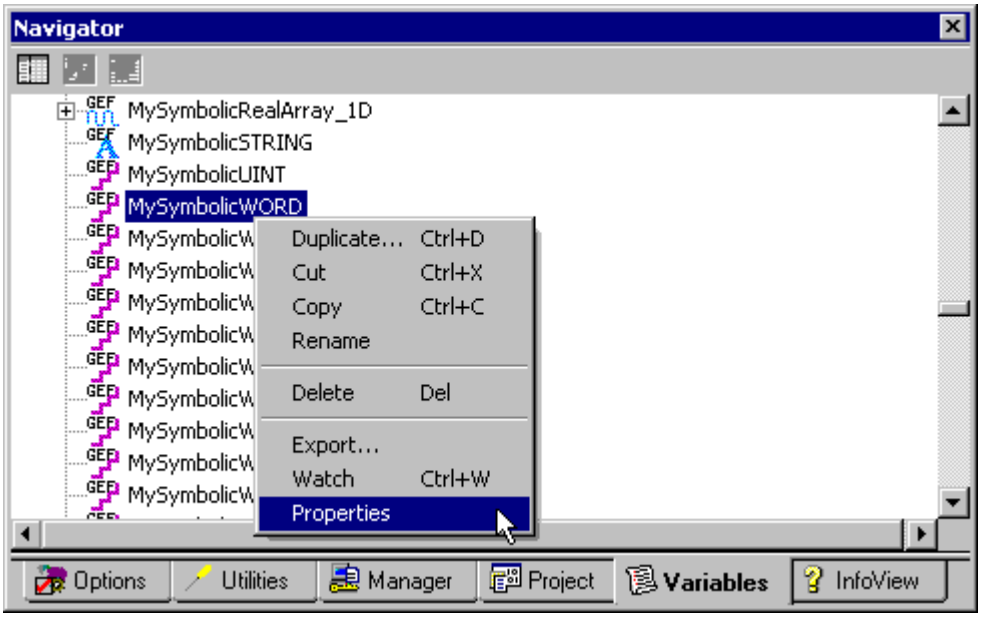
### Create a Symbolic Variable

1. Load the PLC's current configuration project into Proficy Logic Developer.

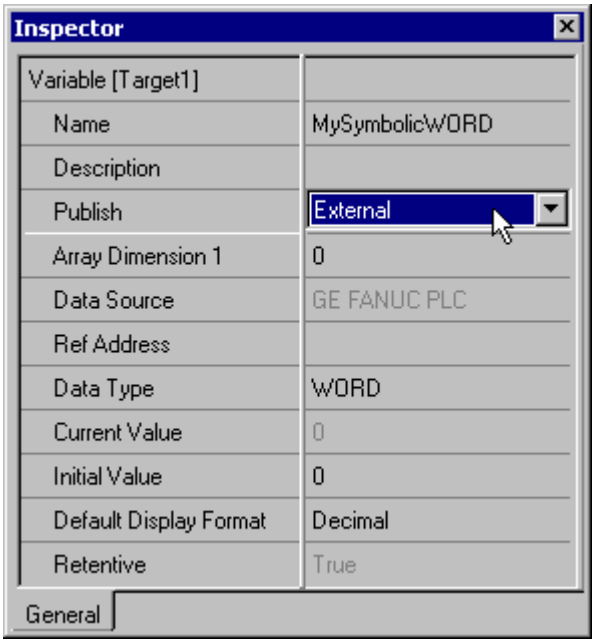
2. Open the **Navigator View** by pressing Shift-F4 (if it isn't already open).

3. Click on the **Variables** tab. To create a new variable, right-click on the **Variables View** and select **New Variable**.

**Note:** To edit an existing variable, right-click on it and then select **Properties**.



4. In either case, the variable's **Properties Inspector** dialog will appear as shown below.




**Note:** The variable shown above is symbolic because the **Ref Address** property is left blank. The variable is named "MySymbolicWORD" and has a data type of Word. An array of variables can be created by setting the **Array Dimension 1** property to a value greater than zero. The **Array Dimension 2** property will appear in the variable inspector if Array Dimension 1 is set. A single dimension array is defined when Array Dimension 2 is left at zero. The total number of array elements is limited by the **Maximum Bytes Per Request** setting in Device Properties. For more information, refer to **Device Setup**.

**Important:** In order for a symbolic variable to be visible to this driver, **Publish** must be set to **External**, as shown above.

5. Download the modified project to the PLC.

6. In order to access a symbolic variable with the OPC Server, a tag will need to be created that has an address that references the variable by name, preceded by the "!" character.

### Examples

1. !MySymbolicArray1D [4] – addresses the symbolic variable named "MySymbolicArray1D", which is assumed to have its Array Dimension 1 property set to 4.

2. !MySymbolicArray1D {3} – addresses the index (3) of the above 1D symbolic array variable "MySymbolicArray1D"

3. !MySymbolicArray2D [3][4] – addresses the symbolic variable named "MySymbolicArray2D", which is assumed to have its Array Dimension 1 property set to 3, and its "Array Dimension 2" property set to 4.

4. !MySymbolicArray2D {2,3} – addresses the index (2,3) of the above 2D symbolic array variable "MySymbolicArray2D."

**Note on addressing array elements (index):** As shown above, the syntax for addressing array elements uses '{' and '}'. These characters are specific to KEPServerEX. The correct GE syntax to access the array elements instead uses '[' and ']'. The appropriate conversion will be done internally by the driver at runtime while communicating with the PLC. However, for addressing purposes due to internal reasons ('[' and ']' are reserved by this driver for array notation), you will need to use the characters '{' and '}'.

**Important:** The tag must be assigned a data type that is compatible with the Data Type property of the symbolic variable, and dimensions of array tags must be the same as the dimensions of the variable. These tag properties can only be validated during run time.

### Compatible Data Types*

| Native Type (device) | Compatible Types (server) |
|---|---|
| BOOL | Bool (no arrays) |
| Byte | Byte, Char |
| INT | Word, Short |
| UINT | Word, Short |
| Word | Word, Short |
| DINT | DWord, Long |
| DWORD | DWord, Long |
| REAL | Float |
| String | String (no arrays) |

*The driver will assign a default type of Word.

Be sure to specify an appropriate data type override for each dynamic tag. (Dynamic tags are defined in the client application only, and are created in the server on demand by the client. See the OPC Server help for details.) The data type of a dynamic tag can be specified by appending one of the following strings to the item name: "@Boolean", "@Byte", "@Char" "@Short", "@Word", "@Long", "@DWord", "@Float", or "@String".

### Example

ItemName = "Channel1.Device1.!MySymbolicWordVariable @DWord"

### Performance Considerations

The driver will attempt to optimize performance by reading blocks of symbolic variable memory. (It is generally faster to read a single large block of data, where only the first and last few bytes are needed to update two tags for example, then it is to perform two separate reads for few bytes needed for each tag.) The amount of symbolic variable memory read per request will be limited by the **Maximum Bytes Per Request** device property setting. It is generally advantageous to maximize this setting. However, in some cases, if the variables most frequently read are widely scattered in the controller's managed memory area, performance may be increased by reducing this setting. Unfortunately, the mapping of symbolic variable data in the controller's memory is not under the user's control. Mapping depends largely on when the variables are added to the configuration project. If performance is a primary concern, some experimentation with this setting is recommended.

This driver will also attempt to optimize performance by performing multi-item writes. The number of tags included in a request is limited by the Maximum Bytes Per Request device property setting. However, unlike the block reads described above, the location of the variables in memory is of little consequence. Writes can further be optimized with the **Write Optimizations** setting in Channel Properties.

If the driver finds that the variable named in a tag's address does not exist in the controller, or if its data type or array dimension does not match the tag's, its OPC quality will be set BAD. The driver will continue to check the controller for the named variable should a new configuration be downloaded at some point. Do not use such tags in the client applications in you know they will remain invalid.

## 311 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |

| | | | |
|---|---|---|---|
| Internal Coils | M0001 to M1024<br>M0001 to M1017 (every 8th bit)<br>M0001 to M1009 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R512.15<br>R001 to R512<br>R001 to R511 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI64.15<br>AI01 to AI64<br>AI01 to AI63 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ032.15<br>AQ001 to AQ032<br>AQ001 to AQ031 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 313 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M1024<br>M0001 to M1017 (every 8th bit)<br>M0001 to M1009 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R1024.15<br>R001 to R1024<br>R001 to R1023 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI64.15<br>AI01 to AI64<br>AI01 to AI63 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |

| | | | |
|---|---|---|---|
| Analog Outputs | AQ1.0 to AQ032.15<br>AQ001 to AQ032<br>AQ001 to AQ031 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 331 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M1024<br>M0001 to M1017 (every 8th bit)<br>M0001 to M1009 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R2048.15<br>R0001 to R2048<br>R0001 to R2047 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI128.15<br>AI001 to AI128<br>AI001 to AI127 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ64.15<br>AQ01 to AQ64<br>AQ01 to AQ63 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 341 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M1024<br>M0001 to M1017 (every 8th bit)<br>M0001 to M1009 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R9999.15<br>R0001 to R9999<br>R0001 to R9998 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI1024.15<br>AI0001 to AI1024<br>AI0001 to AI1023 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ256.15<br>AQ0001 to AQ256<br>AQ0001 to AQ255 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 350 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I2048<br>I0001 to I2041 (every 8th bit)<br>I0001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q0001 to Q2048<br>Q0001 to Q2041 (every 8th bit)<br>Q0001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |

| | | | |
|---|---|---|---|
| Internal Coils | M0001 to M4096<br>M0001 to M4089 (every 8th bit)<br>M0001 to M4081 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R9999.15<br>R0001 to R9999<br>R0001 to R9998 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI2048.15<br>AI0001 to AI2048<br>AI0001 to AI2047 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ512.15<br>AQ001 to AQ512<br>AQ001 to AQ511 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 360 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I2048<br>I0001 to I2041 (every 8th bit)<br>I0001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q0001 to Q2048<br>Q0001 to Q2041 (every 8th bit)<br>Q0001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M4096<br>M0001 to M4089 (every 8th bit)<br>M0001 to M4081 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R32768.15<br>R00001 to R32768<br>R00001 to R32767 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI2048.15<br>AI0001 to AI2048<br>AI0001 to AI2047 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |

| | | | |
|---|---|---|---|
| Analog Outputs | AQ1.0 to AQ512.15<br>AQ001 to AQ512<br>AQ001 to AQ511 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 731 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M2048<br>M0001 to M2041 (every 8th bit)<br>M0001 to M2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers<br>(Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 732 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I512<br>I001 to I505 (every 8th bit)<br>I001 to I497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q512<br>Q001 to Q505 (every 8th bit)<br>Q001 to Q497 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M2048<br>M0001 to M2041 (every 8th bit)<br>M0001 to M2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers (Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.
**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**

Default Data Type Override
String Access to Registers
Array Support

## 771 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I2048<br>I0001 to I2041 (every 8th bit)<br>I0001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q0001 to Q2048<br>Q0001 to Q2041 (every 8th bit)<br>Q0001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G7680<br>G0001 to G7673 (every 8th bit)<br>G0001 to G7665 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M4096<br>M0001 to M4089 (every 8th bit)<br>M0001 to M4081 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers<br>(Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.
**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

Bit Access to Registers
Default Data Type Override
String Access to Registers
Array Support

## 772 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I2048<br>I0001 to I2041 (every 8th bit)<br>I0001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q0001 to Q2048<br>Q0001 to Q2041 (every 8th bit)<br>Q0001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G7680<br>G0001 to G7673 (every 8th bit)<br>G0001 to G7665 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M4096<br>M0001 to M4089 (every 8th bit)<br>M0001 to M4081 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers (Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items (PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.
**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 781 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Discrete Inputs | I00001 to I12288<br>I00001 to I12281 (every 8th bit)<br>I00001 to I12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q00001 to Q12288<br>Q00001 to Q12281 (every 8th bit)<br>Q00001 to Q12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G7680<br>G0001 to G7673 (every 8th bit)<br>G0001 to G7665 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M00001 to M12288<br>M00001 to M12281 (every 8th bit)<br>M00001 to M12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers (Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.
**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## 782 Addressing

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

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I00001 to I12288<br>I00001 to I12281 (every 8th bit)<br>I00001 to I12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |

| | | | |
|---|---|---|---|
| Discrete Outputs | Q00001 to Q12288<br>Q00001 to Q12281 (every 8th bit)<br>Q00001 to Q12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G7680<br>G0001 to G7673 (every 8th bit)<br>G0001 to G7665 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M00001 to M12288<br>M00001 to M12281 (every 8th bit)<br>M00001 to M12273 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S001 to S128<br>S001 to S121 (every 8th bit)<br>S001 to S113 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R16384.15<br>R00001 to R16384<br>R00001 to R16383 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers<br>(Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI8192.15<br>AI0001 to AI8192<br>AI0001 to AI8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ8192.15<br>AQ0001 to AQ8192<br>AQ0001 to AQ8191 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.
**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## GE OPEN Addressing

The GE OPEN model selection has been provided to supply support for any GE SNP compatible device that is not currently listed in the standard model selection menu. The ranges of data for each data type have been expanded to allow a wide range of GE PLCs to be addressed. Although the address ranges shown here may exceed your specific PLC's capability, the driver will respect all messages from the PLC regarding memory range limits.

The default data types for dynamic tags are **bold**.

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I32768<br>I0001 to I32761 (every 8th bit)<br>I0001 to I32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |

| | | | |
|---|---|---|---|
| Discrete Outputs | Q00001 to Q32768<br>Q00001 to Q32761 (every 8th bit)<br>Q00001 to Q32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G00001 to G32768<br>G00001 to G32761 (every 8th bit)<br>G00001 to G32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M00001 to M32768<br>M00001 to M32761 (every 8th bit)<br>M00001 to M32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T00001 to T32768<br>T00001 to T32761 (every 8th bit)<br>T00001 to T32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S00001 to S32768<br>S00001 to S32761 (every 8th bit)<br>S00001 to S32753 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R32768.15<br>R00001 to R32768<br>R00001 to R32767 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Program Block Registers (Program specified in **device settings**) | P00001 to P16384<br>P00001 to P16383 | **Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| SubProgram Block Registers** | L00001<SUBPRGM> to L16384<SUBPRGM><br><br>L00001<SUBPRGM> to L16383<SUBPRGM> | **Word**, Short, BCD<br><br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI32768.15<br>AI00001 to AI32768<br>AI00001 to AI32767 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ32768.15<br>AQ00001 to AQ32768<br>AQ00001 to AQ32767 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | **See Special Items** | | |

*Default data type of Boolean becomes Byte when an array specification is given.

**The SubProgram name/Block name <SUBPRGM> must match the name assigned in the PLC. This name can be found in VersaPro under Block Properties.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## Horner OCS Addressing

The Horner OCS model selection has been provided to supply support for Horner Operator Control Stations. The ranges of data for each data type have been expanded to allow a wide range of Horner OCS devices to be addressed. Although the address ranges shown here may exceed your specific device's capability, the driver will respect all messages from the OCS regarding memory range limits.

The default data types for dynamic tags are **bold**.

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I0001 to I2048<br>I0001 to I2041 (every 8th bit)<br>I0001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |

| | | | |
|---|---|---|---|
| Discrete Outputs | Q00001 to Q20488<br>Q00001 to Q2041 (every 8th bit)<br>Q00001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M00001 to M2048<br>M00001 to M2041 (every 8th bit)<br>M00001 to M2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T00001 to T2048<br>T00001 to T2041 (every 8th bit)<br>T00001 to T2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Register References | R1.0 to R32768.15<br>R00001 to R32768<br>R00001 to R32767 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI512.15<br>AI00001 to AI512<br>AI00001 to AI511 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Outputs | AQ1.0 to AQ512.15<br>AQ00001 to AQ512<br>AQ00001 to AQ511 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |

*Default data type of Boolean becomes Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## VersaMax Addressing

The default data types for dynamic tags are **bold**.

| Device Address | Range | Data Type* | Access |
|---|---|---|---|
| Discrete Inputs | I001 to I2048<br>I001 to I2041 (every 8th bit)<br>I001 to I2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Outputs | Q001 to Q2048<br>Q001 to Q2041 (every 8th bit)<br>Q001 to Q2033 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Discrete Globals | G0001 to G1280<br>G0001 to G1273 (every 8th bit)<br>G0001 to G1265 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Internal Coils | M0001 to M1024<br>M0001 to M1017 (every 8th bit)<br>M0001 to M1009 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Temporary Coils | T001 to T256<br>T001 to T249 (every 8th bit)<br>T001 to T241 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read/Write |
| Status References<br><br>(Same for SA, SB, SC) | S01 to S32<br>S01 to S25 (every 8th bit)<br>S01 to S17 (every 8th bit) | **Boolean**<br>Byte<br>Word, Short, BCD | Read Only |
| Register References | R1.0 to R2048.15<br>R001 to R2048<br>R001 to R2047 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Analog Inputs | AI1.0 to AI128.15<br>AI01 to AI128<br>AI01 to AI127 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |

| | | | |
|---|---|---|---|
| Analog Outputs | AQ1.0 to AQ128.15<br>AQ001 to AQ128<br>AQ001 to AQ127 | **Boolean**<br>**Word**, Short, BCD<br>DWord, Long, LBCD, Float | Read/Write |
| Special Items<br>(PLC Status, Time, etc) | See **Special Items** | | |

*The default data type, Boolean, changes to Byte when an array specification is given.

### Advanced Addressing

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

## Advanced Addressing

The following advanced addressing topics are discussed below:

**Bit Access to Registers**
**Default Data Type Override**
**String Access to Registers**
**Array Support**

### Bit Access to Registers

Register based device types such as R, P, L, AI, and AQ can be accessed at the bit level by appending a bit number to the register address. The valid bit number range is 0 to 15. The bit number must be preceded by either a " ." or "a **:** " .

### Examples

| |
|---|
| R100.12 allows Read/Write access to bit 12 of Register 100. |
| L50SUB1.3 allows Read/Write access to bit 3 of local register L50 in subprogram SUB1 |

**Note:** All device addresses can be prefixed with a % sign if needed, such as %R100. This can aid in converting from other OPC servers or communications drivers.

### Default Data Type Override

The default data types for each device type are shown in **PACSystems Addressing**. The defaults can be overridden by appending data type indicators to the device address. The possible data type indicators are:

| Indicators | Data type |
|---|---|
| F | Float |
| S | Short |
| L | Long |
| M | String |
| (BCD) | BCD |

### Examples

| Address | Description |
|---|---|
| R100 F | Access R100 as a floating point value |
| R300 L | Access R300 as a long |
| R400–R410 M | Access R400-R410 as a string with a length of 22 bytes.<br>(LoHi byte order is assumed.) |
| P100 S | Access P100 as a short |

| | |
|---|---|
| L200SUB1-L210SUB1 M | Access L200-L210 in subprogram SUB1 as a string with a length of 22 bytes. (LoHi byte order is assumed.) |

**Note:** There must be a space between the register number and the data type indicator.

### String Access to Registers

Register space can be accessed as string data by appending the "M" data indicator. The length of the string is based on how the device address reference is entered. Each register addressed can contain 2 characters. The byte order of characters in registers can be specified by appending an optional "H" for HiLo or "L" for LoHi after the "M" data indicator. If no byte order is specified, LoHi order is assumed. Here are some examples:

### Examples

| Address | Description |
|---|---|
| R100-R200 M | Access Register R100 as string with a length of 202 bytes. (LoHi byte order is assumed.) |
| R400 M | Access Register R400 as a string with a length of 4 bytes. (LoHi byte order is assumed.) |
| R405-R405 M | Access Register R405 as a string with a length of 2 bytes. (LoHi byte order is assumed.) |
| L100SUB1-L100SUB1 M | Access local register L100 in subprogram SUB1 as a string with a length of 2 bytes. (LoHi byte order is assumed.) |
| R100-R200 M H | Access Register R100 as string with a length of 202 bytes. HiLo byte order is explicitly specified. |
| R100-R200 M L | Access Register R100 as string with a length of 202 bytes. HiLo byte order is explicitly specified. |

**Notes:** The maximum string length is 255 bytes. For HiLo byte ordering, the string "AB" would be stored in a register as 0x4142. For LoHi byte ordering, the string "AB" would be stored in a register as 0x4241. There must be a space between the "M" data type indicator and the byte order indicator.

### Array Support

An array is a collection of contiguous elements of a given data type. Arrays are supported by the following data types: byte, word, short, DWord, long, float, and char.

| | |
|---|---|
| Maximum Array Size for Referenced or Mapped Variables | 512 DWords (longs, floats), 1024 words (shorts) or 2048 bytes and chars for a total of 16384 bits |
| Maximum Array Size for Symbolic Variables | 512 DWords (longs, floats), 1024 words (shorts) or 1024 bytes and chars for a total of 16384 bits |
| **Note:** The number of usable bytes is directly reflective of the block size. | |

### Examples

| Address | Address Breakdown |
|---|---|
| G1 [4] includes the following **byte** addresses<br><br>**Note:** G25 indicates the fourth byte beginning at bit 25.> | G1, G9, G17, G25<br>1 row implied = 4 bytes<br>4 x 8 (byte) = 32 total bits |
| R16 [3][4] includes the following **Word** addresses: | R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27<br>3 rows x 4 columns = 12 words<br>12 x 16 (word) = 192 total bits |
| P10 [5] includes the following **Word** addresses: | P10, P11, P12, P13, P14<br>1 rows x 5 columns = 5 words<br>5 x 16 (word) = 80 total bits |

## Special Items

The default data types for dynamic tags are **bold**.

**Note:** Though not visible in your server configuration, tags with these addresses are automatically created and can be browsed by the OPC client. They will be found under the <Channel Name>.<Device Name>._InternalTags group. If the OPC client does not support browsing or a non-OPC client is being used, users can create their own static and dynamic tags using these addresses.

| Device Address | Range | Data Type | Access |
|---|---|---|---|
| _OVERSWEEP | Oversweep flag; meaningful only when constant sweep mode is active.<br><br>1 = Constant Sweep value exceeded<br>0 = No oversweep condition exists | **Boolean** | Read Only |
| _CONSWEEP | Constant sweep mode.<br><br>1 = Constant Sweep Mode active<br>0 = Constant Sweep Mode not active | **Boolean** | Read Only |
| _NEWFT | PLC Fault entry since last read.<br><br>1 = PLC Fault Table has changed since last read by the server<br>0 = PLC Fault Table is unchanged since last read by the server | **Boolean** | Read Only |
| _NEWIOFT | IO Fault entry since last read.<br><br>1 = IO Fault Table has changed since last read by the server<br>0 = IO Fault Table is unchanged since last read by the server | **Boolean** | Read Only |
| _FTSTATUS | PLC Fault entry present<br><br>1 = One or more fault entries in PLC Fault Table<br>0 = PLC Fault table is empty | **Boolean** | Read Only |
| _IOSTATUS | IO Fault entry present<br><br>1 = One or more fault entries in IO Fault Table<br>0 = IO Fault Table is empty | **Boolean** | Read Only |
| _PROGATTACH | Programmer attachment in system flag.<br><br>1 = Programmer attachment found in system<br>0 = No programmer attachment found in system | **Boolean** | Read Only |
| _ENSWITCH | Front panel ENABLED/DISABLED switch setting.<br><br>1 = Outputs disabled<br>0 = Outputs enabled | **Boolean** | Read Only |
| _RUN | Front panel RUN/STOP switch setting.<br><br>1 = Run<br>0 = Stop | | |
| _OEMPROT | OEM protected bit.<br><br>1 = OEM protection in effect<br>0 = No OEM protection | **Boolean** | Read Only |
| _SPRGCHG | Program changed flag.<br><br>1 = Program changed<br>0 = No program change<br>(90-70 release 2.x and later) | **Boolean** | Read Only |

| | | | |
|---|---|---|---|
| _STATE | Current PLC State<br><br>0 = Run I/O enabled<br>1 = Run I/O disabled<br>2 = Stop I/O disabled<br>3 = CPU stop faulted<br>4 = CPU halted<br>5 = CPU suspended<br>6 = Stop I/O enabled | **Byte**, Char | Read Only |
| _PROGNUM | Control program number SNP Master is currently logged into.<br><br>-1 = SNP Master is not logged into a task<br>0 = SNP Master is logged into task 0 | Byte, **Char** | Read Only |
| _PRIVLEVEL | Current privilege level of server for accessing memory in PLC CPU (0-4) | **Byte**, Char | Read Only |
| _SWEEPTIME | Time taken by the last complete sweep for the main control program task.<br><br>The value returned is a whole number representing the number of tenths of a millisecond. The Sweep Time in milliseconds is 1/10 of this value. For example, if _SWEEPTIME is 123, the actual Sweep Time is 12.3 milliseconds. | **Word**, Short | Read Only |
| _SNPID | CPU Controller ID. | **String** | Read Only |
| _PROGNAME | Name of control program task in the PLC CPU. | **String** | Read Only |
| _SNUM_PROGS | Number of control program tasks defined for the PLC CPU. | **Byte**, Char | Read Only |
| _SPROG_FLAGS | Bit flags indicating which control programs tasks have programmers attached. Bit 0 = control program 1. | **Byte**, Char | Read Only |
| _TIME | Internal time and date of the PLC CPU. Format:<br><br>SSMMHHDDMoYYDw where<br><br>SS = Seconds (0-59)<br>MM == Minutes (0-59)<br>HH = Hours (0-23)<br>DD = Day (1- 31)<br>Mo = Month (1-12)<br>YY = Year (0-99)<br>Wd = Day of week (1-Sunday, 2-Monday, etc) | **String** | Read Only |
| _SECOND | PLC Time: Seconds (0-59) | **Byte**, Char | Read Only |
| _MINUTE | PLC Time: Minutes (0-59) | **Byte**, Char | Read Only |
| _HOUR | PLC Time: Hours (0-23) | **Byte**, Char | Read Only |
| _DAY | PLC Date: Day (1- 31) | **Byte**, Char | Read Only |
| _MONTH | PLC Date: Month (1-12) | **Byte**, Char | Read Only |
| _YEAR | PLC Date: Year (0-99) | **Byte**, Char | Read Only |
| _DOW | PLC Date: Day of week (1-Sunday, 2-Monday, etc) | **Byte**, Char | Read Only |

## Error Descriptions

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

### Address Validation

**Missing address**
**Device address '<address>' contains a syntax error**
**Address '<address>' is out of range for the specified device or register**
**Device address '<address>' is not supported by model '<model name>'**
**Data Type '<type>' is not valid for device address '<address>'**
**Device address '<address>' is Read Only**

### Device Status Messages



### Driver Error Messages

**Winsock initialization failed (OS Error = n)**



### Automatic Tag Database Generation Messages


**Database Error: Data type '<type>' for tag '<tag name>' is currently not supported. Tag not created**


## Address Validation Error Messages

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

### Address Validation



## Missing address

**Error Type:**

Warning

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

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

## Device address '<address>' contains a syntax error

**Error Type:**
Warning

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

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

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

**Error Type:**
Warning

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

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

## Device address '<address>' is not supported by model '<model name>'

**Error Type:**
Warning

**Possible Cause:**
A tag address that has been specified statically references a location that is valid for the communications protocol but not supported by the target device.

**Solution:**
Verify that the address is correct; if it is not, re-enter it in the client application. Also verify that the selected model name for the device is correct.

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

**Error Type:**
Warning

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

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

## Device address '<address>' is Read Only

**Error Type:**
Warning

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

**Solution:**
Change the access mode in the client application.

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

**Error Type:**
Warning

**Possible Cause:**
1. The number of elements in an array definition exceeds the range of elements supported by the address type.
2. The number of elements in an array definition exceeds the maximum number of data values that may be obtained from the device in a single request.

**Solution:**
Reduce the number of referenced elements in the array definition.

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

**Error Type:**
Warning

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

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

## Device Status Messages

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

**Device Status Messages**

**Device '<device name>' is not responding**

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

**Attempting to reacquire symbolic variable mapping information for device '<device name>'. Cannot read or write symbolic variables until complete**

## Device '<device name>' not responding

**Error Type:**
Serious

**Possible Cause:**
1. The connection between the device and the host PC is broken.
2. The IP address assigned to the device is incorrect.

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

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

**Error Type:**
Serious

**Possible Cause:**
1. The connection between the device and the host PC is broken.
2. The named device may have been assigned an incorrect IP address.

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

## Attempting to reacquire symbolic variable mapping information for device '<device name>'. Cannot read or write symbolic variables until complete

**Error Type:**
Warning

**Possible Cause:**
A new configuration is being downloaded to the device or the configuration has been lost (possibly due to power failure).

**Solution:**
The driver should automatically recover once a new device configuration has been restored.

## Driver Error Messages

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

**Driver Error Messages**

**Winsock initialization failed (OS Error = n)**

**Winsock V1.1 or higher must be installed to use the GE Ethernet device driver**

**Device '<device name>' returned error code <error num> reading n byte(s) starting at <address>**

**The symbolic variable name in tag address '<address>' does not exist in current configuration of device '<device name>'**

**The address length of the symbolic variable addressed by '<tag name>' on device '<device>' is bigger than the configured block size for this device. Deactivating tag**

**The array size of address '<address>' on device '<device name>' must be the same as symbolic variable's array size of [rows][cols]**

**The data type of the symbolic variable addressed by '<address>' on device '<device name>' is not compatible with tag**

## Winsock V1.1 or higher must be installed to use the GE Ethernet device driver

**Error Type:**
Fatal

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

**Solution:**
Upgrade Winsock to version 1.1 or higher.

## Device '<device name>' returned error code <error num> reading n byte(s) starting at <address>

**Error Type:**
Error

**Possible Cause:**
An attempt has been made to read a location that does not exist.

**Solution:**
Review the address map for the device in question and make necessary adjustments in the client application.

## The symbolic variable name in tag address '<address>' does not exist in current configuration of device '<device name>'

**Error Type:**
Warning

**Possible Cause:**
The named variable does not exist in the current device configuration.

**Solution:**
1. Verify that variable is defined in current device configuration.
2. Check the spelling of the variable name.

**Note:**
To optimize driver performance, it is recommended that all tags with invalid symbolic variable addresses be removed from the server configuration or not be used by a client application.

## The address length of the symbolic variable addressed by '<tag name>' on device '<device>' is bigger than the configured block size for this device. Deactivating tag

**Error Type:**
Error

**Possible Cause:**
The requested tag is larger than the configured block size for this device. This can be caused by the name being too big or requested packet being too big.

**Solution:**
Increase the block size or change name size.

## The array size of address '<address>' on device '<device name>' must be the same as symbolic variable's array size of [rows][cols]

**Error Type:**
Warning

**Possible Cause:**
The array dimensions given in the tag address, if any, are not the same as the array size of the referenced symbolic variable.

**Solution:**
Determine the array dimensions of the variable as currently defined in the device. Adjust the tag address to match.

## The data type of the symbolic variable addressed by '<address>' on device '<device name>' is not compatible with tag

**Error Type:**
Warning

**Possible Cause:**
The native data type of the symbolic variable, as currently defined in the device, is not compatible with the data type of the tag.

**Solution:**
Adjust the data type of the tag to match the variable's native data type.

**See Also:**
Symbolic Variables

## Automatic Tag Database Generation Messages

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

**Automatic Tag Database Generation Messages**

Unable to generate a tag database for device <device name>. Reason: Low memory resources
Unable to generate a tag database for device <device name>. Reason: Import file is invalid or corrupt
Database Error: Tag '<orig. tag name>' exceeds 31 characters. Tag renamed to '<new tag name>'
Database Error: Array tags '<orig. tag name><dimensions>' exceed 31 characters. Tags renamed to '<new tag name><dimensions>'
Database Error: Data type '<type>' for tag '<tag name>' not found in import file. Setting to default
Database Error: Data type '<type>' for tag '<tag name>' is currently not supported. Tag not created
Database Error: Logic Developer Variable Arrays are currently not supported. Array Tag(s) '<array tag name>' not created
Database Error: No Reference Address found for tag '<tag name>' in import file. Tag not created
Database Error: Only variables with Data Source '<data source name>' are imported. Data Source '<data source name>' is not supported. Tag '<tag name>' not created
Database Error: Data type '<type>' arrays are currently not supported. Tag '<array tag name>' not created

## Unable to generate a tag database for device <device name>. Reason: Low memory resources

**Error Type:**
Warning

**Possible Cause:**
Memory required for database generation could not be allocated. The process is aborted.

**Solution:**
Close any unused applications and/or increase the amount of virtual memory. Then, try again.

## Unable to generate a tag database for device <device name>. Reason: Import file is invalid or corrupt

**Error Type:**
Warning

**Possible Cause:**
The file specified as the Tag Import File (in the Database Settings device properties page) is a corrupt import file (*.snf or*.csv) or improperly formatted Logic Developer text file.

**Solution:**
Select a valid, properly formatted VersaPro/Logic Developer variable import file or retry the tag export process in the respective application to produce a new import file.

**See Also:**

Automatic Tag Database Generation Preparation

## Database Error: Array tags '<orig. tag name><dimensions>' exceed 31 characters. Tags renamed to '<new tag name><dimensions>'

**Error Type:**
Warning

**Possible Cause:**
The name assigned to an array tag originates from the variable name in the import file. This name exceeds the 31-character limitation and will be renamed to one that is valid. <Dimensions> define the number of dimensions for the given array tag. XXX for 1 Dimension, XXX_YYY for 2 Dimensions. The number of X's and Y's approximates the number of elements for the respective dimensions. Since such an error will occur for each element, generalizing with XXX and YYY implies all array elements will be affected.

**Solution:**
None.

**See Also:**
Import File-to-Server Name Conversions

## Database Error: Tag '<orig. tag name>' exceeds 31 characters. Tag renamed to '<new tag name>'

**Error Type:**
Warning

**Possible Cause:**
The name assigned to a tag originates from the variable name in the import file. This name exceeds the 31 character limitation and will be renamed to one that is valid.

**Solution:**
None.

**See Also:**
Import File-to-Server Name Conversions

## Database Error: Data type '<type>' for tag '<tag name>' not found in import file. Setting to default

**Error Type:**
Warning

**Possible Cause:**
The definition of data type '<type>', for tag <tag name>, could not be found in the import file.

**Solution:**
This tag will take on the Default type for the given address type as assigned by the GE Ethernet Driver.

## Database Error: Logic Developer Variable Arrays are currently not supported. Array Tag (s) '<array tag name>' not created

**Error Type:**
Warning

**Possible Cause:**
Array tags of 1 or 2 dimensions originating from a Logic Developer import file, are not supported at this time. The array

tag(s) were not automatically generated.

**Solution:**
For applicable tags, avoid using arrays in the Logic Developer projects.

## Database Error: No Reference Address found for tag '<tag name>' in import file. Tag not created

**Error Type:**
Warning

**Possible Cause:**
Variables without a reference address cannot have a tag created since the reference address determines the tag's address. The tag was not automatically generated.

**Solution:**
Verify the <tag name> has a PLC as a data source and that reference address (PLC memory location) has been assigned to it.

## Database Error: Only variables with Data Source '<data source name>' are imported. Data Source '<data source name>' is not supported. Tag '<tag name>' not created

**Error Type:**
Warning

**Possible Cause:**
In Logic Developer, variables can take on a data value from a number of sources. For use in the OPC Server, the source must be a GE Ethernet PLC. The tag was not automatically generated.

**Solution:**
Verify the <tag name> has a PLC as a data source.

## Database Error: Data type '<type>' arrays are currently not supported. Tag '<array tag name>' not created

**Error Type:**
Warning

**Possible Cause:**
Boolean or String array tags of 1 or 2 dimensions are not supported at this time.

**Solution:**
For Boolean array tags, individual array elements of the tag if specified in the import file will be generated. Further, the driver will also automatically create individual elements for the array tag (except for bit within word type Boolean array tags).

**Note:**
For String array tags, neither the array tag or the individual elements will be generated. String data type is currently not supported by the driver. Thus, avoid using String data type if possible.

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