Allen-Bradley ControlLogix Ethernet Driver Help

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Help version 1.061

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Overview

The Allen-Bradley ControlLogix Ethernet Driver provides an easy and reliable way to connect Allen-Bradley ControlLogix Ethernet controllers to OPC client applications, including HMI, SCADA, Historian, MES, ERP and countless custom applications.

Supported Allen-Bradley Controllers

ControlLogix 5500 Series
Communications with ControlLogix can be accomplished through an EtherNet/IP communication module for Ethernet communications or through a 1761-NET-ENI module for Ethernet-to-serial communications using the controller's serial port.

CompactLogix 5300 Series
Ethernet communications with CompactLogix requires a processor with a built-in EtherNet/IP port such as the 1769-L35E. Communications with CompactLogix otherwise requires a 1761-NET-ENI module for Ethernet-to-serial communications using the controller's serial port.

FlexLogix 5400 Series
Communications with FlexLogix can be accomplished through a 1788-ENBT daughtercard for Ethernet communications or through a 1761-NET-ENI module for Ethernet-to-serial communications using the controller's serial port.

SoftLogix5800

The Allen-Bradley ControlLogix Ethernet Device Driver also supports the Allen-Bradley SoftLogix5800 Series Controller up to firmware version 12 and requires an Ethernet card in the SoftLogix PC.

DataHighwayPlus Gateway

The driver supports the PLC-5 Series and SLC 500 Series with a Data Highway Plus interface. This is accomplished through a DH+ gateway and requires one of the aforementioned PLCs, an EtherNet/IP communication module and a 1756-DHRIO-interface module (both residing in the ControlLogix rack).

ControlNet Gateway

The driver also supports the PLC-5C Series. This is accomplished through a ControlNet gateway and requires the aforementioned PLC, an EtherNet/IP communication module and a 1756-CNB/CNBR interface module (both residing in the ControlLogix rack).

1761-NET-ENI

The Allen-Bradley ControlLogix Ethernet Device Driver supports communications with the 1761-NET-ENI device. The ENI device adds extra flexibility in device networking and communications by providing an Ethernet-to-serial interface for both Full Duplex DF1 controllers and Logix controllers. In conjunction with the ENI device, this driver supports the following:

- ControlLogix 5500 Series*
- CompactLogix 5300 Series*
- FlexLogix 5400 Series*
- Micrologix Series
- SLC 500 Fixed I/O Processor
- SLC 500 Modular I/O Series
- PLC-5 Series

*These models require 1761-NET-ENI Series B.

MicroLogix 1100

The Allen-Bradley ControlLogix Ethernet Device Driver supports communications with the MicroLogix 1100 (CH1 Ethernet) using EtherNet/IP.

See Also: Device Setup

Quick Links

Model	Quick Link
ControlLogix 5550	ControlLogix 5500 Ethernet Quick Links
ControlLogix 5500 for ENI	1761-NET-ENI (Logix) Quick Links
CompactLogix 5300	CompactLogix 5300 Ethernet Quick Links
CompactLogix 5300 for ENI	1761-NET-ENI (Logix) Quick Links
FlexLogix 5400	FlexLogix 5400 Ethernet Quick Links
FlexLogix 5400 for ENI	1761-NET-ENI (Logix) Quick Links
SoftLogix 5800	SoftLogix 5800 Quick Links
SLC 500 Modular I/O for DH+	DH+ Gateway Quick Links
SLC 500 Modular I/O for ENI	1761-NET-ENI (DF1) Quick Links
SLC 500 Fixed I/O for ENI	1761-NET-ENI (DF1) Quick Links
PLC-5 Series for DH+	DH+ Gateway Quick Links
PLC-5C Series for ControlNet	ControlNet Gateway Quick Links
PLC-5C Series for ENI	1761-NET-ENI (DF1) Quick Links
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    - Logix Communications Parameters
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- Logix Options
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Device Setup

Supported Devices

Device	Communications
ControlLogix 5550 / 5553 / 5555 / 5561 / 5562 / 5563 / 5564 / 5565 / 5571 / 5572 / 5573 / 5574 / 5575 processors	Via 1756-ENBT / ENET / EN2F / EN2T / EN2TR / EN3TR / EWEB / EN2TXT Ethernet module Via 1761-NET-ENI Series B using Channel 0 (Serial)
CompactLogix 5320 / 5330 / 5331 / 5332C / 5332E / 5335CR / 5335E / 5343 / 5345 processors	Built-in EtherNet/IP port on processors with E suffix* Via 1761-NET-ENI Series B using Channel 0 (Serial)
FlexLogix 5433 / 5434 processors	Via 1788-ENBT Ethernet Daughtercard Via 1761-NET-ENI Series B using Channel 0 (Serial)
SoftLogix 5810 / 5830 / 5860 processors	Via SoftLogix EtherNet/IP Messaging module.
MicroLogix 1000 / 1200 / 1500	Via 1761-NET-ENI
MicroLogix 1100 / 1400	Via MicroLogix 1100 / 1400 Channel 1 (Ethernet) or 1761-NET-ENI
SLC 500 Fixed I/O Processor	Via 1761-NET-ENI
SLC 500 Modular I/O Processors (SLC 5/01, SLC 5/02, SLC 5/03, SLC 5/04, SLC 5/05)	Via DH+ Gateway** or 1761-NET-ENI
PLC-5 series (excluding the PLC5/250 series)	Via DH+ Gateway or 1761-NET-ENI
PLC-5/20C, PLC-5/40C, PLC-5/80C	Via ControlNet Gateway or 1761-NET-ENI

*For example, 1769-L35E.
**This driver supports any SLC 500 series PLC that supports DH+ or can be interfaced to a DH+ network (such as the KF2 interface module).

Firmware Versions

ControlLogix 5550 (1756-L1): ver.11.35 - ver.13.34
ControlLogix 5553 (1756-L53): ver.11.28
ControlLogix 5555 (1756-L55): ver.11.32 - ver.16.04
ControlLogix 5561 (1756-L61): ver.12.31 - ver.19.11
ControlLogix 5562 (1756-L62): ver.12.31 - ver.19.11
ControlLogix 5563 (1756-L63): ver.11.26 - ver.19.11
ControlLogix 5564 (1756-L64): ver.16.03 - ver.19.11
ControlLogix 5565 (1756-L65): ver.16.03 - ver.19.11
ControlLogix 5572 (1756-L72): ver.19.11
ControlLogix 5573 (1756-L73): ver.18.12 - ver.19.11
ControlLogix 5574 (1756-L74): ver.19.11
ControlLogix 5575 (1756-L75): ver.18.12 - ver.19.11

CompactLogix 5320 (1769-L20): ver.11.27 - ver.13.18
CompactLogix 5330 (1769-L30): ver.11.27 - ver.13.18
CompactLogix 5331 (1769-L31): ver.16.22 - ver.19.11
CompactLogix 5332C (1769-L32C): ver.16.22 - ver.19.11
CompactLogix 5332E (1769-L32E): ver.16.22 - ver.19.11
CompactLogix 5335CR (1769-L35CR): ver.16.22 - ver.19.11
CompactLogix 5335E (1769-L35E): ver.16.22 - ver.19.11

FlexLogix 5433 (1794-L33): ver.11.25 - ver.13.33
FlexLogix 5434 (1794-L34): ver.11.25 - ver.16.02
SoftLogix 5800: ver.11.11 - ver.19.00
1761-NET-ENI Series B or higher required for ControlLogix, CompactLogix and FlexLogix serial communications
MicroLogix 1100 (1763-L16AWA/BWA/BBB): ver.1.1

Communication Protocol

The Communications Protocol is EtherNet/IP (CIP over Ethernet) using TCP/IP.

Logix and Gateway Models
- Connected Messaging
- Symbolic Addressing Reads
- Physical Addressing Reads
- Symbolic Writes
- Logical Writes

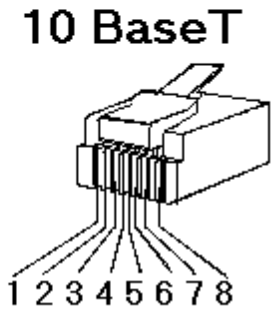
ENI Models
- Unconnected Messaging

Select from the list below for information on setting up a specific type of project.

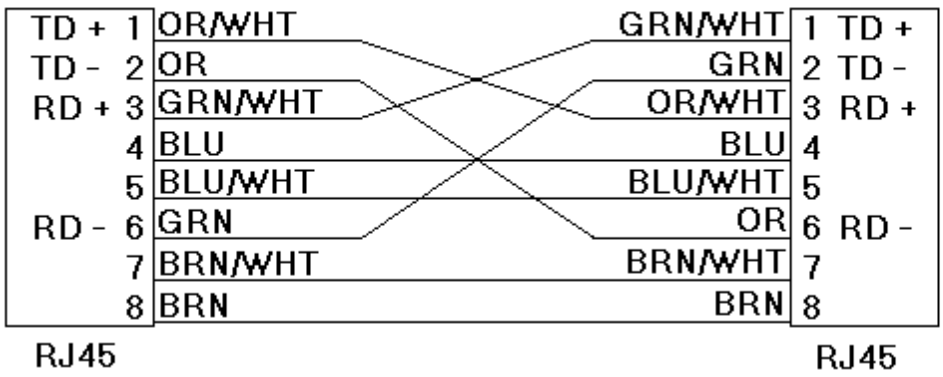
[Logix Setup](#)
[DH+ Gateway Setup](#)
[ControlNet Gateway Setup](#)
[1761-NET-ENI Setup](#)
[MicroLogix 1100 Setup](#)
[Communications Routing Setup](#)
[SLC 500 Slot Configuration](#)

Cable Diagrams

Patch Cable (Straight Through)



Crossover Cable



Terminology

Term	Definition
Protocol Mode	The means by which controller tag addresses are specified in data access communication packets.
Default Type	Due to the symbolic nature of Logix Tag-Based Addressing, tags can be of any data type. This is in contrast to DF1 where file access (for example, N7:0) is always a given set of data types (Word, Short). Because of this flexibility, there needs to be a data type that tags default to when no data type is explicitly set. This is the case when a tag is created in a client and assigned the data type "Native" or created in the server and assigned the data type "Default". In these cases, the tag in question will be assigned the data type set as the Default Type. There are also cases in Automatic Tag Database Generation where the Default Type is used to set a server tag's data type.
Gateway	Utilizing an EtherNet/IP communication module to obtain access to a DH+ or ControlNet network from the same backplane. Rack must contain an EtherNet/IP communication module and a DHRIO or CNB module.

Link Address	Unique Identifier for an interface module (for example, Node ID, IP address, and so forth)
Packet	Stream of data bytes on the wire representing the request(s) being made. Packets are limited in size.
Physical Mode	A Protocol Mode in which controller tag addresses are represented by their actual memory location in the controller. This provides a performance increase over Symbolic Mode but requires a project upload to gather these memory locations. Non-Blocking: Each client/server tag is requested individually using its corresponding controller tag's physical memory address. Similar to Symbolic in nature but much faster in performance. Blocking: Each controller tag is requested as a single block of data. Each client/server tag is updated via cache storage of this data in the server. Much faster performance over Symbolic Mode.
Port ID	Specifies a way out of the interface module in question (for example, channel).
Project Upload	Initialization sequence required for Physical addressing modes. All tags, programs and data types are uploaded from the controller in the process.
Routing	Utilizing one or more Logix racks to hop to another Logix rack.
Symbolic Mode	A Protocol Mode in which controller tag addresses are specified by their ASCII character equivalent. Each client/server tag is requested individually. This provides immediate access to controller data without a project upload but is overall slower in performance when compared to any of the Physical Modes.
Tag Division	Special assignment of tags to devices whose Protocol Mode is set for Physical Blocking or Physical Non-Blocking mode. Assignment is based on rules that maximize the performance of access to these tags. Tag Division rules are outlined in **Performance Statistics and Tuning** and **Optimizing Your Communications**.

Logix Setup

Click on the following links for specific information to aid in setting up the ControlLogix driver.

ControlLogix 5500 Ethernet Device ID
IP Address to EtherNet/IP Communication Module

CompactLogix 5300 Ethernet Device ID
IP Address to EtherNet/IP Port

FlexLogix 5400 Ethernet Device ID
IP Address to ENBT Module

SoftLogix 5800 Device ID
IP Address to SoftLogix EtherNet/IP Module

Logix Communications Parameters
1. Port Number
2. Inactivity Watchdog
3. Array Block Size

Logix Database Settings
1. Database Options
2. Database Filtering

Logix Options
1. Project Options
   a. Default Type
   b. Enable Performance Statistics
2. Protocol Options
   a. Protocol Mode
   b. Automatically Read String Length

Attention ENI ControlLogix/CompactLogix/FlexLogix Users: For information on Device ID setup, refer to **1761-NET-ENI Setup**.

ControlLogix 5500 Ethernet Device ID

The Device ID is used to specify the device IP address, as well as the slot number in which the controller CPU resides. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>

Designator	Description	Formats	Valid Values
IP Address	EtherNet/IP Address	Decimal	0-255
Port ID	Specifies a way out of the EtherNet/IP interface module and must equal 1 (port to the back plane).	Decimal	1
Link Address	Slot Number of the ControlLogix processor	Decimal	0-255

Example
123.123.123.123,1,0

This equates to an EtherNet/IP of 123.123.123.123. The Port ID is 1 and the CPU resides in slot 0.

See Also: **SoftLogix 5800 Connection Notes**.

Advanced Users
For information on supplementing a Device ID with a routing path to a remote ControlLogix back plane, refer to **Communications Routing**.

Attention ENI ControlLogix Users:
Refer to **ENI Device ID** for Device ID setup.

CompactLogix 5300 Ethernet Device ID

The Device ID is used to specify the device IP address, as well as the slot number in which the controller CPU resides. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>

Designator	Description	Formats	Valid Values
IP Address	CompactLogix Ethernet Port IP Address	Decimal	0-255
Port ID	Specifies a way out of the Ethernet port and must equal 1 (port to the back plane).	Decimal	1
Link Address	Slot Number of the CompactLogix processor	Decimal	0-255

Example
123.123.123.123,1,0

This equates to CompactLogix IP of 123.123.123.123. The Port ID is 1 and the CPU resides in slot 0.

Advanced Users:
For information on supplementing a Device ID with a routing path to a remote ControlLogix back plane, refer to **Communications Routing**.

Attention ENI CompactlLogix Users:
Refer to **ENI Device ID** for Device ID setup.

FlexLogix 5400 Ethernet Device ID

The Device ID is used to specify the device IP address, as well as the slot number in which the controller CPU resides. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>

Designator	Description	Formats	Valid Values
IP Address	1788-ENBT IP Address	Decimal	0-255
Port ID	Specifies a way out of the 1788-ENBT interface module and must equal 1 (port to the back plane).	Decimal	1
Link Address	Slot Number of the FlexLogix processor	Decimal	0-255

Example
123.123.123.123,1,0

This equates to 1788-ENBT IP of 123.123.123.123. The Port ID is 1 and the CPU resides in slot 0.

Advanced Users:

For information on supplementing a Device ID with a routing path to a remote ControlLogix back plane, refer to **Communications Routing**.

Attention ENI FlexLogix Users:
Refer to **ENI Device ID** for Device ID setup.

SoftLogix 5800 Device ID

The Device ID is used to specify the SoftLogix PC IP address, as well as the virtual slot number in which the controller CPU resides. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>

Designator	Description	Formats	Valid Values
IP Address	SoftLogix PC NIC IP Address	Decimal	0-255
Port ID	Specifies a way out of the EtherNet/IP Messaging module and must equal 1 (port to the virtual back plane).	Decimal	1
Link Address	Slot Number of the SoftLogix processor in the virtual backplane	Decimal	0-255

Example

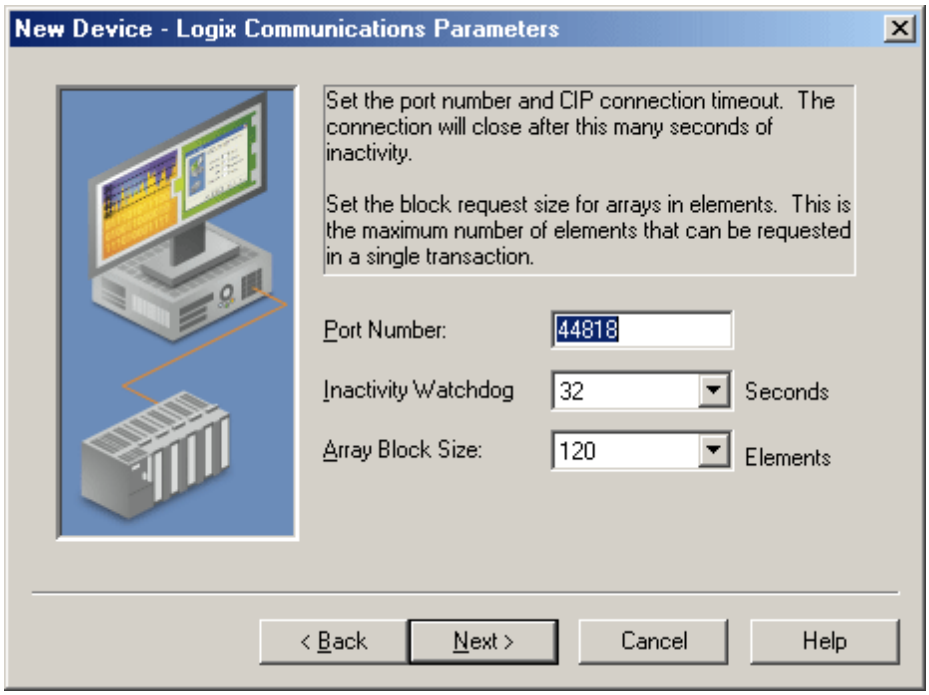
123.123.123.123,1,1

This equates to SoftLogix PC IP Address of 123.123.123.123. The Port ID is 1 and the CPU resides in slot 1.

Advanced Users:

For information on supplementing a Device ID with a routing path to a remote SoftLogix back plane, refer to **Communications Routing**.

Logix Communications Parameters



Descriptions of the parameters are as follows:

- **Port Number:** This parameter specifies the port number that the device is configured to use. The default setting is 44818.
- **Inactivity Watchdog:** This parameter specifies the amount of time a connection can remain idle (without Read/Write transactions) before being closed by the controller. In general, the larger the watchdog value, the more time it will take for connection resources to be released by the controller and vice versa.

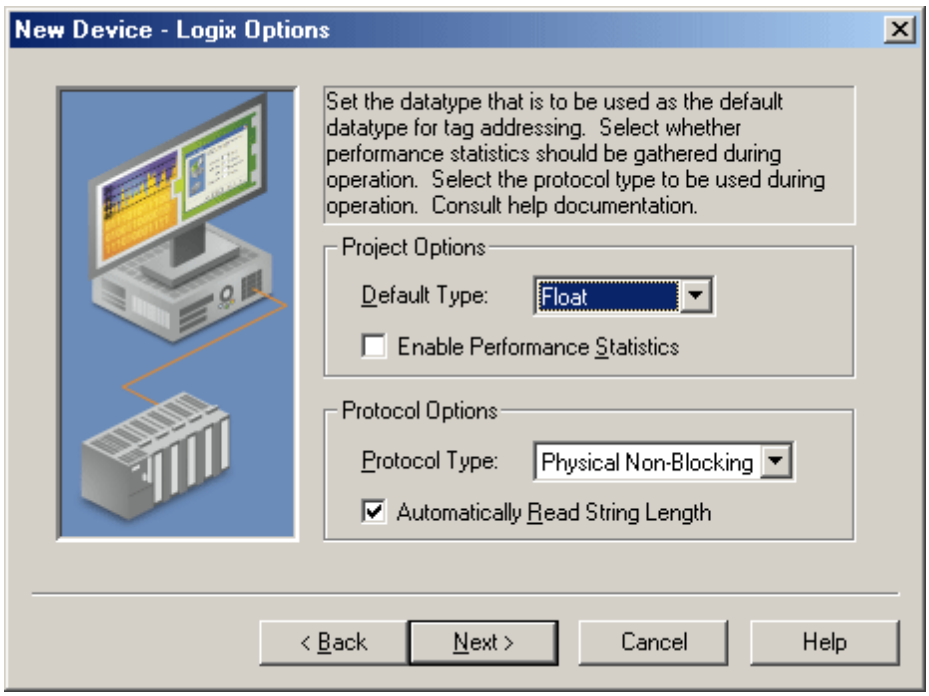
The default setting is 32 seconds.

Note: If the Event Log error "CIP Connection timed-out while uploading project information" occurs frequently, increase the Inactivity Watchdog value. Otherwise, an Inactivity Watchdog value of 32 seconds is preferred.

- **Array Block Size:** This parameter specifies the maximum number of array elements to read in a single transaction. The value is adjustable and ranges from 30 to 3840 elements. The default setting is 120 elements.

  Note: For Boolean arrays, a single "element" is considered a 32-element bit array. Thus, setting the block size to 30 elements translates to 960 bit elements, while 3840 elements translate to 122880 bit elements.

Logix Options



Descriptions of the parameters are as follows:

- **Default Type:** This parameter specifies the data type that will be assigned to a client/server tag when the default type is selected during tag addition/modification/import. The default setting is Float. For more information, refer to **Default Data Type Conditions**.

  Note: Since the majority of I/O module tags are not bit-within-Word/DWord tags, it is advised that the Default Type be set to the 'majority' data type as observed in the .ACD project. For example, if 75% of alias I/O module tags are INT tags, set the Default Type to INT.
- **Enable Performance Statistics:** The Allen-Bradley ControlLogix Ethernet Driver has the ability to gather communication statistics that are useful in determining the driver's performance. When checked, this option will be enabled. The driver will then track the number and types of client/server tag updates. On restart of the server application, the results will be displayed in the server's Event Log. The default setting is disabled.

  Note: Once a project configuration is designed for optimal performance, it is recommended that users disable Performance Statistics. Furthermore, since the statistics are outputted to the Event Log on shutdown, the server will need to be re-launched to view the results.
- **Protocol Type:** This parameter specifies how Logix Tag data will be read from the controller. This option should only be changed by advanced users who are looking to increase client/server tag update performance. Options include Symbolic mode, Physical Non-Blocking mode and Physical Blocking mode. The

server project is interchangeable between these three modes. The default setting is Physical Non-Blocking. For more information, refer to **Protocol Types Description**.

- **Automatically Read String Length:** When checked, the driver will automatically read the LEN member of the STRING structure whenever the DATA member is read. The DATA string will be terminated at the first null character encountered, the character whose position equals the value of LEN, or the maximum string length of DATA (whichever occurs first). When unchecked, the driver will bypass the LEN member read and terminate the DATA string at either the first null character encountered or the maximum string length of DATA (whichever occurs first). Therefore, if LEN is reduced by an external source without modification to DATA, the driver will not terminate DATA according to this reduced length. The default setting is checked.

Default Data Type Conditions

Client/Server tags are assigned the default data type when any of the following conditions occur:

1. A Dynamic Tag is created in the client with Native as its assigned data type.
2. A Static Tag is created in the server with Default as its assigned data type.
3. In offline auto tag generation, when an unknown data type is encountered in the L5K/L5X file for the following types of tags:

   a. UDT members

   b. Alias tags

4. In offline auto tag generation, when an alias of the following type is encountered in the L5K/L5X:

   a. Alias of an alias.

   b. Alias of non bit-within-Word/DWord I/O module tag. For example, if tag 'AliasTag' references I/O module tag 'Local:5:C.ProgToFaultEn' @ BOOL, the data type for 'AliasTag' cannot be resolved and thus this Default Type is assigned to it. On the other hand, if 'Alias Tag' references I/O module tag 'Local:5:C.Ch0Config.RangeType.0' @ BOOL, the data type can be resolved because of the . (dot) BIT that defines it as a bit-within-Word/DWord. Aliases of bit-within-Word/DWord I/O module tags are automatically assigned the Boolean data type.

Protocol Types Description

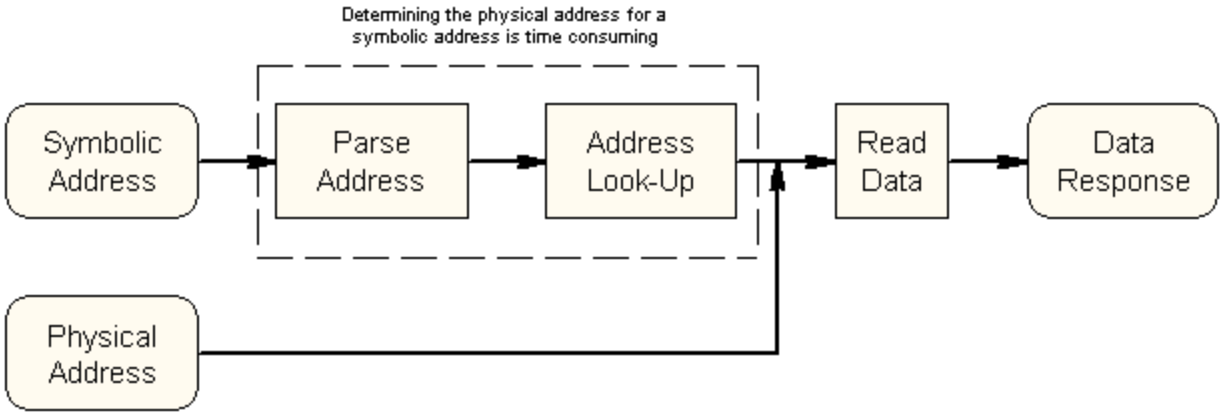
Symbolic Mode

Each Client/Server Tag address is represented in the packet by its ASCII character name. Prior to Allen-Bradley ControlLogix Ethernet Driver Version 4.6.0.xx, the driver was using Symbolic mode. Symbolic mode is convenient in that all the information needed to make a data request lies in the client/server tag's address. To take advantage of the Multi-Request Packet optimization, as many tags should be represented in a single packet as possible. Since tag addresses are represented by their ASCII character name in the packet, this implies tag addresses should be made as short as possible. For example, MyTag is preferred over MyVeryLongTagNameThatContains36Chars.

Category	Description
Pros	1. Low initialization overhead. All information needed lies in client/server tag's address. 2. Only the data being accessed in client/server tags is requested from the PLC. 3. Backward compatibility.
Cons	1. High device turnaround time to process symbolic address. 2. Less requests per Multi Request Packet since each request is of variable size.

Physical Modes

In the physical protocol modes, the physical address in the controller for each client/server Tag (member for structures / element for arrays) is retrieved in a controller project upload sequence performed automatically by the driver. For large projects, this upload sequence can be timely when performed but quickly pays off as transactions are processed much faster than its symbolic mode counterpart. The reason is that the physical modes avoid the timely address parsing and lookups required upon every symbolic request. There are two physical protocol modes, non-blocking and blocking.



Physical Non-Blocking Mode
Non-blocking physical is identical to symbolic in that all client/server tags are requested individually, utilizing the Multi-Request Packet. They differ in that the client/server tags are specified in the packet with their physical address, not their symbolic address. This is considerably faster than symbolic mode as the device turnaround time is diminished.

Category	Description
Pros	1. Low device turnaround time to process physical address. 2. Maximum request per Multi-Request Packet since each request is a fixed size. 3. Only the data being accessed in client/server tags is requested from the PLC.
Cons	Initialization overhead uploading project to determine physical addresses.

Physical Blocking Mode
In Physical Blocking, all data for a Logix tag is retrieved in a single request. It takes only one client/server tag to initiate this request. When the data block is received, it is placed in a cache in the driver and time stamped. Successive client/server tags that belong to the given Logix tag then get their data from this cache. When all tags are updated, a new request is initiated provided that the cache is not old. The cache is old when the current time > cache timestamp + tag scan rate. If this case holds, another block request is made to the device, the cache is refreshed and the cycle repeats.

Blocking is possible because each Logix tag has a base physical address from which to work with. The data for each client/server tag for the given Logix tag is located at a specific offset from the base address. Recall that each Logix tag (member for structures / element for arrays) has a physical address assigned during the initialization upload sequence. The offset for each client/server tag is simply the client/server tag physical address - Logix tag base physical address.

Physical Blocking mode is ideal when most or all members/elements for a given Logix tag are being referenced by a client. Regardless of how many client/server tags are referencing the given Logix tag, the entire contents of the Logix tag is retrieved on every read. Performance may not be optimal if there are not enough client/server tags referencing the given Logix tag. Studies have shown that if 1/3 or less of tags belonging to a Logix tag are being referenced at any given time then Physical Blocking should not be used. This would be a better case for Physical Non-Blocking mode. Otherwise, Physical Blocking is preferred.

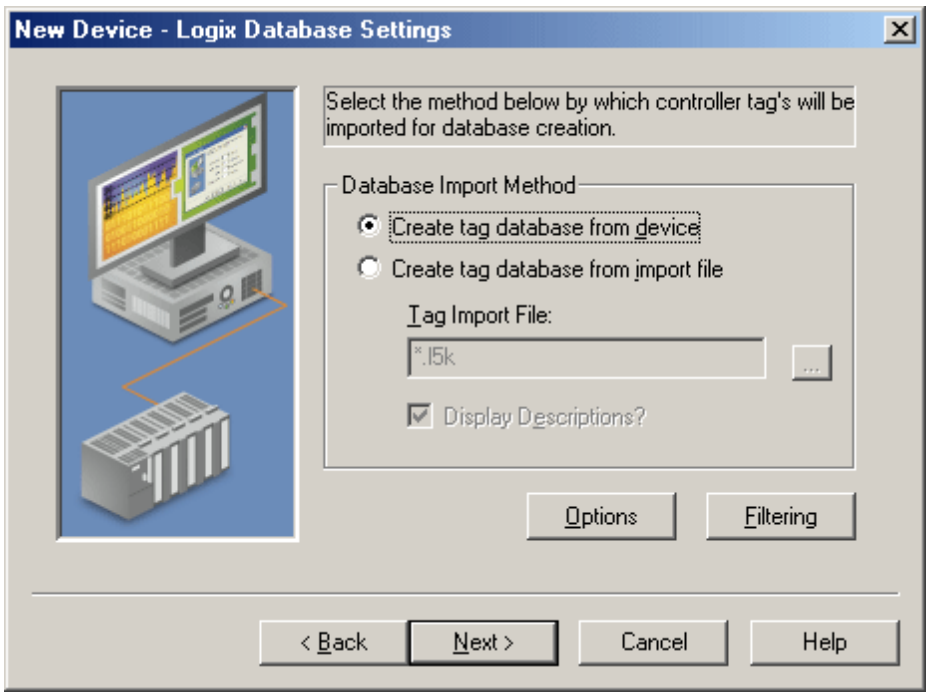
Category	Description
Pros	1. If the majority (1/3 or greater) of Logix tags are referenced, it is faster than Physical Non-Blocking. 2. Low device turnaround time to process physical address. 3. Maximum request per Multi-Request Packet since each request is a fixed size.
Cons	1. Initialization overhead uploading project to determine physical addresses. 2. If the minority (1/3 or less) of Logix tags are referenced, it is slower than Physical Non-Blocking. This is because more data is being accessed

	from the PLC than referenced in client/server tags.

Note: For proper and optimal use of the physical protocol modes, refer to **Optimizing Your Communications**.

See Also: **Performance Statistics and Tuning**

Logix Database Settings



Descriptions of the parameters are as follows:

- **Create Tag Database from Device:** When selected, this feature retrieves tags directly from the controller over the same Ethernet connection that is used for data access. The default setting is selected.
- **Create Tag Database from Import File:** When selected, this feature retrieves the tags directly from an RSLogix L5K/L5X file. The default setting is unselected.
- **Tag Import File:** This parameter specifies the exact location of the L5K/L5X import file from which tags will be imported. This file will be used when Automatic Tag Database Generation is instructed to create the tag database. All tags, including global and program, will be imported and expanded according to their respective data types.
- **Display Descriptions:** When checked, this option imports tag descriptions. Descriptions will be imported for non-structure, non-array tags only. If necessary, a description will be given to tags with long names stating the original tag name.

Database Import Method Pros and Cons

Create Tag Database from Device

Category	Description
Pros	1. Fast. 2. Comprehensive. All tags are imported (including I/O tags).
Cons*	1. Access to the controller is necessary. 2. Descriptions are not imported.

*Add-On Instruction In/Out parameters are not automatically generated, whether creating the tag database from the controller or from an import file.

Create Tag Database from Import File

Category	Description
Pros	1. Access to the controller is not necessary.

	2. Contains the ability to work offline. 3. Descriptions are imported.
Cons*	1. Slow. 2. I/O tags are not imported.

*Add-On Instruction In/Out parameters are not automatically generated, whether creating the tag database from the controller or from an import file.

Logix Database Options

Descriptions of the parameters are as follows:

- **Limit Tag/Group Names to 31 Characters?:** When checked, this parameter limits the tag and group names to 31 characters. Before OPC server version 4.70, tag and group name lengths were restricted to 31 characters; however, the current length restriction of 256 characters can fit Logix 40 character native tag names. The default setting is unchecked.

  Note: If an older OPC server version was used to import tags via L5K/L5X import, inspect the Event Log or scan the server project to see if any tags were cut due to the character limit. If so, it is recommended that this option be enabled in order to preserve the server tag names. OPC client tag references will not be affected. If not chosen, new longer tag names will be created for those that were clipped. OPC clients referencing the clipped tag would have to be changed in order to reference the new tag.

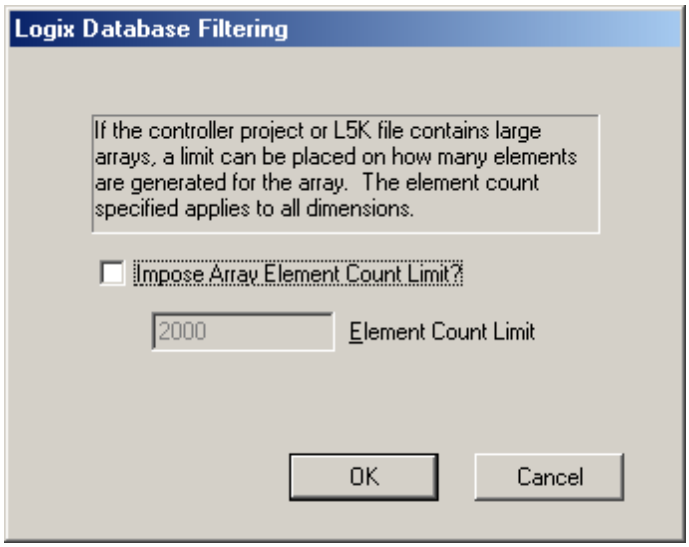
  If an older OPC server version was used to import tags via L5K/L5X import and no tags were clipped due to the 31-character limit, do not select this option. Similarly, if tags were imported via L5K/L5X with OPC server version 4.70 or above, do not select this option.
- **Tag Hierarchy:** This parameter specifies the tag hierarchy. Options include Condensed and Expanded. The default setting is Expanded. Descriptions of the options are as follows:

  - **Condensed Mode:** In this mode, the server tags created by automatic tag generation follow a group/tag hierarchy consistent with the tag's address. Groups are created for every segment preceding the "." (period). Groups created include "Program Scope" and "Structures and Substructures".
  - **Expanded Mode:** In this mode, the server tags created by automatic tag generation follow a group/tag hierarchy consistent with the tag hierarchy in RSLogix 5000. This is the default setting. Groups are created for every segment preceding the "." (period) as in Condensed mode, but groups are also created to represent logical groupings. Groups created include the following: "Global (controller) Scope," "Program Scope, "Structures and Substructures," and "Arrays".

  Note: To enable this functionality, check **Allow Automatically Generated Subgroups** in Device Properties.

See Also: Tag Hierarchy and Controller-to-Server Name Conversions

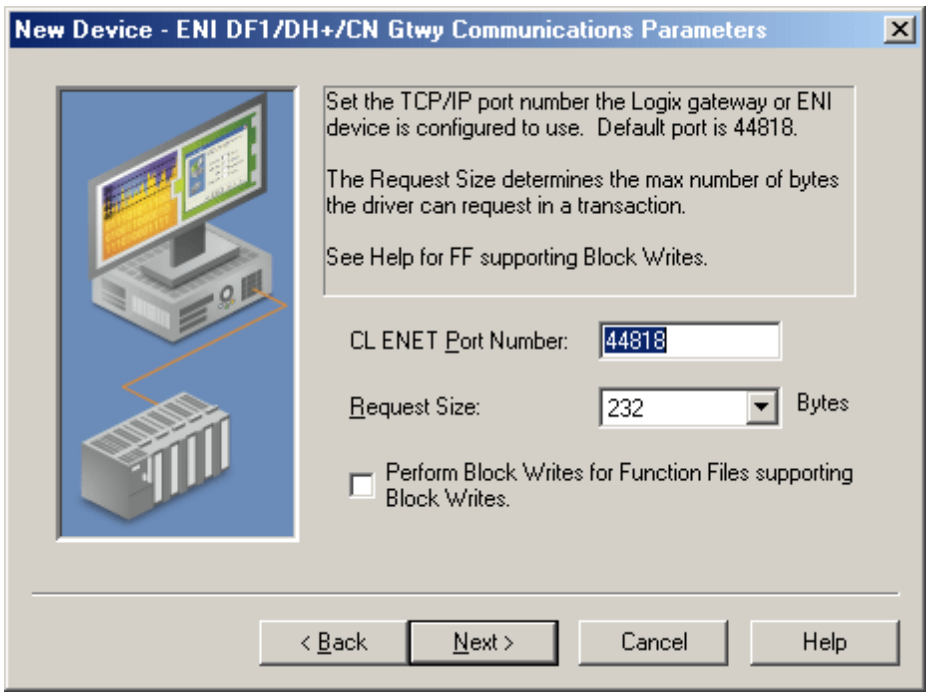
Logix Database Filtering



Descriptions of the parameters are as follows:

- **Impose Array Element Count Limit:** When checked, an array element count limit will be imposed. Tags in the controller can be declared with very large array dimensions. By default, arrays are completely expanded during the tag generation process, thus becoming time consuming for large arrays. By imposing a limit, only a specified number of elements from each dimension will be generated. Limits only takes effect when the array dimension size is exceeds the limit. To enable this setting, check the box. The default setting is unchecked.
- **Element Count Limit:** This parameter is used to specify the limit. The default setting is 2000.

ENI DF1/DH+/ControlNet Gateway Communications Parameters



Descriptions of the parameters are as follows:

- **CL ENET Port Number:** This parameter specifies the port number that the remote device is configured to use (such as 1756-ENBT). The default setting is 44818.
- **Request Size:** This parameter specifies the number of bytes that may be requested from a device at one time. To refine this driver's performance, the request size may be configured to one of the following settings: 32, 64, 128, 232. The default setting is 232 bytes.
- **Perform Block Writes for Function Files Supporting Block Writes:** Function files are structure-based files (much like PD and MG data files) and are unique to the MicroLogix 1100, 1200 and 1500. Function files supported in the Allen-Bradley ControlLogix Ethernet Device Driver are the High Speed Counter (HSC), Real-Time Clock (RTC), Channel 0 Communication Status File (CS0), Channel 1 Communication Status File (CS1), and I/O Module Status File (IOS). For more information, refer to "Block Writes" below.

  For applicable function files, data can be written to the device in a single operation. By default, when data is written to a function file sub element (field within the function file structure), a write operation occurs immediately for that tag. For such files as the RTC file, whose sub elements include hour (HR), minute (MIN) and second (SEC), individual writes are not always acceptable. With such sub elements relying solely on time, values must be written in one operation to avoid time elapsing between sub elements writes. For this reason, there is the option to "block write" these sub elements. The default setting is unchecked.

Block Writes

Block writing involves writing to the device the values of every Read/Write sub element in the function file in a single write operation. It is not necessary to write to every sub element prior to performing a block write. Sub elements not affected (written to) will have their current value written back to them. For example, if the current (last read) date and time is 1/1/2001, 12:00.00, DOW = 3 and the hour is changed to 1 o'clock, then the values written to the device would be 1/1/2001, 1:00.00, DOW = 3. For more information, refer to the instructions below.

1. To start, locate the **Function File Options** tab in **Device Properties**. Then, select the **Perform Block Writes for Function Files Supporting Block Writes** checkbox to notify the driver to utilize block writes on function files supporting block writes.

   Note: The changes will be effective immediately after clicking **OK** or **Apply**.

2. Next, write the desired value to the sub element tag in question. The sub element tag will immediately take on the value written to it.

   Note: After a sub element is written to at least once in block write mode, the tag's value does not originate from the controller, but instead from the driver's write cache. After the block write is done, all sub element tag values will originate from the controller.

3. Once the entire desired sub elements are written to, perform the block write that will send these values to the controller. To instantiate a block write, reference tag address *RTC:<element>._SET*. Setting this tag's value to 'true' will cause a block write to occur based on the current (last read) sub elements and the sub elements affected (written to). Immediately after setting the tag to 'true', it will be automatically reset to "false." This is the default state and performs no action.

Applicable Function Files/Sub Elements

RTC	
Year	YR
Month	MON
Day	DAY
Day of Week	DOW
Hour	HR
Minute	MIN
Second	SEC

See Also: Function File Listing

DataHighwayPlus (TM) Gateway Setup

The DH+ Gateway provides a means of communicating with SLC 500 and PLC-5 series PLC on DH+ with the Allen-Bradley ControlLogix Ethernet driver.

Requirements

Ethernet/IP Interface module.
1756-DHRIO Interface Module with appropriate channel configured for DH+.
SLC500 or PLC-5 series PLC on DH+ Network.

Note: For more information about setting up a DH+ Gateway, refer to **DH+ Gateway Device ID**.

This also includes specification of the EtherNet/IP communication module address, the slot number of the 1756-DHRIO module, the DH+ Channel to use and the destination DH+ Node ID.

ENI DF1/DH+/ControlNet Gateway Communications Parameters
1. Ethernet/IP Port Number.
2. Block Request Size.

Note: DH+ Gateway models do not support automatic tag database generation.

DH+ Gateway Device ID

DH+ Gateway

The Device ID is used to specify the device IP address as well as the DH+ parameters necessary for making a connection. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>.<DH+ Channel>.<DH+ Node Address>

Designator	Description	Formats	Valid Values
IP Address	EtherNet/IP Address.	Decimal	0-255
Port ID	Specifies a way out of the EtherNet/IP interface module and must equal 1 (port to the back plane).	Decimal	1
Link Address	Slot Number of the 1756-DHRIO interface module.	Decimal	0-255
DH+ Channel	DH+ Channel to use.	Alpha	A and B
DH+ Node	DH+ Node ID of target PLC in Decimal Format.*	Decimal	0-99

*For more information, refer to Node ID Octal Addressing below.

Example

123.123.123.123,1,2.A.3

This equates to an EtherNet/IP of 123.123.123.123. The DH+ card resides in slot 2: use DH+ Channel A and addressing target DH+ Node ID 3 (dec).

Node ID Octal Addressing

The DH+ Node ID is specified in Octal format in the PLC and requires a conversion to Decimal format for use in the DH+ Gateway Device ID. The Node ID can be located in RSWho within RSLinx. It is displayed in Octal format.

Example

DH+ Node 10 (octal) in RSWho = DH+ Node 8 (decimal) in DH+ Gateway Device ID.

It is important to verify communications with the proper controller. In the example above, if 10 was entered as the DH+ Node ID in the DH+ Gateway Device ID, then communications would take place with Node 12 (octal equivalent of 10 decimal) and not Node 10 (octal). If Node 12 (octal) does not exist, then the DHRIO module would return DF1 STS 0x02. This means that the link layer could not guarantee delivery of the packet. In short, the DH+ Node could not be located on the DH+ network.

Advanced Users:

For information on supplementing a Device ID with a routing path to a remote DH+ node, refer to **Communications Routing**.

ControlNet (TM) Gateway Setup

The ControlNet Gateway provides a means of communicating with PLC-5C series PLCs on ControlNet with the Allen-Bradley ControlLogix Ethernet driver.

Requirements

Ethernet/IP Interface Module
1756-CNB or 1756-CNBR Interface Module
PLC-5C series PLC on ControlNet Network

ControlNet Gateway Device ID
This includes specification of the EtherNet/IP communication module address, the slot number of the 1756-CNB module, the ControlNet Channel to use and the destination ControlNet Node ID.

ENI DF1/DH+/ControlNet Gateway Communications Parameters
1. Ethernet/IP Port Number.
2. Block Request Size.

Note: ControlNet Gateway models do not support automatic tag database generation.

ControlNet Gateway Device ID

ControlNet Gateway

The Device ID is used to specify the device IP address as well as the ControlNet parameters necessary for making a connection. Device IDs are specified as the following:

<IP Address>, <Port ID>, <Link Address>.<ControlNet Channel>.<ControlNet Node Address>

Designator	Description	Formats	Valid Values
IP Address	EtherNet/IP Address.	Decimal	0-255
Port ID	Specifies a way out of the EtherNet/IP communication module and must equal 1 (port to the back plane).	Decimal	1
Link Address	Slot Number of the 1756-CNB/CNBR interface module.	Decimal	0-255
ControlNet Channel	ControlNet Channel to use.	Alpha	A and B
ControlNet Node	ControlNet Node ID of target PLC in Decimal Format.*	Decimal	0-99

*For more information, refer to Node ID Octal Addressing below.

Example

123.123.123.123,1,2.A.3

This equates to an EtherNet/IP of 123.123.123.123. The ControlNet card resides in slot 2: use ControlNet Channel A and addressing target ControlNet Node ID 3.

Node ID Octal Addressing

The ControlNet Node ID is specified in Octal format in the PLC and requires a conversion to Decimal format for use in the ControlNet Gateway Device ID. The Node ID can be located in RSWho within RSLinx. It is displayed in Octal format.

Example

CN Node 10 (octal) in RSWho = CN Node 8 (decimal) in ControlNet Gateway Device ID.

It is important to verify communications with the proper controller. In the example above, if 10 was entered as the ControlNet Node ID in the ControlNet Gateway Device ID, communications will take place with Node 12 (octal equivalent of 10 decimal), not Node 10 (octal). If Node 12 (octal) does not exist, then the CNB module will return DF1 STS 0x02. This means that the link layer could not guarantee delivery of the packet. In short, the ControlNet Node could not be located on the ControlNet network.

Advanced Users:

For more information on supplementing a Device ID with a routing path to remote ControlNet node, refer to **Communications Routing**.

1761-NET-ENI Setup

The 1761-NET-ENI provides a means of communicating with ControlLogix, CompactLogix, FlexLogix, MicroLogix, SLC 500 and PLC-5 Series PLCs on Ethernet with the Allen-Bradley ControlLogix Ethernet driver.

Requirements

MicroLogix, SLC 500, or PLC-5 series PLC supporting Full Duplex DF1 utilizing the CH0 RS232 Channel.
1761-NET-ENI Device Series A or B

ControlLogix, CompactLogix or FlexLogix PLC utilizing the CH0 RS232 Channel.
1761-NET-ENI Device Series B Only

ENI Device ID
This is the specification of the 1761-NET-ENI IP address.

ENI DF1/DH+/ControlNet Gateway Communications Parameters
1. Ethernet/IP Port Number.
2. Block Request Size.
3. Function File Block Writes.

ENI Logix Communications Parameters
1. Port Number.
2. Inactivity Watchdog.
3. Array Block Size.

Attention ENI ControlLogix / CompactLogix / FlexLogix Users
Refer to **Logix Setup** for communications parameters, database settings and project/protocol options.

Note: These settings are for the driver. In addition to the driver settings, the following setting must be made to ENI modules connecting to ControlLogix / CompactLogix / FlexLogix devices:

Important: Use the ENI / ENIW utility supplied by Allen-Bradley to turn on the **CompactLogix Routing** option (on the **ENI IP Addr** tab of the utility). This was tested on an ENI module with firmware revision 2.31.

Note: Only ENI ControlLogix, CompactLogix and FlexLogix models support automatic tag database generation.

ENI Device ID

1761-NET-ENI

The Device ID is used to specify the IP address of the 1761-NET-ENI. Device IDs are specified as the following:

<IP Address>

Designator	Description	Formats	Valid Values
IP Address	1761-NET-ENI IP Address	Decimal	0-255

Example
123.123.123.123

This equates to an ENI IP of 123.123.123.123. Since the device supports only Full Duplex DF1, no Node ID is required.

ENI Logix Communications Parameters

Port Number

This parameter specifies the port number that the device is configured to use. The default port number is 44818.

Inactivity Watchdog

The Inactivity Watchdog timer specifies the amount of time a connection can remain idle (without any Read/Write transactions) before being closed by the controller. In general, the larger the watchdog value, the more time it will take for connection resources to be released by the controller and vice versa.

If the Event Log error "CIP Connection timed-out while uploading project information" occurs frequently, increase the Inactivity Watchdog value. Otherwise, an Inactivity Watchdog value of 32 seconds is preferred.

Array Block Size

This parameter specifies the maximum number of array elements to read in a single transaction. This value is adjustable and ranges from 30 to 3840 elements. For Boolean arrays, a single "element" is considered a 32-element bit array. Setting the block size to 30 elements translates to 960 bit elements, while 3840 elements translate to 122880 bit elements.

MicroLogix 1100 Setup

Use the following links for information on setting up the ControlLogix driver.

MicroLogix 1100 Device ID
This discusses the specification of the MicroLogix 1100 IP address.

MicroLogix 1100 Communications Parameters
1. Ethernet/IP Port Number.
2. Block Request Size.

3. Function File Block Writes.

MicroLogix 1100 Device ID

MicroLogix 1100

The Device ID is used to specify the IP address of the MicroLogix 1100. Device IDs are specified as the following:

<IP Address>

Designator	Description	Formats	Valid Values
IP Address	MicroLogix 1100 IP Address	Decimal	0-255

Example

123.123.123.123

This equates to an IP of 123.123.123.123.

MicroLogix 1100 Communications Parameters

Port Number

This parameter specifies the port number that the remote device is configured to use (such as 1756-ENBT). The default port number is 44818.

Block Request Size

Request size refers to the number of bytes that may be requested from a device at one time. To refine this driver's performance, the request size may be configured to one of the following settings: 32, 64, 128, 232. The default value is 232 bytes.

Perform Block Writes for Function Files Supporting Block Writes?

Function files are structure-based files (much like PD and MG data files) and are unique to the MicroLogix 1100, 1200 and 1500. Function files supported in the Allen-Bradley ControlLogix Ethernet Device Driver are the High Speed Counter (HSC), Real-Time Clock (RTC), Channel 0 Communication Status File (CS0), Channel 1 Communication Status File (CS1), and I/O Module Status File (IOS).

For applicable function files, data can be written to the device in a single operation. By default, when data is written to a function file sub element (field within the function file structure), a write operation occurs immediately for that tag. For such files as the RTC file, whose sub elements include hour (HR), minute (MIN) and second (SEC), individual writes are not always acceptable. With such sub elements relying solely on time, values must be written in one operation to avoid time elapsing between sub elements writes. For this reason, there is the option to "block write" these sub elements.

See Also: Function File Listing

Applicable Function Files/Sub Elements

RTC	
Year	YR
Month	MON
Day	DAY
Day of Week	DOW
Hour	HR
Minute	MIN
Second	SEC

How Block Writes Work

Block writing involves writing to the device the values of every Read/Write sub element in the function file in a single write operation. It is not necessary to write to every sub element prior to performing a block write. Sub elements not affected (written to) will have their current value written back to them. For example, if the current (last read) date and time is 1/1/2001, 12:00.00, DOW = 3 and the hour is changed to 1 o'clock, then the values written to the device would be 1/1/2001, 1:00.00, DOW = 3.

Instructions:

1. Go to the **Function File Options** tab in Device Properties. Check the **Perform Block Writes for Function Files Supporting Block Writes?** checkbox to notify the driver to utilize block writes on function files supporting block writes. The changes will be effective immediately after clicking **OK** or **Apply**.
2. Write the desired value to the sub element tag(s) in question. The sub element tag(s) will immediately take on the value(s) written to it.

   Note: After a sub element is written to at least once in block write mode, the tag's value does not originate from the controller, but instead from the driver's write cache. After the block write is done, all sub element tag values will originate from the controller.
3. Once the entire desired sub elements are written to, its time to perform the block write that will send these values to the controller. To instantiate a block write, reference tag address *RTC:<element>._SET*. Setting this tag's value to 'true' will cause a block write to occur based on the current (last read) sub elements and the sub elements affected (written to). The _SET tag is treated as a Write Only tag; meaning, a write to this tag is not reflected in subsequent reads on it. Setting this tag's value to 'false' performs no action.

Communications Routing

Routing provides a means of communicating with a remote device over various networks. It can be thought of as a bridge between the local device and a remote device even if they are on two different field bus networks. Access to a remote (destination) back plane allows for direct communication with the following modules located on this back plane.

Important: ENI ControlLogix/CompactLogix/FlexLogix and MicroLogix 1100 users will find that routing is not supported for ENI and MicroLogix 1100 models.

Remote Modules Accessible Via Routing

1. ControlLogix 5500 processor for ControlLogix applications.
2. SoftLogix 5800 processor for SoftLogix applications.
3. 1756-DHRIO interface module for DH+ Gateway applications.
4. 1756-CNB or 1756-CNBR interface module for ControlNet Gateway applications.

A routing path is a series of back plane hops, with the last hop pointing to the destination back plane. Each hop requires a Logix back plane (not a Logix processor). An individual hop can utilize one of the following networks as its medium.

Supported Networks

Supported networks include the following:

- ControlNet
- DH+
- TCP/IP (EtherNet/IP)

Application Notes

1. Messages cannot be routed in or out of the same interface module channel more than once within the path. Doing so will result in CIP Error 0x01 Ext. Error 0x100B.

2. For multiple channel interface modules, messages cannot be routed into and then immediately out of that same module (using different channels), regardless if the message is either directed to the back plane first or avoids the back plane all together. As previously mentioned, the latter is not supported since each hop requires a ControlLogix back plane. An example would be to route a DH+ message from one DH+ link (such as Channel A of 1756-DHRIO) to another DH+ link (such as Channel B of same 1756-DHRIO) through one 1756-DHRIO-interface module. This is commonly referred to as Remote DH+ messaging and is not supported.

For more information on setting up Communications Routing, refer to the following:

Connection Path Specification
Routing Examples
Port Reference

Connection Path Specification

The routing path is specified in the Device ID. As with non-routing applications, communication originates from the Allen-Bradley ControlLogix Ethernet driver on the PC and is directed at the local Ethernet module. Once at this local Ethernet module, the Device ID specifies a way out of the module and onto the back plane, just like with non-routing applications. The routing path will then direct the message to the desired Logix back plane. The Device ID also determines what device will be communicated with (ControlLogix processor, SoftLogix processor, DH+ node, ControlNet node).

The routing path specification begins and ends with the left and right bracket respectively ([ ]). The path itself is a series of port/link address pairs, identical to the Communication Path syntax in RSLogix 5000 Message Configuration dialog. A port describes a way out of a device via a network or back plane. A link address is a destination address and is commonly referred to as a Node ID or next hop.

Designator	Description	Formats	Valid Values
Port ID	Specifies a way out of the interface module in question.*	Decimal	0-65535
Link Address	If the corresponding port is the back plane, then the link address is the slot number of the interface module which will go out. If the corresponding port is an interface module port, then the link address specifies a destination node as follows. - DH+/ControlNet: Node ID - EtherNet/IP communication module: IP address - SoftLogix EtherNet/IP module: IP address	Decimal	0-255

*For more information, refer to **Ports**.

Single Hop
IP Address, Port ID0, [Link Address0, Port ID1, Link Address1, Port ID2], Link Address2

Multi-Hop (N Hops)
IP Address, Port ID0, [Link Address0, Port ID1, Link Address1, Port ID2, Link Address2, ... Port ID(N+1), Link Address(N+1), Port ID(N+2)], Link Address(N+2)

Note 1: The last Port ID in the path (Port ID2 and Port ID(N+2) for single hop and multi-hop respectively) must be 1 (port for back plane).

Note 2: Port ID0 must be 1 (port for back plane). Link Address2 and Link Address (N+2) are the slot numbers of the remote Logix processor/1756-DHRIO module/1756-CNB module.

Routing Examples

The routing examples below include the entire Device ID minus the IP of the local 1756-ENBT. The perspective of the Device ID/Routing Path is from the local 1756-ENBT Module.

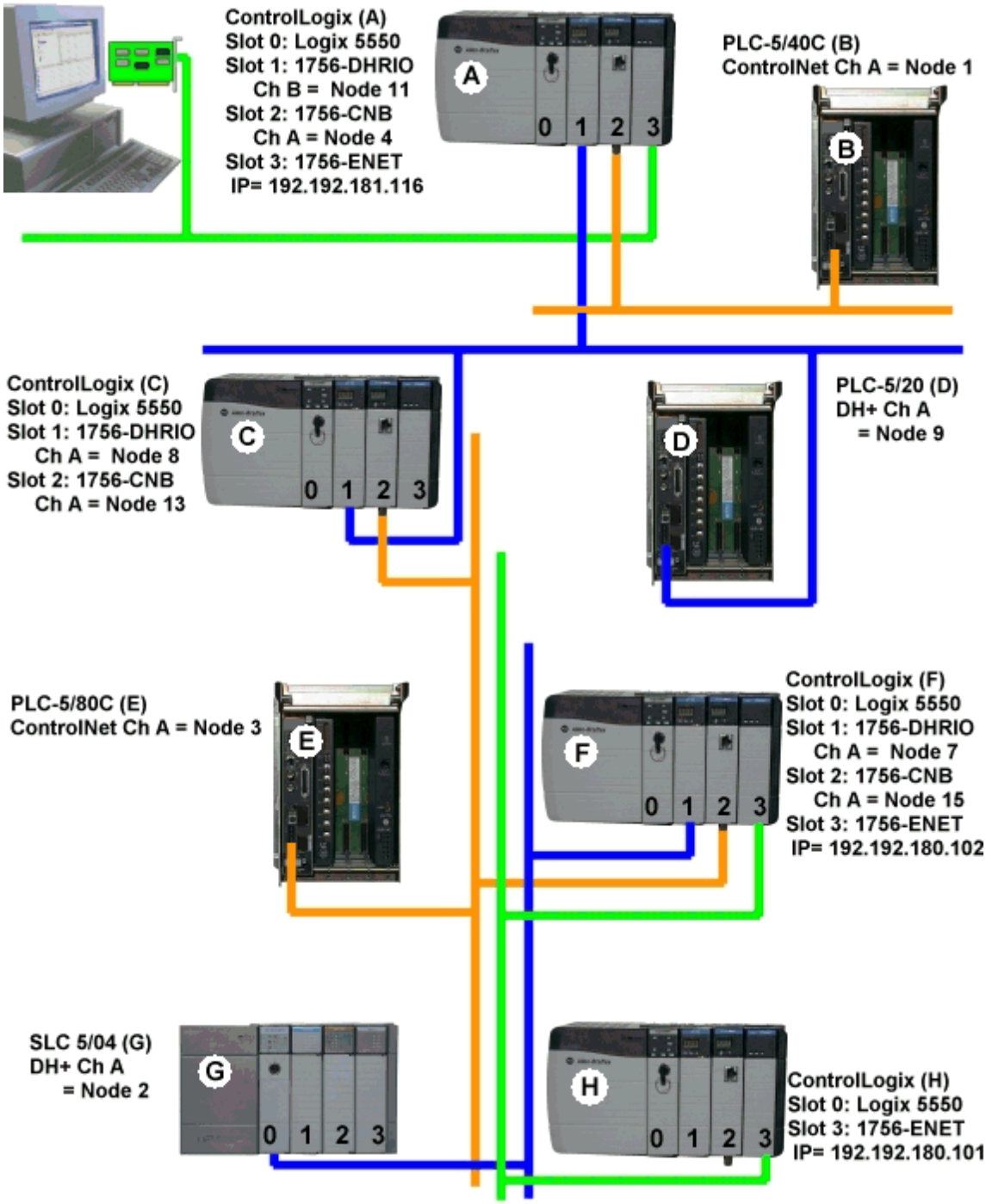
Hop descriptions are in the following form:

Link Address (N), Port ID(N+1), Link Address(N+1), Port ID(N+2).

Note: For more information, refer to **Connection Path Specification**. For further details on building a connection/routing path, refer to Allen-Bradley Publication 1756-6.5.14, pp. 4-5 through 4-8.

Octal Addressing Note: In the illustration below, all DH+/ControlNet Node IDs are specified in Decimal format. The Node ID specified in the PLC and displayed in RSWho is in Octal format. For more information, refer to **DH+ Gateway Device ID ControlNet Gateway Device ID**.

Key:
Green = Ethernet
Blue = DH+
Orange = ControlNet



Example 1
Logix5550 to PLC-5 via DH+ Gateway.

Destination Node	Model	Routing	Device ID less IP
PLC-5/20 (D)	DH+ Gateway	No	1,1.B.9

Example 2
Logix5550 to PLC-5C via CN Gateway.

Destination Node	Model	Routing	Device ID less IP
PLC-5/40C (B)	CN Gateway	No	1,2.A.1

Example 3

Logix5550 to Logix5550 via Routing over DH+.

Destination Node	Model	Routing	Device ID less IP
Logix5550 (C)	ControlLogix 5550	Yes	1,[1,2,8,1],0

Routing Path Breakdown for Example 3

Hop	Segment	Description
1	1,2,8,1	Slot 1 (DHRIO) -> Port 2 (DH+ Ch A) -> DH+ Node 8 -> Logix C Back plane

Example 4

Logix5550 to PLC-5C via CN Gateway, Routing over DH+.

Destination Node	Model	Routing	Device ID less IP
PLC-5/80C (E)	CN Gateway	Yes	1,[1,2,8,1],2.A.3

Routing Path Breakdown for Example 4

Hop	Segment	Description
1	1,2,8,1	Slot 1 (DHRIO) -> Port 2 (DH+ Ch A) -> DH+ Node 8 -> Logix C Back plane

Example 5

Logix5550 to Logix5550 via Routing over DH+, ControlNet

Destination Node	Model	Routing	Device ID less IP
Logix5550 (F)	ControlLogix 5550	Yes	1,[1,2,8,1,2,2,15,1],0

Routing Path Breakdown for Example 5

Hop	Segment	Description
1	1,2,8,1	Slot 1 (DHRIO) -> Port 2 (DH+ Ch A) -> DH+ Node 8 -> Logix C Back plane
2	2,2,15,1	Slot 2 (CNB) -> Port 2 (CN Ch A) -> CN Node 15 -> Logix F Back plane

Example 6

Logix5550 to SLC 5/04 via Routing over DH+, ControlNet.

Destination Node	Model	Routing	Device ID less IP
SLC 5/04 (G)	DH+ Gateway	Yes	1,[1,2,8,1,2,2,15,1],1.A.2

Routing Path Breakdown for Example 6

Hop	Segment	Description
1	1,2,8,1	Slot 1 (DHRIO) -> Port 2 (DH+ Ch A) -> DH+ Node 8 -> Logix C Back plane
2	2,2,15,1	Slot 2 (CNB) -> Port 2 (CN Ch A) -> CN Node 15 -> Logix F Back plane

Example 7

Logix5550 to Logix5550 via Routing over DH+, ControlNet, Ethernet.

Destination Node	Model	Routing	Device ID less IP
Logix5550 (H)	ControlLogix 5550	Yes	1,[1,2,8,1,2,2,15,1,3,2,192.192.180.101,1],0

Routing Path Breakdown for Example 7

Hop	Segment	Description
1	1,2,8,1	Slot 1 (DHRIO) -> Port 2 (DH+ Ch A) -> DH+ Node 8 -> Logix C Back plane
2	2,2,15,1	Slot 2 (CNB) -> Port 2 (CN Ch A) -> CN Node 15 -> Logix F Back plane
3	3,2,192.192.180.101,1	Slot 3 (ENBT) -> Port 2 -> Remote1756-ENBT IP -> Logix H Back plane

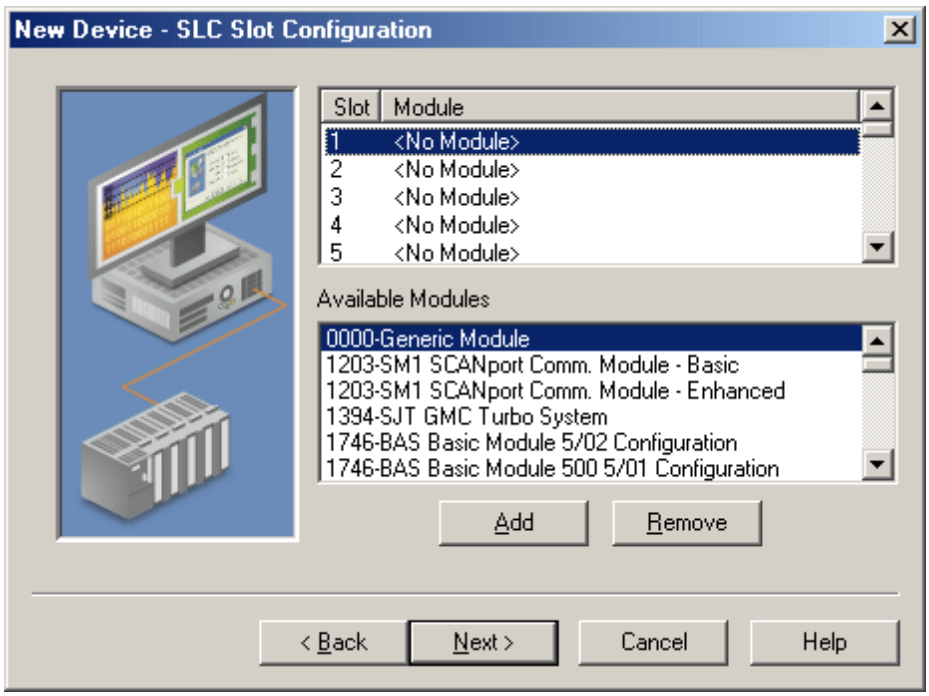
Port Reference

Ports

Interface Module	Port 1	Port 2	Port 3
Ethernet/IP Communication Module	Backplane	Ethernet Network	N/A
SoftLogix EtherNet/IP Messaging Module	Virtual Backplane	Ethernet Network	N/A
1756-DHRIO	Backplane	DH+ Network on Ch. A	DH+ Network on Ch. B
1756-CNB	Backplane	ControlNet Network	N/A

SLC 500 Slot Configuration

SLC5/01/02/03/04/05 models (modular I/O racks) must be configured for use with the Allen-Bradley ControlLogix Ethernet Driver if the I/O is to be accessed. Up to 30 slots can be configured per device.



Descriptions of the parameters are as follows:

- **Add:** When clicked, this button will add the selected module to the selected slot.

  Note: Before adding a module, users must know the number of input and output words in each slot. This is necessary for the driver to correctly address the I/O. Only the number of input and output words in slots (up to the slot of interest) are needed to address I/O in that slot. For example, if users are only going to access slot 3, all slots up to 3 (slots 1 and 2) must be configured if they contain any I/O and slot 3 (but not slot 4 or greater).
- **Remove:** When clicked, this button will remove the selected model from the selected slot.

See Also: **Modular I/O Selection Guide**

SLC 500 Modular I/O Selection Guide

The following table lists the number of input and output words available for each I/O module in the Slot Configuration list.

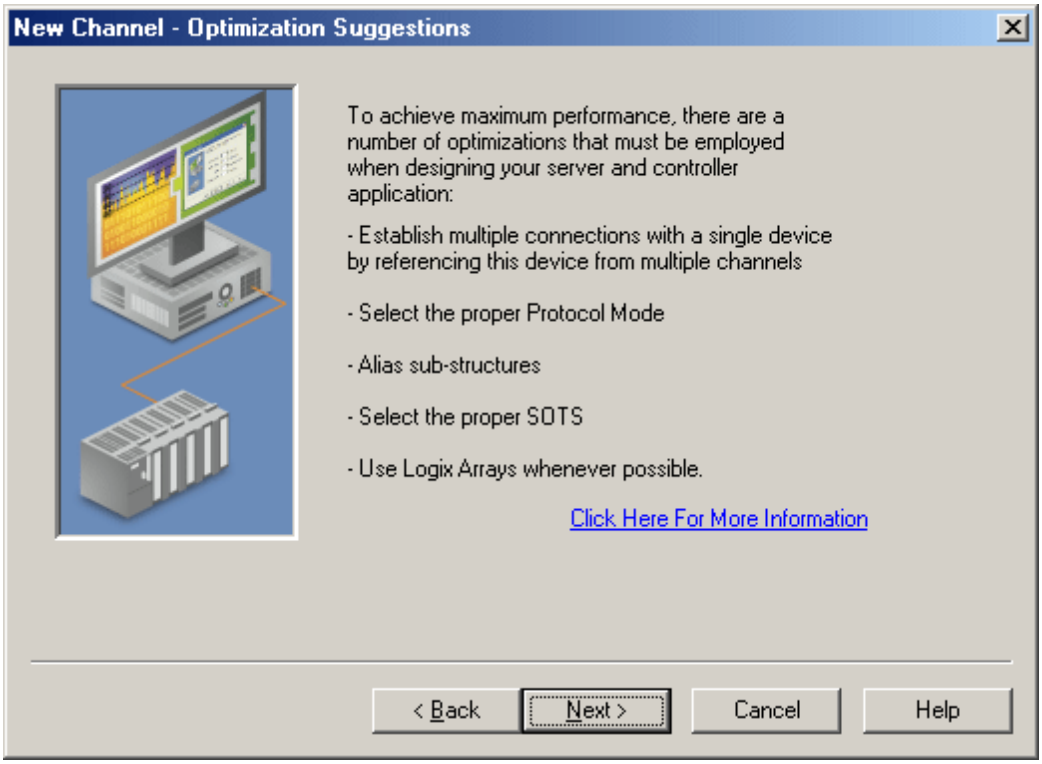
Module Type	Input Words	Output Words
1746-I*8 Any 8 pt Discrete Input Module	1	0
1746-I*16 Any 16 pt Discrete Input Module	1	0
1746-I*32 Any 32 pt Discrete Input Module	2	0
1746-O*8 Any 8 pt Discrete Output Module	0	1
1746-O*16 Any 16 pt Discrete Output Module	0	1

1746-O*32 Any 32 pt Discrete Output Module	0	2
1746-IA4 4 Input 100/120 VAC	1	0
1746-IA8 8 Input 100/120 VAC	1	0
1746-IA16 16 Input 100/120 VAC	1	0
1746-IB8 8 Input (Sink) 24 VDC	1	0
1746-IB16 16 Input (Sink) 24 VDC	1	0
1746-IB32 32 Input (Sink) 24 VDC	2	0
1746-IG16 16 Input [TTL] (Source) 5VDC	1	0
1746-IM4 4 Input 200/240 VAC	1	0
1746-IM8 8 Input 200/240 VAC	1	0
1746-IM16 16 Input 200/240 VAC	1	0
1746-IN16 16 Input 24 VAC/VDC	1	0
1746-ITB16 16 Input [Fast] (Sink) 24 VDC	1	0
1746-ITV16 16 Input [Fast] (Source) 24 VDC	1	0
1746-IV8 8 Input (Source) 24 VDC	1	0
1746-IV16 16 Input (Source) 24 VDC	1	0
1746-IV32 32 Input (Source) 24 VDC	2	0
1746-OA8 8 Output (Triac) 100/240 VAC	0	1
1746-OA16 16 Output (Triac) 100/240 VAC	0	1
1746-OB8 8 Output [Trans] (Source) 10/50 VDC	0	1
1746-OB16 16 Output [Trans] (Source) 10/50 VDC	0	1
1746-OB32 32 Output [Trans] (Source) 10/50 VDC	0	2
1746-OBP16 16 Output [Trans 1 amp] (SRC) 24 VDC	0	1
1746-OV8 8 Output [Trans] (Sink) 10/50 VDC	0	1
1746-OV16 16 Output [Trans] (Sink) 10/50 VDC	0	1
1746-OV32 32 Output [Trans] (Sink) 10/50 VDC	0	2
1746-OW4 4 Output [Relay] VAC/VDC	0	1
1746-OW8 8 Output [Relay] VAC/VDC	0	1
1746-OW16 16 Output [Relay] VAC/VDC	0	1
1746-OX8 8 Output [Isolated Relay] VAC/VDC	0	1
1746-OVP 16 16 Output [Trans 1 amp] (Sink) 24VDC3	0	1
1746-IO4 2 In 100/120 VAC 2 Out [Rly] VAC/VDC3	1	1
1746-IO8 4 In 100/120 VAC 4 Out [Rly] VAC/VDC4	1	1
1746-IO12 6 In 100/120 VAC 6 Out [Rly] VAC/VDC	1	1
1746-NI4 4 Ch Analog Input	4	0
1746-NIO4I Analog Comb 2 in & 2 Current Out	2	2
1746-NIO4V Analog Comb 2 in & 2 Voltage Out	2	2
1746-NO4I 4 Ch Analog Current Output	0	4
1746-NO4V 4 Ch Analog Voltage Output	0	4
1746-NT4 4 Ch Thermocouple Input Module	8	8
1746-NR4 4 Ch Rtd/Resistance Input Module	8	8
1746-HSCE High Speed Counter/Encoder	8	1
1746-HS Single Axis Motion Controller	4	4
1746-OG16 16 Output [TLL] (SINK) 5 VDC	0	1
1746-BAS Basic Module 500 5/01 Configuration	8	8
1746-BAS Basic Module 5/02 Configuration	8	8
1747-DCM Direct Communication Module (1/4 Rack)	2	2
1747-DCM Direct Communication Module (1/2 Rack)	4	4
1747-DCM Direct Communication Module (3/4Rack)	6	6
1747-DCM Direct Communication Module (Full Rack)	8	8
1747-SN Remote I/O Scanner	32	32
1747-DSN Distributed I/O Scanner 7 Blocks	8	8
1747-DSN Distributed I/O Scanner 30 Blocks	32	32
1747-KE Interface Module, Series A	1	0
1747-KE Interface Module, Series B	8	8

1746-NI8 8 Ch Analog Input, Class 1	8	8
1746-NI8 8 Ch Analog Input, Class 3	16	12
1746-IC16 16 Input (Sink) 48 VDC	1	0
1746-IH16 16 Input [Trans] (Sink) 125 VDC	1	0
1746-OAP12 12 Output [Triac] 120/240 VDC	0	1
1746-OB6EI 6 Output [Trans] (Source) 24 VDC	0	1
1746-OB16E 16 Output [Trans] (Source) Protected	0	1
1746-OB32E 32 Output [Trans] (Source) 10/50 VDC	0	2
1746-OBP8 8 Output [Trans 2 amp] (Source) 24 VDC	0	1
1746-IO12DC 6 Input 12 VDC, 6 Output [Rly	1	1
1746-INI4I Analog 4 Ch. Isol. Current Input	8	8
1746-INI4VI Analog 4 Ch. Isol. Volt./Current Input	8	8
1746-INT4 4 Ch. Isolated Thermocouple Input	8	8
1746-NT8 Analog 8 Ch Thermocouple Input	8	8
1746-HSRV Motion Control Module	12	8
1746-HSTP1 Stepper Controller Module	8	8
1747-MNET MNET Network Comm Module	0	0
1747-QS Synchronized Axes Module	32	32
1747-QV Open Loop Velocity Control	8	8
1747-RCIF Robot Control Interface Module	32	32
1747-SCNR ControlNet SLC Scanner	32	32
1747-SDN DeviceNet Scanner Module	32	32
1394-SJT GMC Turbo System	32	32
1203-SM1 SCANport Comm Module - Basic	8	8
1203-SM1 SCANport Comm Module - Enhanced	32	32
AMCI-1561 AMCI Series 1561 Resolver Module	8	8

ControlLogix Performance Optimizations

Although the Allen-Bradley ControlLogix Ethernet Driver is fast, a few guidelines may be applied to control and optimize the application (and gain maximum performance).



For more information on optimization at the communication and application levels, select a link from the list below.

Optimizing Your Communications
Optimizing Your Application
Performance Statistics and Tuning
Performance Tuning Example

See Also: **Device Setup**

Optimizing Your Communications

As with any programmable controller, there are unique ways for optimizing system throughput. The Logix has a variety of ways to enhance the overall performance and system communications.

Protocol Mode

The Protocol Mode determines how Logix Tag data is accessed from the controller. There are three types of protocol modes: Symbolic, Physical Non-Blocking and Physical Blocking. Descriptions are as follows:

- **Symbolic Mode:** Each client/server Tag address is represented in the packet by its ASCII character name.
- **Physical Non-Blocking Mode:** Each is represented by its physical memory address in the PLC.
- **Physical Blocking Mode:** The Logix Tag is accessed as a single chunk of data. Each client/server Tag (such as MYTIMER.ACC) has a corresponding Logix Tag (MYTIMER). Many client/server Tags can belong to the same Logix Tag, as in the case of structures. On every read cycle, the Logix Tag is read, its block is updated in the driver cache and all client/server Tags are updated from this cache.

It is generally recommended that Physical Non-Blocking Mode be used as it is most efficient in gathering and processing Logix Tag data. Symbolic is available for backward compatibility while Physical Non-Blocking Mode is recommended for projects containing a small number of references to UDT and/or predefined structure Logix Tags. Physical Blocking mode, while it can be highly efficient, can also hurt performance if used incorrectly. The idea behind Physical Blocking is that all the members for a Logix tag are retrieved in a single block. If only a few

members are going to be referenced, it would be a waste to read the Logix tag as a block. This is a case where Physical Blocking is not recommended.

Tag Division Tips
Designate one or more devices for Physical Blocking purposes and one or more devices for Physical Non-Blocking purposes. This provides some tags with better performance using Physical Blocking while others will get better performance using Physical Non-Blocking. When using such tag division, users should do the following:

1. Assign server tags referencing Atomic Logix tags (array or non-array) to the Physical Non-Blocking device.
2. Assign server tags referencing a Structure Logix tag composing of a 1/3* or less of the Structure tag to the Physical Non-Blocking device(s). For example, if there are 55** or less member tags referencing a PID_ENHANCED Logix tag, all these tags should be assigned to the Physical Non-Blocking device.
3. Assign server tags referencing a Structure Logix tag composing of a 1/3* or more of the Structure tag to the Physical Blocking device(s). For example, if there are more than 55** member tags referencing a PID_ENHANCED Logix tag, all of those tags should be assigned to the Physical Blocking device.

*1/3 is not an exact limit, but a round figure that has held true in a number of studies.
**A PID_ENHANCED structure has 165 tags; thus, 1/3 = 55 tags.

UDT Substructure Aliasing
If a UDT contains large substructures and 1/3* or more of the substructure are referenced (but the rest of the UDT is sparsely referenced), create an alias in RSLogix 5000. Then, assign server tags referencing this aliased substructure to a Physical Blocking device. Assign the server tags referencing the rest of the UDT to a Physical Non-Blocking device. In this way, Structure Logix Tag access can be optimized based on how the substructures are referenced.

*1/3 is not an exact limit, but a round figure that has held true in a number of studies.

System Overhead Time Slice
The System Overhead Time Slice (SOTS) is the percentage of time allocated to perform communication tasks (such as OPC driver communications) that is set in RSLogix5000. 100% - SOTS is the percentage of time for controller tasks (such as ladder logic). The default SOTS is 10%. This means that for every 10ms program scan that occurs, the controller spends 1ms processing Allen-Bradley ControlLogix Ethernet driver requests. The SOTS's value defines the task's priority. If controller tasks are a high priority, the SOTS should be set below 30%. If the communication tasks (such as OPC application) are high priority, the SOTS should be set at or above 30%. For the best balance of communications performance and CPU utilization, set the SOTS to 10% - 40% .

Multi-Request Packets
The Allen-Bradley ControlLogix Ethernet driver has been designed to optimize reads and writes. For non-array, non-string tags (tags requesting only one element), requests are blocked into a single transaction. This provides drastic improvement in performance over single tag transactions. The only limitation is on the number of data bytes that can fit in a single transaction.

Important: Symbolic Mode Users should note that in Symbolic mode, each tag's ASCII string value is inserted into the request packet until no more tag requests will fit. For this reason, tag names should be kept to a minimum in size for optimum performance. The smaller the tag name, the more tags that will fit in a single transaction, the fewer transactions that are necessary to process all tags.

Array Elements Blocked (Symbolic and Physical Non-Blocking Modes Only)
The reading of Logix atomic array elements is optimized by reading a block of the array in a single request instead of individually. The more elements read in a block, the greater the performance. Since transaction overhead and processing consumes the most time, it is optimal to do as few transactions as possible while scanning as many desired tags as possible. This is the essence of array element blocking.

Block sizes are specified as an element count. A block size of 120 elements means that a maximum of 120 array elements will be read in one request. The maximum block size is 3840 elements. Boolean arrays are treated a little different. In protocol, a Boolean array is a 32-bit array. Thus, requesting element 0 is requesting bits 0 through 31. To maintain consistency in discussion, a Boolean array element will be considered a single bit. In summary, the maximum number of array elements (based on block size of 3840) that can be requested is: 122880 BOOL, 3840 SINT, 3840 INT, 3840 DINT and 3840 REAL.

As discussed in **ControlLogix Communication Parameters**, the block size is adjustable. The block size to choose depends on the project at hand. For example, if array elements 0-26 and element 3839 are tags to be read, then using a block size of 3840 is not only overkill, but detrimental to the driver's performance. The reason

is because all elements between 0 and 3839 will be read on each request, when only 28 of those elements are of importance. In this case, a block size of 30 would be more appropriate. Elements 0-26 would be serviced in one request and element 3839 would be serviced on the next.

Optimizing Strings

In the Physical Addressing modes, a write to STRING.DATA will also write to STRING.LEN with the proper length value. This optimization is automatic and cannot be turned off.

Bypass Automatically Read String Length

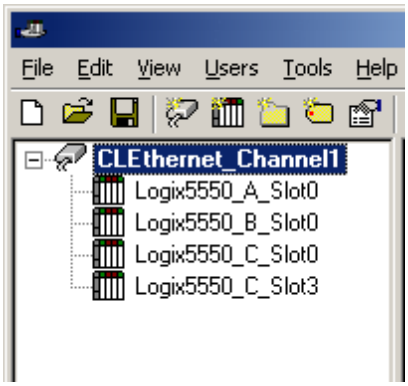
In this driver, string tags are structures with separate character data and length components. As such, the driver will automatically write a string tag in two transactions: one in Physical Protocol Mode for the string character data (DATA) and one in Symbolic Mode for the string length (LEN). When the "Automatically Read String Length" option is unchecked, a single transaction will be made to read the string character data. In this case, the Symbolic Mode read for string length will be bypassed. In a project with many string tags, this can significantly reduce the time required to read all tags.

Note: For more information on the "Automatically Read String Length" option, refer to **Logix Options**.

Optimizing Your Application

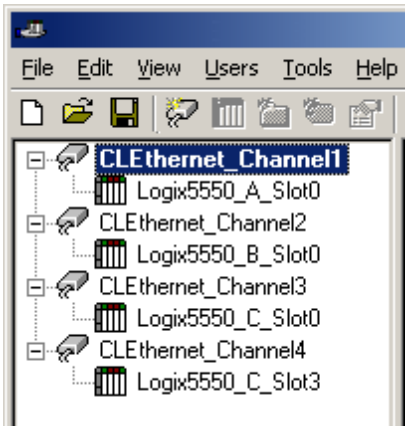
The Allen-Bradley ControlLogix Ethernet driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the Allen-Bradley ControlLogix Ethernet driver is fast, there are a couple of guidelines that can be used in order to control and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

The server refers to communications protocols like Allen-Bradley ControlLogix 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 Allen-Bradley Logix CPU 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 Allen-Bradley ControlLogix 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 channel, called CLEthernet_Channel1. 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 Allen-Bradley ControlLogix Ethernet driver could only define one single channel, then the example shown above would be the only option available; however, the Allen-Bradley ControlLogix 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.

Performance Statistics and Tuning

The Performance Statistics feature provides benchmarks and statistics about the ControlLogix application's performance. Since the server's performance can be affected by Performance Statistics (because it is an additional layer of processing) the default setting is off. Refer to the FAQ below for information to help decide whether or not Performance Statistics is appropriate for the application.

Where is Performance Statistics Enabled?

The Performance Statistics feature is disabled by default. To enable it, open Device Properties and then select the **CLX Options** tab. Check the **Enable Performance Statistics** box.

Why should Performance Statistics be Enabled?

Performance Statistics will provide meaningful numerical results across three scopes: device, channel and driver. Descriptions are as follows:

- **Device statistics** provide the data access performance on a particular device.
- **Channel statistics** provide the average data access performance for all the devices under a given channel with Performance Statistics enabled.
- **Driver statistics** provide the average data access performance for all devices using the Allen-Bradley ControlLogix Ethernet Driver with Performance Statistics enabled.

What is most relevant: Device, Channel or Driver Statistics?

This depends on the application. In general, driver statistics provide a true measure of performance for an application. Channel and device statistics are most relevant while tuning the application. For instance, will moving 10 certain tags from Device A to Device B increase the performance of Device A? Will moving Device A from Channel 1 to Channel 2 increase the performance of Channel 1? These are questions that come about in the tuning process but are good examples of times when device and channel statistics are viewed distinctly.

Where do I find the statistics?

Server statistics are outputted to the server's Event Log upon shutdown. To view the statistics' results, the server must be shutdown and then reopened.

How do Performance Statistics Differ from Server Statistics?

Server statistics exist at the channel scope only, whereas Performance Statistics exist at the device, channel and driver level. Performance Statistics provide the makeup of the types of reads performed (for example, symbolic vs. physical, device reads vs. cache reads) while server statistics provide a general read count value.

How can the Application be Tuned for Increased Performance?

A summary of steps to increase device and channel statistic results is listed below. For more information, refer to **Optimizing Your Communications**.

1. Server tags referencing Atomic Logix tags (array or non-array) should be assigned to Physical Non-Blocking devices.
2. Server tags referencing a Structure Logix tag composed of 1/3 or less of the Structure tag should be assigned to Physical Non-Blocking devices.

3. Server tags referencing a Structure Logix tag composed of 1/3 or more of the Structure tag should be assigned to Physical Blocking devices.
4. If Symbolic mode is used, Logix names should be kept to a minimum length.
5. Logix Arrays should be used as often as possible.
6. Only the necessary amount of System Overhead Time Slice for Ladder Logic/FBD should allocated in order to leave the rest for driver communications.
7. For projects that read a large number of string tags in Physical Mode, uncheck the "Automatically Read String Length" option (located in the **Logix Options** tab of **Device Properties**).

A summary of steps to increase driver statistic results are listed below. For more information, refer to **Optimizing Your Application**.

1. Devices should be spread across channels. More than one device should not be put on a channel unless absolutely necessary.
2. Load should be spread evenly across devices. A single device should not be overloaded unless absolutely necessary.
3. The same Logix tag should not be referenced across different devices.

Note: These general rules can help optimize performance, but it ultimately depends on the application at hand. Note that the scan rate can obscure results: if tag requests are light, Read and Write transactions can complete before the next request comes in. In this case, Physical Blocking and Physical Non-Blocking will have the same Performance Statistics results. If tag requests are high (many tags or high scan rates), transaction completion time may take longer. This is when the strengths and weaknesses of Physical Blocking and Physical Non-Blocking become apparent. Performance Statistics can help tune the application for maximum performance. For an example of tuning applications, refer to **Application Performance Tuning Example**.

Performance Tuning Example

This example is designed to illustrate the concepts discussed in the following sections:

Optimizing Your Communications
Optimizing Your Application
Performance Statistics and Tuning

Statistics can be applied to any application. In this example, the Quick Client is used in the performance tuning process. The idea is that all the tags used in the project are read at the same time at a fast scan rate. Though this is not realistic, it does provide an accurate benchmark to the project layout in the server (tags belonging to specific devices, devices belonging to specific channels and and so forth.).

The statistics gathered are relative. Users should start with a server project layout, gather the statistics and then tune. Once the most efficient layout is determined, the client application can be built with reassurance that the server is optimal.

Note: More than one trial is required to properly assess the results for a given layout.

Caution: Performance results obtained using the Quick Client will not equate to performance results obtained using other Client applications. The amount of tags being read/written at any given time, the tag scan rates and the number of clients involved are just a few of the factors that will produce discrepancies between Quick Client results and other Client application results. The tuning process described here provides the optimal project layout assuming all tags are being read at a fast scan rate. Writes will hinder this performance.

Users can also perform performance tuning with the client application instead of the Quick Client. This will provide the most accurate results. The only downside is that any tuning required will not only affect the server project, but most likely the Client application as well. It is recommended that the Quick Client be used to tune the application before the client application is developed.

1. In the controller project below, there are the following:

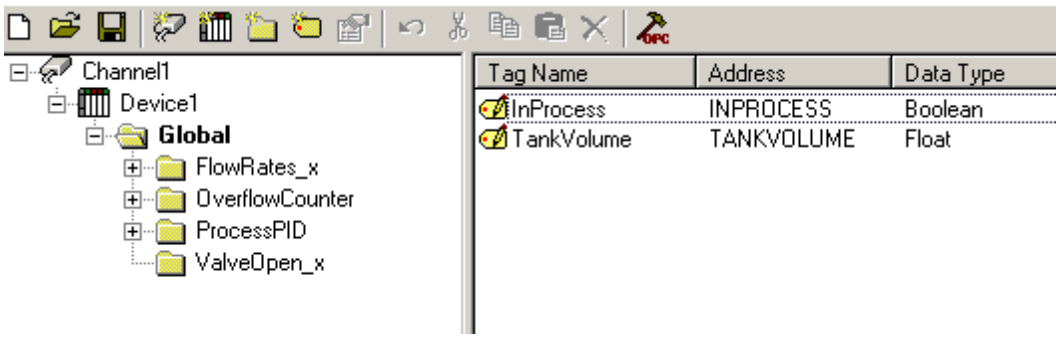
- 2 Atomics
- 1 Atomic array
- 1 UDT

- 1 UDT array
- 1 Pre-Defined Type

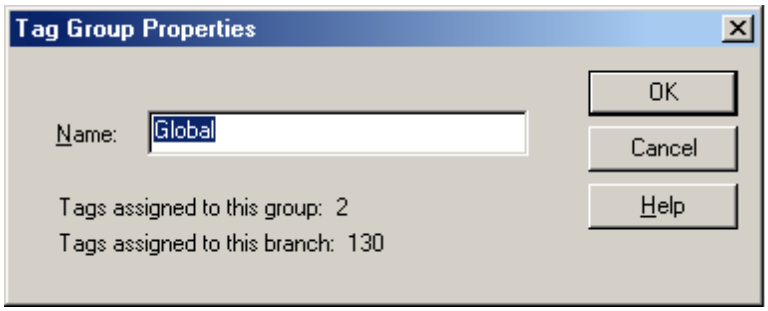
Overhead Time Slice (OTS) = 10%

P	Tag Name	Alias For	Base Tag	Type
	InProcess			BOOL
	⊞-OverflowCounter			COUNTER
	⊞-ValveOpen			DINT[10]
	⊞-ProcessPID			PIDLoop
	⊞-FlowRates			ProcessVariable[2]
	TankVolume			REAL

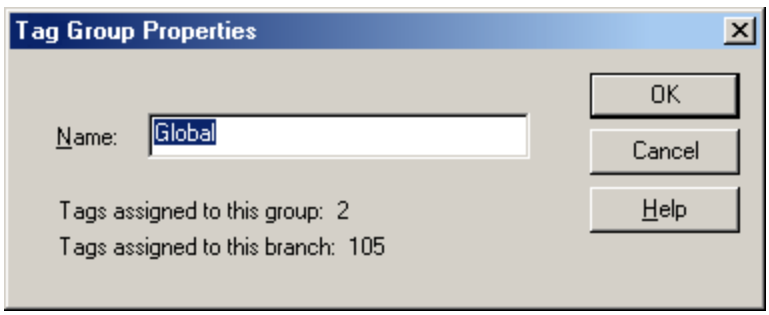
2. After performing Automatic Tag Database Generation from this controller, the server produces the following project:



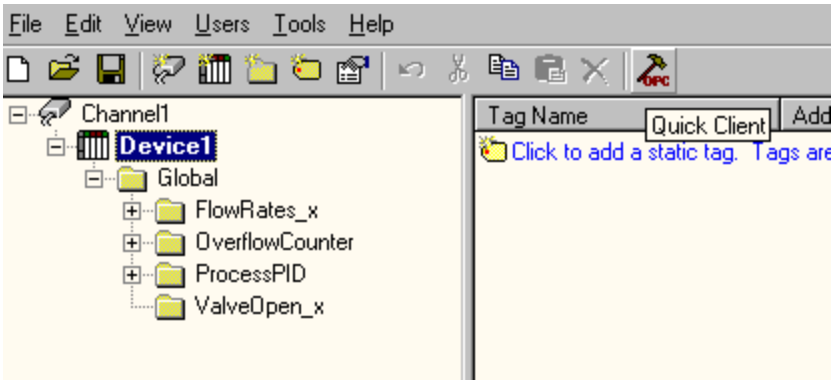
Global contains 130 tags, as depicted below.



3. In order to illustrate the benefits of tag division, not all tags will be referenced in this example. More than one-third of the ProcessPID tags and less than one-third of the FlowRates tags will be referenced. All other tags will be referenced. The new tag count is 105.



4. The client needs to be prepared for the test. To do so, launch the provided **Quick Client** from the server application by clicking on the OPC hammer as shown below.

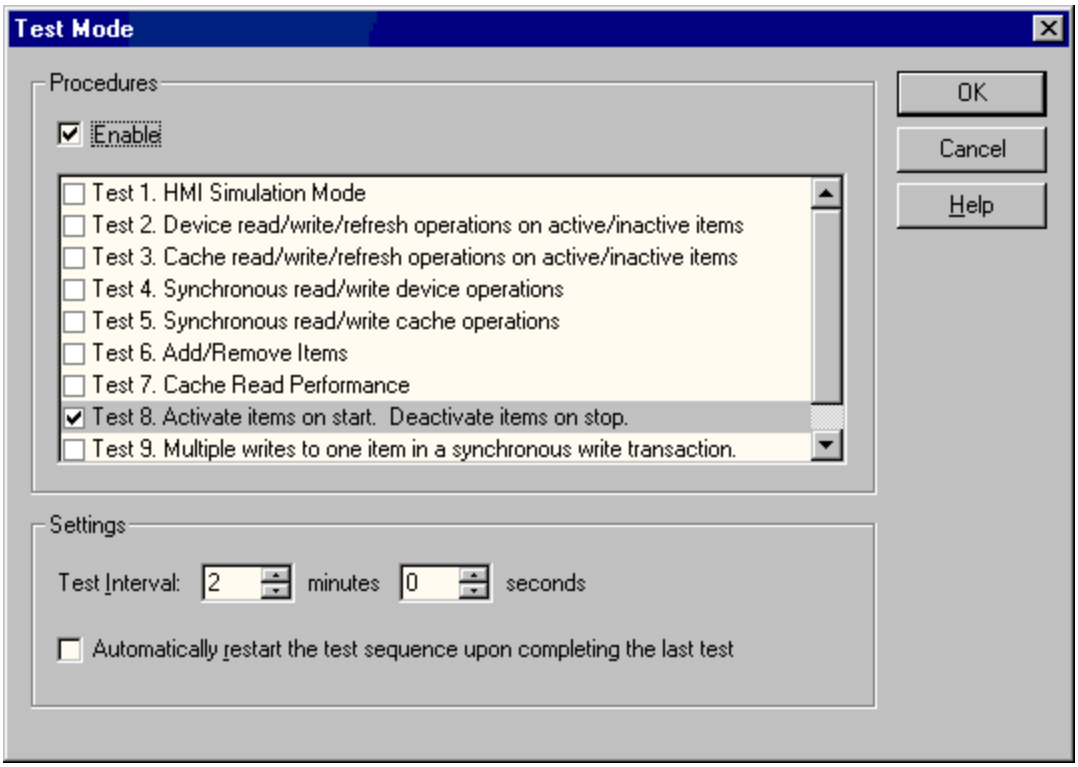


5. Once the project is loaded in the Quick Client, remove all groups except the ones containing tags of interest. Statistics and System tags, for example, are not needed. For small projects, set the **Group Update Rate** to 0-10ms. For large projects, set the rate to 10-50ms.

6. Next, click **Tools** | **Test Mode**.

7. Select **Test 8. Activate items on start. Deactivate items on stop** and then set a test interval. Since this project is fairly small, the interval has been set to 2 minutes. For larger projects, this interval should be increased in order to get a more accurate reading.

8. Enable **Test Mode**.



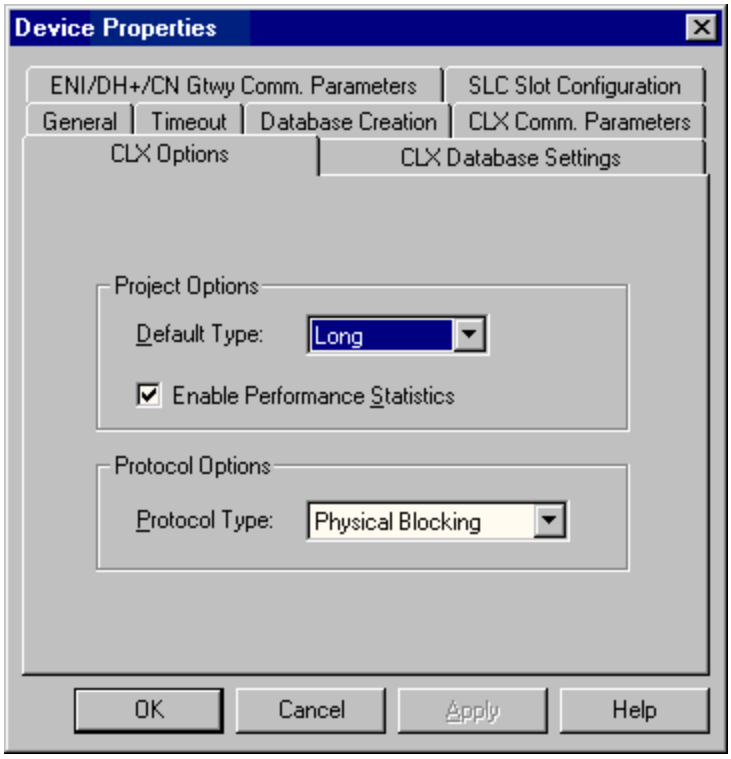
9. Return to **Tools** | **Test Mode** and disable test mode. All tags should be deactivated.

10. Disconnect the Quick Client so that time trials can begin.

11. Shutdown the server.

Physical Blocking Mode
12. Launch the server and set the protocol type to **Physical Blocking**. This is the default setting.

13. Select **Enable Performance Statistics**.



14. Connect to the server using **Quick Client**. Then, click **Tools** | **Test Mode**. Enable test mode.

Note: Data reading will begin. When the test interval expires, all tags will be deactivated and the driver will cease all statistics gathering. The results can then be viewed.

15. Disconnect the Quick Client from the server and then shutdown the server.

16. Next, re-launch the server and search its **Event Log** for statistics. The image below is a capture of the first trial utilizing Physical Blocking for the device.

```
DEVICE Channel1:Device1 STATISTICS
Physical Block Device Reads = 40932
Physical Block Cache Reads = 661734
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 13644
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 716390, Elapsed Time = 119969 ms
DEVICE Channel1:Device1 PERFORMANCE: AvgTagReadPerSec = 5972.26
```

The image shown below is a capture of the first trial utilizing Physical Blocking for the channel and driver.

```
DRIVER STATISTICS (ALL CHANNELS)
Physical Block Device Reads = 40932
Physical Block Cache Reads = 661734
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 13644
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 716390, Elapsed Time = 119969 ms
DRIVER PERFORMANCE: AvgTagReadPerSec = 5972.26
Closing project C:\RDM\Support\ControlLogix Ethernet\CL_DEFAULT.opf
CHANNEL Channel1 STATISTICS
Physical Block Device Reads = 40932
Physical Block Cache Reads = 661734
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 13644
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 716390, Elapsed Time = 119969 ms
CHANNEL Channel1 PERFORMANCE: AvgTagReadPerSec = 5972.26
```

Note: This is the control set for comparisions.

Physical Non-Blocking Mode
17. From the server, set the protocol type to **Physical Non-Blocking**.

18. Connect to the server using **Quick Client**. Then, click **Tools** | **Test Mode** and enable test mode.

Note: Data reading will begin. When the test interval expires, all tags will be deactivated and the driver will cease all statistics gathering. The results can then be viewed.

19. Disconnect the Quick Client from the server and then shutdown the server.

20. Next, re-launch the server and then search its **Event Log** for statistics. The image below is a capture of the second trial utilizing Physical Non-Blocking for the device.

```
DEVICE Channel1:Device1 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 8254
Physical Non Block, Array Block Cache Reads = 174419
Physical Non Block Device Reads = 261716
Symbolic, Array Block Device Reads = 2
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 63
Total tags read = 444454, Elapsed Time = 119969 ms
DEVICE Channel1:Device1 PERFORMANCE: AvgTagReadPerSec = 3705.23
```

The image shown below is a capture of the second trial utilizing Physical Non-Blocking for the channel and driver.

```
DRIVER STATISTICS (ALL CHANNELS)
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 8254
Physical Non Block, Array Block Cache Reads = 174419
Physical Non Block Device Reads = 261716
Symbolic, Array Block Device Reads = 2
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 63
Total tags read = 444454, Elapsed Time = 119969 ms
DRIVER PERFORMANCE: AvgTagReadPerSec = 3705.23
Closing project C:\RDM\Support\ControlLogix Ethernet\CL_DEFAULT.opf
CHANNEL Channel1 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 8254
Physical Non Block, Array Block Cache Reads = 174419
Physical Non Block Device Reads = 261716
Symbolic, Array Block Device Reads = 2
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 63
Total tags read = 444454, Elapsed Time = 119969 ms
CHANNEL Channel1 PERFORMANCE: AvgTagReadPerSec = 3705.23
```

Symbolic Mode

21. From the server, set the protocol type to **Symbolic** in order to see how the performance faired prior to Allen-Bradley ControlLogix Ethernet Driver version 4.6.0.xx.

22. Connect to the server using **Quick Client** . Then, click **Tools** | **Test Mode** and enable test mode.

Note: Data reading will begin. When the test interval expires, all tags will be deactivated and the driver will cease all statistics gathering. The results can then be viewed.

23. Disconnect the Quick Client from the server and then shutdown the server.

24. Next, re-launch the server and search its **Event Log** for statistics. The image below is a capture of the third trial utilizing Symbolic for the device.

```
DEVICE Channel1:Device1 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 0
Symbolic, Array Block Device Reads = 1744
Symbolic, Array Block Cache Reads = 36613
Symbolic Device Reads = 54985
Total tags read = 93342, Elapsed Time = 120063 ms
DEVICE Channel1:Device1 PERFORMANCE: AvgTagReadPerSec = 777.442
```

The image shown below is a capture of the third trial utilizing Symbolic for the channel and driver.

```
DRIVER STATISTICS (ALL CHANNELS)
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 0
Symbolic, Array Block Device Reads = 1744
Symbolic, Array Block Cache Reads = 36613
Symbolic Device Reads = 54985
Total tags read = 93342, Elapsed Time = 120063 ms
DRIVER PERFORMANCE: AvgTagReadPerSec = 777.442
Closing project C:\RDM\Support\ControlLogix Ethernet\CL_DEFAULT.opf
CHANNEL Channel1 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 0
Symbolic, Array Block Device Reads = 1744
Symbolic, Array Block Cache Reads = 36613
Symbolic Device Reads = 54985
Total tags read = 93342, Elapsed Time = 120063 ms
CHANNEL Channel1 PERFORMANCE: AvgTagReadPerSec = 777.442
```

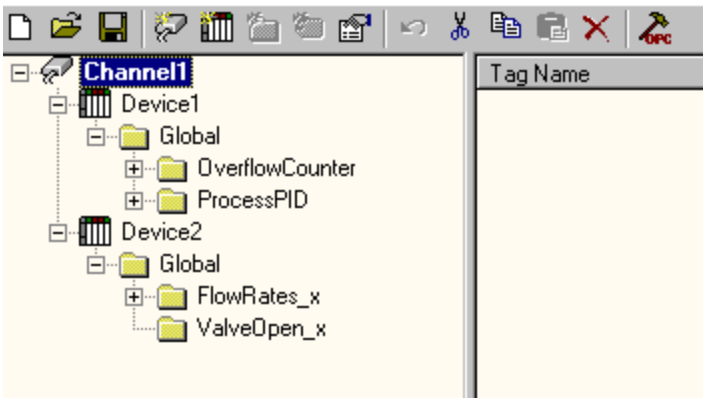
Note: It appears that Physical Blocking is most optimal for the given application.

Optimizing Channel Communications

Channel communications can be optimized by moving tags for Physical Blocking in one device and tags for Physical Non-Blocking in another (Tag Division).

Physical Blocking (Device 1)
ProcessPID
OverflowCounter

Physical Non-Blocking (Device 2)
FlowRate
ValveOpen
InProcess
Tank Volume



25. Repeat Steps 4 through 15. In Step 11, make sure Device 1 is Physical Blocking and Device 2 is Physical Non-Blocking.

26. Launch the server and search the server Event Log for statistics. The image shown below is a capture of this fourth trial utilizing tag division for the Device.

```
DEVICE Channel1:Device1 STATISTICS
Physical Block Device Reads = 13866
Physical Block Cache Reads = 610104
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 6933
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 76
Total tags read = 630979, Elapsed Time = 119782 ms
DEVICE Channel1:Device1 PERFORMANCE: AvgTagReadPerSec = 5268.43
DEVICE Channel1:Device2 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 6933
Physical Non Block, Array Block Cache Reads = 69375
Physical Non Block Device Reads = 27732
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 4
Total tags read = 104044, Elapsed Time = 119969 ms
DEVICE Channel1:Device2 PERFORMANCE: AvgTagReadPerSec = 867.373
```

The image shown below is a capture of this fourth trial utilizing tag division for the channel and driver.

```
DRIVER STATISTICS (ALL CHANNELS)
Physical Block Device Reads = 13866
Physical Block Cache Reads = 610104
Physical Non Block, Array Block Device Reads = 6933
Physical Non Block, Array Block Cache Reads = 69375
Physical Non Block Device Reads = 34665
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 735023, Elapsed Time = 119969 ms
DRIVER PERFORMANCE: AvgTagReadPerSec = 6126.77
Closing project C:\RDM\Support\ControlLogix Ethernet\CL_DEFAULT.opf
CHANNEL Channel1 STATISTICS
Physical Block Device Reads = 13866
Physical Block Cache Reads = 610104
Physical Non Block, Array Block Device Reads = 6933
Physical Non Block, Array Block Cache Reads = 69375
Physical Non Block Device Reads = 34665
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 735023, Elapsed Time = 119969 ms
CHANNEL Channel1 PERFORMANCE: AvgTagReadPerSec = 6126.77
```

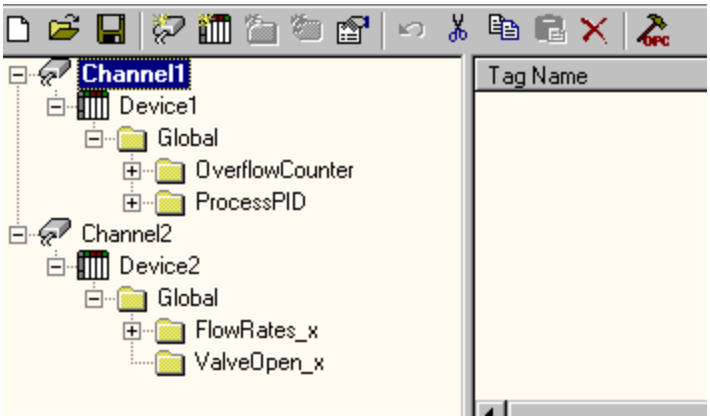
The individual device statistics do not look impressive because the two devices are running on separate statistic counters. The key to this test is that the channel and driver statistics are better (6126) than using one channel/one device with either Physical Blocking (5972) or Physical Non-Blocking (3705).

Optimize Application

Next, the application can be optimized by moving Device 1 to one channel and Device 2 to another.

Physical Blocking (Channel1.Device 1
ProcessPID
OverflowCounter

Physical Non-Blocking (Channel2.Device 2)
FlowRate
ValveOpen
InProcess
Tank Volume



27. Repeat Steps 4 through 15. In Step 11, make sure Channel1.Device 1 is Physical Blocking and Channel2.Device 2 is Physical Non-Blocking.

28. Launch the server and search the server Event Log for statistics. The image shown below is a capture of this fifth trial utilizing Tag Division coupled with multiple channels for Channel 1.Device1.

```
CHANNEL Channel1 STATISTICS
Physical Block Device Reads = 14542
Physical Block Cache Reads = 639848
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 7271
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 661741, Elapsed Time = 119968 ms
CHANNEL Channel1 PERFORMANCE: AvgTagReadPerSec = 5517.4
DEVICE Channel1:Device1 STATISTICS
Physical Block Device Reads = 14542
Physical Block Cache Reads = 639848
Physical Non Block, Array Block Device Reads = 0
Physical Non Block, Array Block Cache Reads = 0
Physical Non Block Device Reads = 7271
Symbolic, Array Block Device Reads = 0
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 80
Total tags read = 661741, Elapsed Time = 119968 ms
DEVICE Channel1:Device1 PERFORMANCE: AvgTagReadPerSec = 5517.4
```

The image shown below is a capture of this fourth trial utilizing Tag Division for Channel2.Device2.

```
CHANNEL Channel2 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 7280
Physical Non Block, Array Block Cache Reads = 72800
Physical Non Block Device Reads = 29120
Symbolic, Array Block Device Reads = 1
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 4
Total tags read = 109205, Elapsed Time = 119968 ms
CHANNEL Channel2 PERFORMANCE: AvgTagReadPerSec = 910.52
DEVICE Channel2:Device2 STATISTICS
Physical Block Device Reads = 0
Physical Block Cache Reads = 0
Physical Non Block, Array Block Device Reads = 7280
Physical Non Block, Array Block Cache Reads = 72800
Physical Non Block Device Reads = 29120
Symbolic, Array Block Device Reads = 1
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 4
Total tags read = 109205, Elapsed Time = 119968 ms
DEVICE Channel2:Device2 PERFORMANCE: AvgTagReadPerSec = 910.52
```

The image shown below is a capture of this fourth trial utilizing Tag Division for the Driver.

```
DRIVER STATISTICS (ALL CHANNELS)
Physical Block Device Reads = 14542
Physical Block Cache Reads = 639848
Physical Non Block, Array Block Device Reads = 7280
Physical Non Block, Array Block Cache Reads = 72800
Physical Non Block Device Reads = 36391
Symbolic, Array Block Device Reads = 1
Symbolic, Array Block Cache Reads = 0
Symbolic Device Reads = 84
Total tags read = 770946, Elapsed Time = 119968 ms
DRIVER PERFORMANCE: AvgTagReadPerSec = 6426.26
```

Results

Server Project Layout	Driver Performance (Reads/Sec)	Improvement Over Symbolic
Single Channel Single Device with Physical Blocking	5972	768%
Single Channel Single Device with Physical Non-Blocking	3705	476%
Single Channel Single Device with Symbolic	777	N/A
Single Channel Multiple Devices with Tag Division	6126	788%
Multiple Channels Multiple Devices with Tag Division	6426	827%

Conclusions

The project began with a single channel and a single device, which is the default behavior for a single controller. All tags were imported from this controller to this channel.device. With this layout, all three protocol types were explored to see which would provide the best performance. Physical Blocking protocol was the clear winner, although this isn't always the case. It depends on the makeup of the application at hand. It is always worth performing Physical Blocking and Physical Non-Blocking trials to determine the best protocol type for the application

when performance is crucial. Symbolic protocol is not necessary since it will never meet the performance caliber of either one of these other protocol types. It is shown here for the sake of example.

Measures were taken to optimize communications using the tips outlined in **Optimizing Your Communications**. Most notably, tag division was used to place the Physical Blocking type tags in a device assigned Physical Blocking and the Physical Non-Blocking type tags in a device assigned Physical Non-Blocking. Both devices resided on the same channel. The results show an improvement over just using Physical Blocking on a single device. This is because some tags lend themselves better to one protocol type over another. For example, reading an entire COUNTER will benefit from Physical Blocking over Physical Non-Blocking since its much faster reading the COUNTER as a block then reading its individual members.

Measures were also taken to optimize the application by placing devices on their own channel. Using the devices created in the previous trial, a Physical Blocking device was placed on one channel and a Physical Non-Blocking device on another. The results show improvement over the single channel/multiple devices scenario from the previous trial. This reinforces the idea that performance is improved by having as few devices per channel and as many channels as necessary.

After using these three optimization methods, the project has an 827% performance increase over Allen-Bradley ControlLogix Ethernet Driver version earlier than 4.6.0.xx. Tag division and multiple channels improved the performance by 107%. The performance increases will be more apparent with larger projects.

Data Types Description

Data Types	Description
Boolean	Single bit
Byte	Unsigned 8 bit value
Char	Signed 8 bit value
Word	Unsigned 16 bit value
Short	Signed 16 bit value
DWord	Unsigned 32 bit value
Long	Signed 32 bit value
BCD	Two byte packed BCD, four decimal digits
LBCD	Four byte packed BCD, eight decimal digits
Float	32 bit IEEE Floating point
Double	64 bit IEEE Floating point
Date	64 bit Date/Time
String	Null terminated character array

Note: For a description of Logix platform-specific data types, refer to **Logix Data Types**.

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.

Protocol Class	Models	Help Link
Logix-Ethernet	ControlLogix 5500 Ethernet, CompactLogix 5300, Ethernet, FlexLogix 5400 Ethernet, SoftLogix 5800	**Logix Tag-Based Addressing**
DH+ Gateway	DH+ Gateway: PLC-5 DH+ Gateway: SLC 5/04	**PLC-5 Series Addressing for DH+** **SLC 500 Modular I/O Addressing for DH+**
ControlNet Gateway	ControlNet Gateway: PLC-5C	**PLC-5 Series Addressing for ControlNet**
1761-NET-ENI	ENI: ControlLogix 5500, ENI: CompactLogix 5300, ENI: FlexLogix 5400 ENI: MicroLogix ENI: SLC 500 Fixed I/O ENI: SLC 500 Modular I/O ENI: PLC-5	**Logix Tag-Based Addressing** **MicroLogix Addressing for ENI** **SLC 500 Fixed I/O Addressing for ENI** **SLC 500 Modular I/O Addressing for ENI** **PLC-5 Series Addressing for ENI**
MicroLogix 1100 Ethernet	MicroLogix 1100	**MicroLogix 1100 Addressing**
MicroLogix 1400 Ethernet	MicroLogix 1400	**MicroLogix 1400 Addressing**

ControlLogix 5500 Addressing for Ethernet

ControlLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

ControlLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

ControlLogix 5500 Addressing for ENI

ControlLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

ControlLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

CompactLogix 5300 Addressing for Ethernet

CompactLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

CompactLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

CompactLogix 5300 Addressing for ENI

CompactLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

CompactLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

FlexLogix 5400 Addressing for Ethernet

FlexLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

FlexLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

FlexLogix 5400 Addressing for ENI

FlexLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

FlexLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

SoftLogix 5800 Addressing

SoftlLogix is a member of the Logix family and part of Rockwell Automation's Integrated Architecture. This means it uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

SoftLogix tag-based addressing and its relationship to the Allen-Bradley ControlLogix Ethernet Driver is discussed in **Logix Tag-Based Addressing**.

SLC 500 Modular I/O Addressing for DH+

Open Addressing In Use

The actual number of addresses available depends on the model of the PLC. The ranges have been opened up as such to allow for maximum flexibility with future models. If at runtime the driver finds that an address is not present in the device, the driver will post an error message and remove the tag from its scan list.

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files

SLC 500 Modular I/O Addressing for ENI

Open Addressing In Use

The actual number of addresses available depends on the model of the PLC. The ranges have been opened up as such to allow for maximum flexibility with future models. If at runtime the driver finds that an address is not present in the device, the driver will post an error message and remove the tag from its scan list.

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files

Float Files
ASCII Files
String Files

SLC 500 Fixed I/O Addressing for ENI

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files

PLC-5 Series Addressing for DH+

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
BCD Files
PID Files
Message Files
Block Transfer Files

PLC-5 Series Addressing for ControlNet

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
BCD Files
PID Files
Message Files
Block Transfer Files

PLC-5 Series Addressing for ENI

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files

Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
BCD Files
PID Files
Message Files
Block Transfer Files

MicroLogix Addressing for ENI

Open Addressing

The actual number of addresses available depends on the model of the PLC. The ranges have been opened up as such to allow for maximum flexibility with future models. If at runtime the driver finds that an address is not present in the device, the driver will post an error message and remove the tag from its scan list.

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
Long Files
MicroLogix PID Files
MicroLogix Message Files

Function Files

High Speed Counter File (HSC)
Real-Time Clock File (RTC)
Channel 0 Communication Status File (CS0)
Channel 1 Communication Status File (CS1)
I/O Module Status File (IOS)

MicroLogix 1100 Addressing

Open Addressing

The actual number of addresses available depends on the model of the PLC. The ranges have been opened up as such to allow for maximum flexibility with future models. If at runtime the driver finds that an address is not present in the device, the driver will post an error message and remove the tag from its scan list.

File Specific Addressing

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
String Files
Long Files
MicroLogix PID Files
MicroLogix Message Files

Function Files
High Speed Counter File (HSC)
Real-Time Clock File (RTC)
Channel 0 Communication Status File (CS0)
Channel 1 Communication Status File (CS1)
I/O Module Status File (IOS)

MicroLogix 1400 Addressing

Open Addressing
The actual number of addresses available depends on the model of the PLC. The ranges have been opened up as such to allow for maximum flexibility with future models. If at runtime the driver finds that an address is not present in the device, the driver will post an error message and remove the tag from its scan list.

File Specific Addressing
Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
Long Files
MicroLogix PID Files
MicroLogix Message Files

Function Files
High Speed Counter File (HSC)
Real-Time Clock File (RTC)
Channel 0 Communication Status File (CS0)
Channel 1 Communication Status File (CS1)
I/O Module Status File (IOS)

Logix Tag-Based Addressing

Introduction
1. Logix vs. client/server data types and tags.
2. Atomic vs. Structure Logix data types.
3. Client/Server tag name and address naming conventions.

Syntax
1. Address format syntax allowed for each Logix atomic data type.
2. Global vs. program controller tags.

Usage
1. Basic use of address formats in addressing Logix atomic data types.
2. Ordering of Logix Array data as returned to the server.
3. Advanced use of address formats in addressing Logix atomic data types.
4. Addressing examples.

Logix Data Type Reference
1. List of pre-defined atomic data types.
2. List of pre-defined structure data types.

Terminology
Terms commonly used throughout this section.

Note: Throughout this help file, Logix Tags are assumed to be global in nature unless specified otherwise.

Addressing Introduction

Rockwell Automation's Integrated Architecture uses a tag or symbol based addressing structure. Commonly referred to as Native Tags or Logix Tags, these tags differ from conventional PLC data items in that the tag name itself is the address, not a physical or logical address.

Important: Before preceding, ssers should become familiar with **Logix Addressing Terminology**.

The Allen-Bradley ControlLogix Ethernet driver allows users to access the controller's atomic data types: BOOL, SINT, INT, DINT, LINT and REAL. Although some of the pre-defined types are structures, they are ultimately based on these atomic data types. Thus, all non-structure (atomic) members of a structure are accessible. For example, a TIMER cannot be assigned to a server tag but an atomic member of the TIMER can be assigned to the tag (for example, TIMER.EN, TIMER.ACC, and so forth.). If a structure member is a structure itself, both structures would have to be expanded to access an atomic member of the substructure. This is more common with user- and module-defined types and is not found in any of the pre-defined types. For more information, refer to **Logix Data Types**.

Atomic Data Type	Description		Range
BOOL	Single bit value	VT_BOOL	0, 1
SINT	Signed 8 bit value	VT_UI1	-128 to 127
INT	Signed 16 bit value	VT_I2	-32,768 to 32,767
DINT	Signed 32 bit value	VT_I4	-2,147,483,648 to 2,147,483,647
LINT	Signed 64 bit value	VT_I8	–9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
REAL	32 bit IEEE Floating point	VT_R4	1.1755 E-38 to 3.403E38, 0, -3.403E-38 to -1.1755

Client/Server Tag Address Rules
Logix Tag names correspond to client/server tag addresses. Logix tag names (entered via RSLogix5000) follow the IEC 1131-3 identifier rules. Client/server tag addresses follow these same rules. They are as follows:

- Must begin with an alphabetic (A-Z, a-z) character or an underscore (_).
- Can only contain alphanumeric characters and underscores.
- Can have as many as 40 characters.
- Cannot have consecutive underscores.
- Are not case sensitive.

Client/Server Tag Name Rules
Tag name assignment in the server differs from address assignment in that names cannot begin with an underscore.

Note: Logix Tag names should be kept to a minimum in size for optimum performance. The smaller the name, the more requests that will be able fit in a single transaction.

Attention Symbolic Mode Users:
Complete client/server Tag addresses should be kept below 400 characters. For example, tagarray[1,2,4].somestruct.substruct_array[3].basetag.[4] is 57 characters in length. Since a packet can only hold 500 data bytes, any overhead bytes that need to be added to the packet can greatly diminish the room available to the characters themselves. By keeping the address below 400, the tag request will remain complete and valid.

See Also: **Performance Optimizations**

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Table Of Contents	Address Formats

Terminology

Term	Definition
Array Element	An element within a Logix Array. For client/server access, the element must be atomic. For example, ARRAYTAG [0].
Array with Offset	A client/server array tag whose address has an array element specified. For example, ARRAYTAG [0] {5}.
Array w/o Offset	A client/server array tag whose address has no array element specified. For example, ARRAYTAG {5}.

Atomic Data Type	A Logix, pre-defined, non-structured data type (for example, SINT, DINT).
Atomic Tag	A Logix tag defined with an Atomic Data Type.
Client	An HMI/SCADA or data bridging software package utilizing OPC, DDE or proprietary client/server protocol to interface with the server.
Client/Server Data Type	Data type for tags defined statically in the server or dynamically in a client. The data types supported in the client depends on the client in use.*
Client/Server Tag	Tag defined statically in the server or dynamically in a client. These tags are different than Logix tags. A Logix tag name becomes a client/server tag address when referencing such Logix tag.
Client/Server Array	Row x column data presentation format supported by the server and by some clients. Not all clients support arrays.
Logix Data Type	A data type defined in RSLogix 5000 for Logix-platform controllers.
Logix Tag	Tag defined in RSLogix 5000 for Logix-platform controllers.
Logix Array	Multi-dimensional array (1, 2 or 3 dimensions possible) support within RSLogix 5000 for Logix-platform controllers. All Logix atomic data types support Logix Arrays. Not all Logix structure data types support Logix Arrays.
Logix Pre-Defined Data Type	Logix Data Type pre-defined for use in RSLogix 5000. **
Logix User-Defined Data Type	Logix Data Type defined by the user for use in the given controller. **
Server	The OPC/DDE/proprietary server utilizing this Allen-Bradley ControlLogix Ethernet Driver.
Structure Data Type	A Logix pre-defined or user-defined data type that consists of members whose data types are atomic or structure in nature.
Structure Tag	A Logix tag defined with a Structure Data Type.

*Supported data types in the server are listed in **Data Type Descriptions**.
For more information, refer to **Logix Data Types.

Logix Address Syntax

Select a link from the list below for more specific information on Logix address syntax.

Address Formats
Address format syntax allowed for each Logix atomic data type.

Tag Scope
Global vs. program controller tags.

Address Formats

There are several ways to address a Logix Tag statically in the server or dynamically from a client. The format used depends on the type and usage of the tag. For example, the bit format woul dbe used when accessing a bit within a SINT-type tag. Every format is native to RSLogix5000 except the Array and String formats. This means that an RSLogix5000 tag name (when referencing an atomic data type), could be copied and pasted into the server's tag address field and be valid. The table below summarizes the valid addressing formats for Logix models.

Format	Notation	Example	Notes
Standard	<logix tag name>	tag_1	Tag cannot be an array.
Array Element	<logix array tag name> [dim 1, dim2, dim 3]	tag_1 [2, 58, 547] tag_1 [0, 3]	Dimension Range = 1 to 3 | Element Range = 0 to 65535
Array w/o Offset*	<logix array tag name> {# columns} <logix array tag name> {# rows}{# columns}	tag_1 {8} tag_1 {2}{4}	Dimension Range = 1 to 2 | Element Range = 1 to 65535 The number of elements to Read/Write equals # of rows times # of columns. If no rows are specified, # of rows will default to 1. The array begins at a zero offset (array index equals 0 for all dimensions).
Array w/ Offset*	<logix array element tag> {# columns} <logix array element tag> {# rows}{# columns}	tag_1 [2, 3] {10} tag_1 [2, 3] 2}{5}	The array begins at an offset specified by the dimensions in the array element tag. The array always covers

			the highest dimension. Thus, tag_1[2,3]{10} would produce an array of elements tag_1[2,3] -> tag_1[2,13]
Bit	<logix tag name>.bit <logix tag name>.[bit]	tag_1.0 tag_1.[0]	Bit Range = 0 to 31 If tag is an array, it must be a BOOL array, otherwise tag cannot be an array.
String	<logix tag name>.Data/<Maximum string length>	tag_1.Data/4	Length Range = 1 to 65535 The maximum number of characters that can Read/Write to the string.

*Since this format may request more than one element, the order in which array data is passed depends on the dimension of the Logix array tag. For example, if rows times cols = 4 and the controller tag is a 3X3 element array, then the elements that are being referenced are array_tag [0,0], array_tag [0,1], array_tag [0,2], and array_tag [1,0] in that exact order. The results would be different if the controller tag were a 2X10 element array.

Note: For more information on how elements are referenced for 1, 2 and 3 dimensional arrays, refer to **Ordering of Array Data**.

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Introduction	Tag Scope

Tag Scope

Global Tags

Global tags are Logix Tags that have global scope in the controller. Any program (task) can access the global tags. The number of ways a global tag can be referenced depends on its Logix Data Type and the address format being used.

Program Tags

Program tags are identical to global tags except a program tag's scope is local to the program in which it is defined. Program tags follow the same addressing rules and limitations as global tags, but are prefixed with the following notation:

Program: <program name> .

For example, Logix Tag tag_1 in program prog_1 would be addressed as Program:prog_1.tag_1 in a client/server tag address.

Structure Tag Addressing

Logix Structure tags, Global or Program, are tags with one or more member tags. Member tags can be atomic or structured in nature.

<stucture name> . <atomic-type tag>

This implies that a substructure would be addressed as:

<structure name> . <substructure name> .<atomic-type tag>

Arrays of structures would be addressed as follows:

<structure array name> [dim1, dim2, dim3] . <atomic-type tag>

Again, this implies that an array of substructures would be addressed as:

<structure name> . <substructure array name> [dim1, dim2, dim3] . <atomic-type tag>

Note: The examples given above are only a few of the many addressing possibilities involving structures. They are displayed in order to provide an introduction to structure addressing. For more information, refer to Allen-Bradley or Rockwell documentation.

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Address Formats | Addressing Atomic Data Types

Logix Address Usage

Select a link from the list below for specific information on Logix address usage.

Addressing Atomic Data Types
Basic use of address formats in addressing Logix atomic data types.

Advanced Addressing
Advanced use of address formats in addressing Logix atomic data types.

Addressing Structure Data Types
How to address atomic structure members.

Addressing STRING Data Type
How to use the pre-defined Logix data type String.

Ordering of Logix Array Data
Ordering of Logix Array data as returned to the server.

Examples
Addressing examples.

Addressing Atomic Data Types

Below are suggested usages and addressing possibilities for a Logix Data Type given the address formats available. Examples are also given for reinforcement. Click on Advanced for advanced addressing possibilities for the given atomic data type. Click on More for more examples, including advanced examples.

Note: Empty cells do not necessarily indicate a lack of support.

Atomic Data Type	Standard	Array Element	Array with or without Offset	Bit	String
BOOL					
Client/Server Data Type **Advanced**	Boolean	Boolean (BOOL 1 dimensional array)	Boolean Array (BOOL 1 dimensional array)		
Client/Server Tag Example **More**	BOOLTAG	BOOLARR[0]	BOOLARR[0]{32}		
SINT					
Client/Server Data Type **Advanced**	Byte, Char	Byte, Char	Byte Array, Char Array (SINT 1/2/3 dimensional array)	Boolean (Bit w/i SINT)	String (SINT 1/2/3 dimensional array)
Client/Server Tag Example **More**	SINTTAG	SINTARR[0]	SINTARR[0]{4}	SINTTAG.0	SINTARR/4
INT					
Client/Server Data Type **Advanced**	Word, Short	Word, Short	Word Array, Short Array (INT 1/2/3 dimensional array)	Boolean (Bit w/i INT)	*
Client/Server Tag Example **More**	INTTAG	INTARR[0]	INTARR[0]{4}	INTTAG.0	
DINT					
Client/Server Data Type	DWord, Long	DWord, Long	DWord Array, Long Array	Boolean	**

Advanced				(Bit w/i DINT)	
Client/Server Tag Example More	DINTTAG	DINTARR[0]	DINTARR[0]{4}	DINTTAG.0	
LINT					
Client/Server Data Type Advanced	Double, Date	Double, Date	Double Array		
Client/Server Tag Example More	LINTTAG	LINTARR[0]	LINTARR[0]{4}		
REAL					
Client/Server Data Type Advanced	Float	Float	Float Array	***	***
Client/Server Tag Example More	REALTAG	REALARR[0]	REALARR[0]{4}		

***See Also:** Advanced Addressing INT.
****See Also:** Advanced Addressing DINT.
*****See Also:** Advanced Addressing REAL.

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Tag Scope	Addressing Structure Data Types

Addressing Structure Data Types

Structures cannot be referenced at the structure level: only the atomic structure members can be addressed. For more information, refer to the examples below.

Logix Tag
MyTimer @ TIMER

Client/Server Tag
1. Invalid

TimerTag address = MyTimer
TimerTag data type = ??

2. Valid
TimerTag address = MyTimer.ACC
TimerTag data type = DWord

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Addressing Atomic Data Types	Ordering of Logix Array Data

Addressing String DATA Type

String is a pre-defined Logix DATA type whose structure contains two members: DATA and LEN. DATA is an array of Sints and stores the characters of the string. LEN is a DINT and represents the number of characters in DATA to display to a client.

Because LEN and DATA are atomic members, they must be referenced independently from a client/server. The syntax is as shown below.

Description	Syntax	Example

String Value	DATA/<Maximum String length >	MYSTRING.DATA/82
Actual String length	LEN	MYSTRING.LEN

Reads
The string read from DATA will be terminated by the following:

a. The first null terminator encountered.

b. The value in LEN if a) doesn't occur first.

c. The <Maximum String length > if either a) or b) doesn't occur first.

Example
MYSTRING.DATA contains "Hello World" in the PLC, but LEN is manually set to 5. A read of MYSTRING.DATA/82 will display "Hello". If LEN is set to 20, MYSTRING.DATA/82 will display "Hello World".

Writes
When a string value is written to DATA, the driver will also write to LEN with the length of DATA written. If the write to LEN fails for any reason, the write operation to DATA will be considered failed as well (despite the fact that the DATA write to the controller succeeded).

Note: This behavior was designed specifically for Logix Tags of type string or a custom derivative of it. The following precautions apply to users who wish to implement their own string in UDTs.

- If a UDT exists that has a DATA member referenced as a string and a LEN member referenced as a DINT, the write to LEN will succeed regardless of the intentions of LEN for the given UDT. Care must be taken when designing UDTs to avoid this possibility if LEN is not intended to be the length of DATA.
- If a UDT exists that has a DATA member referenced as a string but does not have a LEN member, the write to LEN will fail silently without consequence to DATA.

Example
MYSTRING.DATA/82 holds the value "Hello World." MYSTRING.LEN holds 11. If the value "Alarm Triggered" is written to MYSTRING.DATA/82, 15 will be written to MYSTRING.LEN. If the write to MYSTRING.LEN fails, MYSTRING.LEN will hold its previous value of 11 while MYSTRING.DATA/82 displays the first 11 characters ("Alarm Trigg"). If the write to MYSTRING.DATA/82 fails, neither tag is affected.

Bypass Automatically Read String Length
In the Physical Addressing modes, reading STRING.DATA will cause an automatic read of STRING.LEN in Symbolic Mode. This may be bypassed by unchecking the "Automatically Read String length" option. For more information, refer to **Logix Options**.

Ordering of Logix Array Data

1. Dimensional Arrays - array [dim1]
1 dimensional array data is passed to and from the controller in ascending order.
for (dim1 = 0; dim1 < dim1_max; dim1++)

Example: 3 element array
array [0]
array [1]
array [2]

2. Dimensional Arrays - array [dim1, dim2]
2 dimensional array data is passed to and from the controller in ascending order.
for (dim1 = 0; dim1 < dim1_max; dim1++)
for (dim2 = 0; dim2 < dim2_max; dim2++)

Example: 3X3 element array
array [0, 0]
array [0, 1]
array [0, 2]
array [1, 0]
array [1, 1]
array [1, 2]
array [2, 0]
array [2, 1]
array [2, 2]

3. Dimensional Arrays - array [dim1, dim2, dim3]
3 dimensional array data is passed to and from the controller in ascending order.
for (dim1 = 0; dim1 < dim1_max; dim1++)
for (dim2 = 0; dim2 < dim2_max; dim2++)
for (dim3 = 0; dim3 < dim3_max; dim3++)

Example: 3X3x3 element array
array [0, 0, 0]
array [0, 0, 1]
array [0, 0, 2]
array [0, 1, 0]
array [0, 1, 1]
array [0, 1, 2]
array [0, 2, 0]
array [0, 2, 1]
array [0, 2, 2]
array [1, 0, 0]
array [1, 0, 1]
array [1, 0, 2]
array [1, 1, 0]
array [1, 1, 1]
array [1, 1, 2]
array [1, 2, 0]
array [1, 2, 1]
array [1, 2, 2]
array [2, 0, 0]
array [2, 0, 1]
array [2, 0, 2]
array [2, 1, 0]
array [2, 1, 1]
array [2, 1, 2]
array [2, 2, 0]
array [2, 2, 1]
array [2, 2, 2]

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Addressing Structure Data Types	Terminology

Logix Advanced Addressing

Advanced Addressing is available for the following atomic data types. Select a link from the list below for more information on a specific data type.

BOOL
SINT
INT
DINT
LINT
REAL

Advanced Addressing: BOOL

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean Byte, Char Word, Short, BCD DWord, Long, LBCD Float$	None.
Array Element	Boolean	The controller tag must be a 1 dimensional array.
Array w/o Offset	Boolean Array	1. The controller tag must be a 1 dimensional array. 2. The number of elements must be a factor of 8.
Array w/o Offset	Byte Array, Char Array Word Array, Short Array, BCD Array DWord Array, Long Array, LBCD Array Float Array*	Not supported.

Array w/ Offset	Boolean Array	1. The controller tag must be a 1 dimensional array. 2. The offset must lie on 32-bit boundary. 3. The number of elements must be a factor of 8.
Bit	Boolean	1. The controller tag must be a 1 dimensional array. 2. The range is limited from 0 to 31.
String	String	Not supported.

$The Float value will equal face value of the controller tag in Float form (non-IEEE Floating point number).

See Also: **BOOL Examples**

Advanced Addressing: SINT

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean* Byte, Char Word, Short, BCD DWord, Long, LBCD Float $	None.
Array Element	Byte, Char Word, Short, BCD DWord, Long, LBCD Float $	The controller tag must be an array.
Array w/o Offset	Boolean Array	1. Use this case to have the bits within an SINT in array form. **Note:** This is not an array of SINTs in Boolean notation. 2. Applies to bit-within-SINT only. (For example, tag_1.0{8}) 3. .bit + array size cannot exceed 8 bits (For example, tag_1.1{8} exceeds an SINT, tag_1.0{8} does not.)
Array w/o Offset	Byte Array, Char Array Word Array, Short Array, BCD Array # DWord Array, Long Array, LBCD Array # Float Array #,$	If accessing more than a single element, the controller tag must be an array.
Array w/ Offset	Byte Array, Char Array Word Array, Short Array, BCD Array # DWord Array, Long Array, LBCD Array # Float Array #,$	The controller tag must be an array.
Bit	Boolean	1. The range is limited from 0 to 7. 2. If the controller tag is an array, the bit class reference must be prefixed by an array element class reference (for example, tag_1 [2,2,3].0).
String	String	1. If accessing a single element, the controller tag need not be an array. **Note:** The value of the string will be the ASCII equivalent of the SINT value. Example: SINT = 65dec = "A". 2. If accessing more than a single element, the controller tag must be an array. The value of the string will be the null-terminated ASCII equivalent of all the SINTs in the string. 1 character in string = 1 SINT

*Nonzero values will be clamped to true.
Each element of the array corresponds to an element in the SINT array. Arrays are not packed.
$ Float value will equal face value of controller tag in Float form (non-IEEE Floating point number).

See Also: SINT Examples

Advanced Addressing: INT

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean* Byte, Char** Word, Short, BCD DWord, Long, LBCD Float $	None.
Array Element	Byte, Char** Word, Short, BCD DWord, Long, LBCD Float $	The controller tag must be an array.
Array w/o Offset	Boolean Array	1. Use this case to have the bits within an INT in array form. **Note:** This is not an array of INTs in Boolean notation. 2. Applies to bit-within-INT only. (For example, tag_1.0{16}) 3. .bit + array size cannot exceed 16 bits (For example, tag_1.1{16} exceeds an INT, tag_1.0{16} does not.)
Array w/o Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array DWord Array, Long Array, LBCD Array # Float Array #,$	If accessing more than a single element, the controller tag must be an array.
Array w/ Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array DWord Array, Long Array, LBCD Array # Float Array #,$	The controller tag must be an array.
Bit	Boolean	1. The range is limited from 0 to 15. 2. If the controller tag is an array, the bit class reference must be prefixed by an array element class reference (for example, tag_1 [2,2,3].0).
String	String	1. If accessing a single element, the controller tag need not be an array. **Note:** The value of the string will be the ASCII equivalent of the INT value (clamped to 255). Example: INT = 65dec = "A". 2. If accessing more than a single element, the controller tag must be an array. The value of the string will be the null-terminated ASCII equivalent of all the INTs (clamped to 255) in the string. 1 character in string = 1 INT, clamped to 255 INT strings are not packed. For greater efficiency, use SINT strings or the STRING structure instead.

*Nonzero values will be clamped to true.
**Values exceeding 255 will be clamped to 255.
Each element of the array corresponds to an element in the INT array. Arrays are not packed.
$ Float value will equal face value of controller tag in Float form (non-IEEE Floating point number).

See Also: INT Examples

Advanced Addressing: DINT

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean* Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $	None.
Array Element	Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $	The controller tag must be an array.
Array w/o Offset	Boolean Array	1. Use this case to have the bits within an DINT in array form. **Note:** This is not an array of DINTs in Boolean notation. 2. Applies to bit-within-DINT only. (For example, tag_1.0{32}) 3. .bit + array size cannot exceed 32 bits (For example, tag_1.1{32} exceeds an DINT, tag_1.0{32} does not.)
Array w/o Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array*** DWord Array, Long Array, LBCD Array Float Array $	If accessing more than a single element, the controller tag must be an array.
Array w/ Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array*** DWord Array, Long Array, LBCD Array Float Array $	The controller tag must be an array.
Bit	Boolean	1. The range is limited from 0 to 31. 2. If controller tag is an array, bit class reference must be prefixed by an array element class reference (for example, tag_1 [2,2,3].0).
String	String	1. If accessing a single element, the controller tag need not be an array. **Note:** The value of the string will be the ASCII equivalent of the DINT value (clamped to 255). Example: SINT = 65dec = "A". 2. If accessing more than a single element, the controller tag must be an array. The value of the string will be the null-terminated ASCII equivalent of all the DINTs (clamped to 255) in the string. 1 character in string = 1 DINT, clamped to 255 **Note:** DINT strings are not packed. For greater efficiency, use SINT strings or the STRING structure instead.

*Nonzero values will be clamped to true.
**Values exceeding 255 will be clamped to 255.
***Values exceeding 65535 will be clamped to 65535.
$Float value will equal face value of controller tag in Float form (non-IEEE Floating point number).

See Also: DINT Examples

Advanced Addressing: LINT

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Double $ Date*	None.

Array Element	Double $ Date*	The controller tag must be an array.
Array w/o Offset	Double Array $	If accessing more than a single element, the controller tag must be an array.
Array w/ Offset	Double Array $	The controller tag must be an array.
Bit	N/A	Not supported.
String	N/A	Not supported.

$ Double value will equal face value of controller tag in Float form (non-IEEE Floating point number).
*Date values are in universal time (UTC), not localized time.

See Also: **LINT Examples**

Advanced Addressing: REAL

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean* Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $$	None.
Array Element	Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $$	The controller tag must be an array.
Array w/o Offset	Boolean Array	1. Use this case to have the bits within an REAL in array form. **Note:** This is not an array of REALs in Boolean notation. 2. Applies to bit-within-REAL only. (For example, tag_1.0{32}) 3. .bit + array size cannot exceed 32 bits (For example, tag_1.1{32} exceeds an REAL, tag_1.0{32} does not.)
Array w/o Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array*** DWord Array, Long Array, LBCD Array Float Array $$	If accessing more than a single element, the controller tag must be an array.
Array w/ Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array*** DWord Array, Long Array, LBCD Array Float Array $$	The controller tag must be an array.
Bit	Boolean	**1. The range is limited from 0 to 31**. 2. If the controller tag is an array, the bit class reference must be prefixed by an array element class reference (for example, tag_1 [2,2,3].0). **Note:** Float is casted to a DWord to allow referencing of bits.
String	String	1. If accessing a single element, the controller tag need not be an array. **Note:** The value of the string will be the ASCII equivalent of the REAL value (clamped to 255). Example: SINT = 65dec = "A". 2. If accessing more than a single element, the controller tag must be an array. The value of the string will be the null-terminated ASCII equivalent of all the REALs (clamped to 255) in the string.

		1 character in string = 1 REAL, clamped to 255 **Note:** REAL strings are not packed. For greater efficiency, use SINT strings or the STRING structure instead.

*Nonzero values will be clamped to true.
**Values exceeding 255 will be clamped to 255.
***Values exceeding 65535 will be clamped to 65535.
$$ Float value will be a valid IEEE single precision Floating point number.

See Also: REAL Examples

Logix Addressing Examples

Select a link from the list below for addressing examples for the following atomic data types.

BOOL
SINT
INT
DINT
LINT
REAL

Addressing Examples: BOOL

Examples highlighted in yellow signify common use cases.

BOOL Controller Tag - booltag = true

Server Tag Address	Format	Data Type	Notes
booltag	Standard	Boolean	Value = true
booltag	Standard	Byte	Value = 1
booltag	Standard	Word	Value = 1
booltag	Standard	DWord	Value = 1
booltag	Standard	Float	Value = 1.0
booltag [3]	Array Element	Boolean	Invalid: Tag not an array.
booltag [3]	Array Element	Word	Invalid: Tag not an array.
booltag {1}	Array w/o Offset	Word	Invalid: Not supported.
booltag {1}	Array w/o Offset	Boolean	Invalid: Not supported.
booltag [3] {32}	Array w/ Offset	Boolean	Invalid: Tag not an array.
booltag . 3	Bit	Boolean	Invalid: Tag not an array.
booltag / 1	String	String	Invalid: Not supported.
booltag / 4	String	String	Invalid: Not supported.

BOOL Array Controller Tag - bitarraytag = [0,1,0,1]

Server Tag Address	Format	Data Type	Notes
bitarraytag	Standard	Boolean	Invalid: Tag cannot be an array.
bitarraytag	Standard	Byte	Invalid: Tag cannot be an array.
bitarraytag	Standard	Word	Invalid: Tag cannot be an array.
bitarraytag	Standard	DWord	Invalid: Tag cannot be an array.
bitarraytag	Standard	Float	Invalid: Tag cannot be an array.
bitarraytag [3]	Array Element	Boolean	Value = true
bitarraytag [3]	Array Element	Word	Invalid: Bad data type.
bitarraytag {3}	Array w/o Offset	Word	Invalid: Tag cannot be an array.
bitarraytag {1}	Array w/o Offset	Word	Invalid: Tag cannot be an array.
bitarraytag {1}	Array w/o Offset	Boolean	Invalid: Array size must be a factor of 8.
bitarraytag {32}	Array w/o Offset	Boolean	Value = [0,1,0,1,...]
bitarraytag [3] {32}	Array w/ Offset	Boolean	Offset must begin on 32-bit boundary.
bitarraytag[0]{32}	Array w/ Offset	Boolean	Value = [0,1,0,1,...]
bitarraytag[32]{64}	Array w/ Offset	Boolean	Value = [...] *values not provided above*

bitarraytag . 3	Bit	Boolean	Value = true
bitarraytag / 1	String	String	Invalid: Not supported.
bitarraytag / 4	String	String	Invalid: Not supported.

Addressing Examples: SINT

Examples highlighted in yellow signify common use cases.

SINT Controller Tag - sinttag = 122 (decimal)

Server Tag Address	Format	Data Type	Notes
sinttag	Standard	Boolean	Value = true
sinttag	Standard	Byte	Value = 122
sinttag	Standard	Word	Value = 122
sinttag	Standard	DWord	Value = 122
sinttag	Standard	Float	Value = 122.0
sinttag [3]	Array Element	Boolean	Invalid: Tag not an array. Also, Boolean is invalid.
sinttag [3]	Array Element	Byte	Invalid: Tag not an array.
sinttag {3}	Array w/o Offset	Byte	Invalid: Tag not an array.
sinttag {1}	Array w/o Offset	Byte	Value = [122]
sinttag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
sinttag [3] {1}	Array w/ Offset	Byte	Invalid: Tag not an array.
sinttag . 3	Bit	Boolean	Value = true
sinttag . 0 {8}	Array w/o Offset	Boolean	Value = [0,1,0,1,1,1,1,0] Bit value of 122
sinttag / 1	String	String	Value = "z"
sinttag / 4	String	String	Invalid: Tag not an array.

SINT Array Controller Tag - sintarraytag [4,4] = [[83,73,78,84],[5,6,7,8],[9,10,11,12],[13,14,15,16]]

Server Tag Address	Format	Data Type	Notes
sintarraytag	Standard	Boolean	Invalid: Tag cannot be an array.
sintarraytag	Standard	Byte	Invalid: Tag cannot be an array.
sintarraytag	Standard	Word	Invalid: Tag cannot be an array.
sintarraytag	Standard	DWord	Invalid: Tag cannot be an array.
sintarraytag	Standard	Float	Invalid: Tag cannot be an array.
sintarraytag [3]	Array Element	Byte	Invalid: Server tag missing dimension 2 address.
sintarraytag [1,3]	Array Element	Boolean	Invalid: Boolean not allowed for array elements.
sintarraytag [1,3]	Array Element	Byte	Value = 8
sintarraytag {10}	Array w/o Offset	Byte	Value = [83,73,78,84,5,6,7,8,9,10]
sintarraytag {2} {5}	Array w/o Offset	Word	Value = [83,73,78,84,5] [6,7,8,9,10]
sintarraytag {1}	Array w/o Offset	Byte	Value = 83
sintarraytag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
sintarraytag [1,3] {4}	Array w/ Offset	Byte	Value = [8,9,10,11]
sintarraytag . 3	Bit	Boolean	Invalid: Tag must reference atomic location.
sintarraytag [1,3] . 3	Bit	Boolean	Value = 1
sintarraytag [1,3] . 0 {8}	Array w/o Offset	Boolean	Value = [0,0,0,1,0,0,0,0]
sintarraytag / 1	String	String	Value = "S"
sintarraytag / 4	String	String	Value = "SINT"

Addressing Examples: INT

Examples highlighted in yellow signify common use cases.

INT Controller Tag - inttag = 65534 (decimal)

Server Tag Address	Class	Data Type	Notes
inttag	Standard	Boolean	Value = true
inttag	Standard	Byte	Value = 255

inttag	Standard	Word	Value = 65534
inttag	Standard	DWord	Value = 65534
inttag	Standard	Float	Value = 65534.0
inttag [3]	Array Element	Boolean	Invalid: Tag not an array. Also, Boolean is invalid.
inttag [3]	Array Element	Word	Invalid: Tag not an array.
inttag {3}	Array w/o Offset	Word	Invalid: Tag not an array.
inttag {1}	Array w/o Offset	Word	Value = [65534]
inttag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
inttag [3] {1}	Array w/ Offset	Word	Invalid: Tag not an array.
inttag . 3	Bit	Boolean	Value = true
inttag . 0 {16}	Array w/o Offset	Boolean	Value = [0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1] Bit value of 65534
inttag / 1	String	String	Value = unprintable character = 255 decimal.
inttag / 4	String	String	Invalid: Tag not an array.

INT Array Controller Tag - intarraytag [4,4] = [[73,78,84,255],[256,257,258,259],[9,10,11,12],[13,14,15,16]]

Server Tag Address	Class	Data Type	Notes
intarraytag	Standard	Boolean	Invalid: Tag cannot be an array.
intarraytag	Standard	Byte	Invalid: Tag cannot be an array.
intarraytag	Standard	Word	Invalid: Tag cannot be an array.
intarraytag	Standard	DWord	Invalid: Tag cannot be an array.
intarraytag	Standard	Float	Invalid: Tag cannot be an array.
intarraytag [3]	Array Element	Word	Invalid: Server tag missing dimension 2 address.
intarraytag [1,3]	Array Element	Boolean	Invalid: Boolean not allowed for array elements.
intarraytag [1,3]	Array Element	Word	Value = 259
intarraytag {10}	Array w/o Offset	Byte	Value = [73,78,84,255,255,255,255,255,9,10]
intarraytag {2} {5}	Array w/o Offset	Word	Value = [73,78,84,255,256] [257,258,259,9,10]
intarraytag {1}	Array w/o Offset	Word	Value = 73
intarraytag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
intarraytag [1,3] {4}	Array w/ Offset	Word	Value = [259,9,10,11]
intarraytag . 3	Bit	Boolean	Invalid: Tag must reference atomic location.
intarraytag [1,3] . 3	Bit	Boolean	Value = 0
intarraytag [1,3] . 0 {16}	Array w/o Offset	Boolean	Value = [1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0] Bit value for 259
intarraytag / 1	String	String	Value = "I"
intarraytag / 3	String	String	Value = "INT"

Addressing Examples: DINT

Examples highlighted in yellow signify common use cases.

DINT Controller Tag - dinttag = 70000 (decimal)

Server Tag Address	Format	Data Type	Notes
dinttag	Standard	Boolean	Value = true
dinttag	Standard	Byte	Value = 255
dinttag	Standard	Word	Value = 65535
dinttag	Standard	DWord	Value = 70000
dinttag	Standard	Float	Value = 70000.0
dinttag [3]	Array Element	Boolean	Invalid: Tag not an array. Also, Boolean is invalid.
dinttag [3]	Array Element	DWord	Invalid: Tag not an array.
dinttag {3}	Array w/o Offset	DWord	Invalid: Tag not an array.
dinttag {1}	Array w/o Offset	DWord	Value = [70000]
dinttag {1}	Array w/o Offset	Boolean	Invalid: Bad data type
dintag [3] {1}	Array w/ Offset	DWord	Invalid: Tag not an array.
dinttag . 3	Bit	Boolean	Value = false
dinttag . 0 {32}	Array w/o Offset	Boolean	Value = [0,0,0,0,1,1,1,0,1,0,0,0,1,0,0,0,1,0,...0]

			Bit value for 70000
dinttag / 1	String	String	Value = unprintable character = 255 decimal
dinttag / 4	String	String	Invalid: Tag not an array.

DINT Array Controller Tag - dintarraytag [4,4] = [[68,73,78,84],[256,257,258,259],[9,10,11,12],[13,14,15,16]]

Server Tag Address	Format	Data Type	Notes
dintarraytag	Standard	Boolean	Invalid: Tag cannot be an array.
dintarraytag	Standard	Byte	Invalid: Tag cannot be an array.
dintarraytag	Standard	Word	Invalid: Tag cannot be an array.
dintarraytag	Standard	DWord	Invalid: Tag cannot be an array.
dintarraytag	Standard	Float	Invalid: Tag cannot be an array.
dintarraytag [3]	Array Element	DWord	Invalid: Server tag missing dimension 2 address.
dintarraytag [1,3]	Array Element	Boolean	Invalid: Boolean not allowed for array elements.
dintarraytag [1,3]	Array Element	DWord	Value = 259
dintarraytag {10}	Array w/o Offset	Byte	Value = [68,73,78,84,255,255,255,255,9,10]
dintarraytag {2}{5}	Array w/o Offset	DWord	Value = [68,73,78,84,256] [257,258,259,9,10]
dintarraytag {1}	Array w/o Offset	DWord	Value = 68
dintarraytag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
dintarraytag [1,3]{4}	Array w/ Offset	DWord	Value = [259,9,10,11]
dintarraytag . 3	Bit	Boolean	Invalid: Tag must reference atomic location.
dintarraytag [1,3] . 3	Bit	Boolean	Value = 0
dintarraytag [1,3] .0 {32}	Array w/o Offset	Boolean	Value = [1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0] Bit value for 259
dintarraytag / 1	String	String	Value = "D"
dintarraytag / 3	String	String	Value = "DINT"

Addressing Examples: LINT

Examples highlighted in yellow signify common use cases.

LINT Controller Tag - linttag = 2007-01-01T16:46:40.000 (date) == 1.16767E+15 (decimal)

Server Tag Address	Format	Data Type	Notes
linttag	Standard	Boolean	Invalid: Boolean not supported.
linttag	Standard	Byte	Invalid: Byte not supported.
linttag	Standard	Word	Invalid: Word not supported.
linttag	Standard	Double	Value = 1.16767E+15
linttag	Standard	Date	Value = 2007-01-01T16:46:40.000*
linttag [3]	Array Element	Boolean	Invalid: Tag not an array. Also, Boolean is invalid.
linttag [3]	Array Element	Double	Invalid: Tag not an array.
linttag {3}	Array w/o Offset	Double	Invalid: Tag not an array.
linttag {1}	Array w/o Offset	Double	Value = [1.16767E+15]
linttag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
lintag [3] {1}	Array w/ Offset	Double	Invalid: Tag not an array.
linttag . 3	Bit	Boolean	Invalid: Syntax/data type not supported.
linttag / 1	String	String	Invalid: Syntax/data type not supported.

*Date values are in universal time (UTC), not localized time.

LINT Array Controller Tag - dintarraytag [2,2] = [0, 1.16767E+15],[9.4666E+14, 9.46746E+14] where:

1.16767E+15 == 2007-01-01T16:46:40.000 (date)
9.4666E+14 == 1999-12-31T17:06:40.000
9.46746E+14 == 2000-01-1T17:00:00.000
0 == 1970-01-01T00:00:00.000

Server Tag Address	Format	Data Type	Notes

lintarraytag	Standard	Boolean	Invalid: Boolean not supported.
lintarraytag	Standard	Byte	Invalid: Byte not supported.
lintarraytag	Standard	Word	Invalid: Word not supported.
lintarraytag	Standard	Double	Invalid: Tag cannot be an array.
lintarraytag	Standard	Date	Invalid: Tag cannot be an array.
lintarraytag [1]	Array Element	Double	Invalid: Server tag missing dimension 2 address.
lintarraytag [1,1]	Array Element	Boolean	Invalid: Boolean not allowed for array elements.
lintarraytag [1,1]	Array Element	Double	Value = 9.46746E+14
lintarraytag [1,1]	Array Element	Date	Value = 2000-01-01T17:00:00.000*
lintarraytag {4}	Array w/o Offset	Double	Value = [0, 1.16767E+15, 9.4666E+14, 9.46746E+14]
lintarraytag {2} {2}	Array w/o Offset	Double	Value = [0, 1.16767E+15][9.4666E+14, 9.46746E+14]
lintarraytag {4}	Array w/o Offset	Date	Invalid: Date array not supported.
lintarraytag {1}	Array w/o Offset	Double	Value = 0
lintarraytag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
lintarraytag [0,1] {2}	Array w/ Offset	Double	Value = [1.16767E+15, 9.4666E+14]
lintarraytag . 3	Bit	Boolean	Invalid: Syntax/data type not supported.
lintarraytag / 1	String	String	Invalid: Syntax/data type not supported.

*Date values are in universal time (UTC), not localized time.

Addressing Examples: REAL

Examples highlighted in yellow signify common use cases.

REAL Controller Tag - realtag = 512.5 (decimal)

Server Tag Address	Format	Data Type	Notes
realtag	Standard	Boolean	Value = true
realtag	Standard	Byte	Value = 255
realtag	Standard	Word	Value = 512
realtag	Standard	DWord	Value = 512
realtag	Standard	Float	Value = 512.5
realtag [3]	Array Element	Boolean	Invalid: Tag not an array. Also, Boolean is invalid.
realtag [3]	Array Element	DWord	Invalid: Tag not an array.
realtag {3}	Array w/o Offset	DWord	Invalid: Tag not an array.
realtag {1}	Array w/o Offset	Float	Value = [512.5]
realtag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
realtag [3] {1}	Array w/ Offset	Float	Invalid: Tag not an array.
realtag . 3	Bit	Boolean	Value = true
realtag . 0 {32}	Array w/o Offset	Boolean	Value = [0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,...0] Bit value for 512
realtag / 1	String	String	Value = unprintable character = 255 decimal
realtag / 4	String	String	Invalid: Tag not an array.

REAL Array Controller Tag - realarraytag [4,4] = [[82.1,69.2,65.3,76.4],[256.5,257.6,258.7,259.8],[9.0,10.0,11.0,12.0],[13.0,14.0,15.0,16.0]]

Server Tag Address	Format	Data Type	Notes
realarraytag	Standard	Boolean	Invalid: Tag cannot be an array.
realarraytag	Standard	Byte	Invalid: Tag cannot be an array.
realarraytag	Standard	Word	Invalid: Tag cannot be an array.
realarraytag	Standard	DWord	Invalid: Tag cannot be an array.
realarraytag	Standard	Float	Invalid: Tag cannot be an array.
realarraytag [3]	Array Element	Float	Invalid: Server tag missing dimension 2 address.
realarraytag [1,3]	Array Element	Boolean	Invalid: Boolean not allowed for array elements.
realarraytag [1,3]	Array Element	Float	Value = 259.8
realarraytag {10}	Array w/o Off-set	Byte	Value = [82,69,65,76,255,255,255,255,9,10]
realarraytag {2} {5}	Array w/o Off-	Float	Value = [82.1,69.2,65.3,76.4,256.5] [257.6,258.7,259.8,9,10]

	set		
realarraytag {1}	Array w/o Offset	Float	Value = 82.1
realarraytag {1}	Array w/o Offset	Boolean	Invalid: Bad data type.
realarraytag [1,3] {4}	Array w/ Offset	Float	Value = [259.8,9.0,10.0,11.0]
realarraytag . 3	Bit	Boolean	Invalid: Tag must reference atomic location.
realarraytag [1,3] . 3	Bit	Boolean	Value = 0
realarraytag [1,3] . 0 {32}	Array w/o Offset	Boolean	Value = [1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0] Bit value for 259
realarraytag / 1	String	String	Value = "R"
realarraytag / 3	String	String	Value = "REAL"

Logix Data Types

Atomic Data Types

BOOL
SINT
INT
DINT
REAL

Structure Data Types

For more information on the controller's pre-defined data types, refer to the device's documentation.

File Listing

Select a link from the list below for information on a specific file supported by various device models.

Output Files
Input Files
Status Files
Binary Files
Timer Files
Counter Files
Control Files
Integer Files
Float Files
ASCII Files
String Files
BCD Files
Long Files
MicroLogix PID Files
PID Files
MicroLogixMessage Files
Message Files
Block Transfer Files

Function File Listing

High Speed Counter File (HSC)
Real-Time Clock File (RTC)
Channel 0 Communication Status File (CS0)
Channel 1 Communication Status File (CS1)
I/O Module Status File (IOS)

Note: For more information on device models and their supported files, refer to **Address Descriptions**.

Output Files

The syntax for accessing data in the output file differs depending on the PLC model. Arrays are not supported for output files. The default data types are shown in **bold**.

PLC-5 Syntax

Syntax	Data Type	Access
O:<word>	Short, **Word**, BCD	Read/Write
O:<word>/<bit>	**Boolean**	Read/Write
O/bit	**Boolean**	Read/Write

Note: Word and bit address information is in octal for PLC-5 models. This follows the convention of the programming software.

Micrologix Syntax

Syntax	Data Type	Access
O:<word>	Short, **Word**, BCD	Read/Write
O:<word>/<bit>	**Boolean**	Read/Write
O/bit	**Boolean**	Read/Write

Micrologix models have two types of I/O: embedded I/O and expansion I/O (not applicable for Micrologix 1000). Embedded I/O resides with the CPU base unit while Expansion I/O plugs into the CPU base unit. The table below lists the I/O capabilities of each Micrologix model.

Micrologix Model	Embedded I/O	Expansion I/O
1000	Slot 0	N/A
1100	Slot 0	Slots 1-4
1200	Slot 0	Slots 1-6
1400	Slot 0	Slots 1-7
1500	Slot 0	Slots 1-16

The address syntax for Micrologix I/O references a zero-based word offset, not a slot. Thus, calculations must be done to determine the word offset to a particular slot. This requires knowledge of the modules and their respective size in words. Below is a table specifying the size of some available modules but it is recommended that users consult both the Micrologix documentation and the controller project to determine the true word size of a module.

Micrologix Embedded I/O Word Sizes

Micrologix Model	# Input Words	# Output Words
1000	2	1
1100	6	4
1200	4	4
1400	8	6
1500	4	4

Micrologix Expansion I/O Word Sizes

Modules	# Input Words	# Output Words
1769-HSC	35	34
1769-IA8I	1	0
1769-IA16	1	0
1769-IF4	6	0
1769-IF4XOF2	8	2
1769-IF8	12	1
1769-IM12	1	0
1769-IQ16	1	0
1769-IQ6XOW4	1	1
1769-IQ16F	1	0
1769-IQ32	2	0
1769-IR6	8	0
1769-IT6	8	0
1769-OA8	0	1
1769-OA16	0	1
1769-OB8	0	1

1769-OB16	0	1
1769-OB16P	0	1
1769-OB32	0	2
1769-OF2	2	2
1769-OF8C	11	9
1769-OF8V	11	9
1769-OV16	0	1
1769-OW8	0	1
1769-OW16	0	1
1769-OW8I	0	1
1769-SDN	66	2
1769-SM1	12	12
1769-SM2	7	7
1769-ASCII	108	108
1762-IA8	1	0
1762-IF2OF2	6	2
1762-IF4	7	0
1762-IQ8	1	0
1762-IQ8OW6	1	1
1762-IQ16	1	0
1762-OA8	0	1
1762-OB8	0	1
1762-OB16	0	1
1762-OW8	0	1
1762-OW16	0	1
1762-IT4	6	0
1762-IR4	6	0
1762-OF4	2	4
1762-OX6I	0	1

Calculation
Output Word Offset for Slot x = # Output Words in Slot 0 through Slot (x-1).

Note 1: The Embedded I/O needs to be taken into account when offsetting to Expansion I/O.

Note 2: The number of Input words does not factor into the calculation for Output Word Offset.

I/O Example
Let
Slot 0 = Micrologix 1500 LRP Series C = 4 Output Words
Slot 1 = 1769-OF2 = 2 Output Words
Slot 2 = 1769-OW8 = 1 Output Word
Slot 3 = 1769-IA16 = 0 Output Word
Slot 4 = 1769-OF8V = 9 Output Word
Bit 5 of Slot 4 = 4 + 2 + 1 = 7 words = O:7/5

SLC 500 Syntax
The default data types are shown in **bold**.

Syntax	Data Type	Access
O:<slot>	Short, **Word**, BCD	Read Only
O:<slot>.<word>	Short, **Word**, BCD	Read Only
O:<slot>/<bit>	**Boolean**	Read Only
O:<slot>.<word>/<bit>	**Boolean**	Read Only

Ranges
PLC Model	Min Slot	Max Slot	Max Word
Micrologix	NA	NA	2047

SLC 500 Fixed I/O	NA	NA	1
SLC 500 Modular I/O	1	30	*
PLC-5 Series	NA	NA	277 (octal)

*The number of Input or Output words available for each I/O module can be found in the **Modular I/O Selection Guide**. For slot configuration help, refer to **Device Setup**.

Examples

Micrologix	
O:0	word 0
O/2	bit 2
O:0/5	bit 5

SLC 500 Fixed I/O	
O:0	word 0
O:1	word 1
O/16	bit 16
O:1/0	bit 0 word 1 (same as O/16)

PLC5*	
O:0	word 0
O:37	word 31 (37 octal = 31 decimal)
O/42	bit 34 (42 octal = 34 decimal)
O:2/2	bit 2 word 2 (same as O/42)

*Addresses are in Octal.

SLC 500 Modular I/O	
O:1	word 0 slot 1
O:1.0	word 0 slot 1 (same as O:1)
O:12	word 0 slot 12
O:12.2	word 2 slot 12
O:4.0/0	bit 0 word 0 slot 4
O:4/0	bit 0 slot 4 (same as O:4.0/0)
O:4.2/0	bit 0 word 2 slot 4
O:4/32	bit 32 slot 4 (same as O:4.2/0)

Input Files

The syntax for accessing data in the input file differs depending on the PLC model. Arrays are not supported for input files. The default data types are shown in **bold**.

PLC-5 Syntax

Syntax	**Data Type**	**Access**
I:<word>	Short, **Word**, BCD	Read/Write
I:<word>/<bit>	**Boolean**	Read/Write
I/bit	**Boolean**	Read/Write

Note: Word and bit address information is in octal for PLC-5 models. This follows the convention of the programming software.

Micrologix Syntax

Syntax	**Data Type**	**Access**
I:<word>	Short, **Word**, BCD	Read/Write
I:<word>/<bit>	**Boolean**	Read/Write
I/bit	**Boolean**	Read/Write

Micrologix models have two types of I/O: embedded I/O and expansion I/O (not applicable for Micrologix 1000). Embedded I/O resides with the CPU base unit while Expansion I/O plugs into the CPU base unit. The table below lists the I/O capabilities of each Micrologix model.

Micrologix Model	Embedded I/O	Expansion I/O
1000	Slot 0	N/A
1100	Slot 0	Slots 1-4
1200	Slot 0	Slots 1-6
1400	Slot 0	Slots 1-7
1500	Slot 0	Slots 1-16

The address syntax for Micrologix I/O references a zero-based word offset, not a slot. Thus, calculations must be done to determine the word offset to a particular slot. This requires knowledge of the modules and their respective size in words. Below is a table specifying the size of some available modules but it is recommended that the Micrologix documentation and controller project be consulted in order to determine the true word size of a module.

Micrologix Embedded I/O Word Sizes

Micrologix Model	# Input Words	# Output Words
1000	2	1
1100	6	4
1200	4	4
1400	8	6
1500	4	4

Micrologix Expansion I/O Word Sizes

Modules	# Input Words	# Output Words
1769-HSC	35	34
1769-IA8I	1	0
1769-IA16	1	0
1769-IF4	6	0
1769-IF4XOF2	8	2
1769-IF8	12	1
1769-IM12	1	0
1769-IQ16	1	0
1769-IQ6XOW4	1	1
1769-IQ16F	1	0
1769-IQ32	2	0
1769-IR6	8	0
1769-IT6	8	0
1769-OA8	0	1
1769-OA16	0	1
1769-OB8	0	1
1769-OB16	0	1
1769-OB16P	0	1
1769-OB32	0	2
1769-OF2	2	2
1769-OF8C	11	9
1769-OF8V	11	9
1769-OV16	0	1
1769-OW8	0	1
1769-OW16	0	1
1769-OW8I	0	1
1769-SDN	66	2
1769-SM1	12	12
1769-SM2	7	7
1769-ASCII	108	108

1762-IA8	1	0
1762-IF2OF2	6	2
1762-IF4	7	0
1762-IQ8	1	0
1762-IQ8OW6	1	1
1762-IQ16	1	0
1762-OA8	0	1
1762-OB8	0	1
1762-OB16	0	1
1762-OW8	0	1
1762-OW16	0	1
1762-IT4	6	0
1762-IR4	6	0
1762-OF4	2	4
1762-OX6I	0	1

Calculation

Input Word Offset for Slot x = # Input Words in Slot 0 through Slot (x-1).

Note 1: The Embedded I/O needs to be taken into account when offsetting to Expansion I/O.

Note 2: The number of Output words does not factor into the calculation for Input Word Offset.

I/O Example

Let
Slot 0 = Micrologix 1500 LRP Series C = 4 Input Words
Slot 1 = 1769-OF2 = 2 Input Words
Slot 2 = 1769-OW8 = 0 Input Word
Slot 3 = 1769-IA16 = 1 Input Word
Slot 4 = 1769-OF8V = 11 Input Word
Bit 5 of Slot 3 = 4 + 2 = 6 words = I:6/5

SLC 500 Syntax

Syntax	Data Type	Access
I:<slot>	Short, **Word**, BCD	Read Only
I:<slot>.<word>	Short, **Word**, BCD	Read Only
I:<slot>/<bit>	**Boolean**	Read Only
I:<slot>.<word>/<bit>	**Boolean**	Read Only

Ranges

PLC Model	Min Slot	Max Slot	Max Word
Micrologix	NA	NA	2047
SLC 500 Fixed I/O	NA	NA	1
SLC 500 Modular I/O	1	30	*
PLC-5 Series	NA	NA	277 (octal)

*The number of Input or Output words available for each I/O module can be found in the **Modular I/O Selection Guide**. For slot configuration help, refer to **Device Setup**.

Examples

Micrologix	
I:0	Word 0
I/2	Bit 2
I:1/5	Bit 5 word 1

SLC 500 Fixed I/O	
I:0	Word 0
I:1	Word 1

I/16	bit 16
I:1/0	Bit 0 word 1 (same as I/16)

PLC5*	
I:0	Word 0
I:10	Word 8 (10 octal = 8 decimal)
I/20	Bit 16 (20 octal = 16 decimal)
I:1/0	Bit 0 word 1 (same as I/20)

*Addresses are in Octal.

SLC 500 Modular I/O	
I:1	Word 0 slot 1
I:1.0	Word 0 slot 1 (same as I:1)
I:12	Word 0 slot 12
I:12.2	Word 2 slot 12
I:4.0/0	Bit 0 word 0 slot 4
I:4/0	Bit 0 slot 4 (same as I:4.0/0)
I:4.2/0	Bit 0 word 2 slot 4
I:4/32	Bit 32 slot 4 (same as I:4.2/0)

Status Files

To access status files, specify a word and an optional bit in the word. The default data types are shown in **bold**.

Syntax	Data Type	Access
S:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Read/Write
S:<word> [rows][cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
S:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
S:<word>/<bit>	**Boolean**	Read/Write
S/bit	**Boolean**	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that the array size cannot exceed 16 words given a block request size of 32 bytes.

Ranges

PLC Model	Max Word
Micrologix	999
SLC 500 Fixed I/O	96
SLC 500 Modular I/O	999
PLC-5 Series	999

The maximum word location is one less when accessing as a 32 bit data type (Long, DWord or Long BCD).

Examples

Example	Description
S:0	Word 0
S/26	Bit 26
S:4/15	Bit 15 word 4
S:10 [16]	16 element array starting at word 10
S:0 [4] [8]	4 by 8 element array starting at word 0

Binary Files

To access binary files, specify a file number, a word and optional bit in the word. The default data types are shown in **bold**.

Syntax	Data Type	Access
B<file>:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Read/Write

B<file>:<word> [rows][cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
B<file>:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
B<file>:<word>/<bit>	**Boolean**	Read/Write
B<file>/bit	**Boolean**	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that array size cannot exceed 16 words given a block request size of 32 bytes.

Ranges

PLC Model	File Number	Max Word
Micrologix	3, 9-999	999
SLC 500 Fixed I/O	3, 9-255	255
SLC 500 Modular I/O	3, 9-999	999
PLC-5 Series	3-999	1999

The maximum word location is one less when accessing as a 32 bit data type (Long, DWord or Long BCD).

Examples

Example	Description
B3:0	Word 0
B3/26	Bit 26
B12:4/15	Bit 15 word 4
B3:10 [20]	20 element array starting at word 10
B15:0 [6] [6]	6 by 6 element array starting at word 0

Timer Files

Timer files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

Syntax	Data Type	Access
T<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For a description of the usage of each field, refer to the PLC documentation.

Element Field	Data Type	Access
ACC	**Short**, Word	Read/Write
PRE	**Short**, Word	Read/Write
DN	**Boolean**	Read Only
TT	**Boolean**	Read Only
EN	**Boolean**	Read Only

Ranges

PLC Model	File Number	Max Element
Micrologix	4, 9-999	999
SLC 500 Fixed I/O	4, 9-255	255
SLC 500 Modular I/O	4, 9-999	999
PLC-5 Series	3-999	1999

Examples

Example	Description
T4:0.ACC	Accumulator of timer 0 file 4
T4:10.DN	Done bit of timer 10 file 4
T15:0.PRE	Preset of timer 0 file15

Counter Files

Counter files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

Syntax	Data Type	Access
C<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
ACC	**Word**, Short	Read/Write
PRE	**Word**, Short	Read/Write
UA	**Boolean**	Read Only
UN	**Boolean**	Read Only
OV	**Boolean**	Read Only
DN	**Boolean**	Read Only
CD	**Boolean**	Read Only
CU	**Boolean**	Read Only

Ranges

PLC Model	File Number	Max Element
Micrologix	5, 9-999	999
SLC 500 Fixed I/O	5, 9-255	255
SLC 500 Modular I/O	5, 9-999	999
PLC-5 Series	3-999	1999

Examples

Example	Description
C5:0.ACC	Accumulator of counter 0 file 5
C5:10.DN	Done bit of counter 10 file 5
C15:0.PRE	Preset of counter 0 file 15

Control Files

Control files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

Syntax	Data Type	Access
R<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For more information about the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
LEN	**Word**, Short	Read/Write
POS	**Word**, Short	Read/Write
FD	**Boolean**	Read Only
IN	**Boolean**	Read Only
UL	**Boolean**	Read Only
ER	**Boolean**	Read Only
EM	**Boolean**	Read Only
DN	**Boolean**	Read Only
EU	**Boolean**	Read Only
EN	**Boolean**	Read Only

Ranges

PLC Model	File Number	Max Element

Micrologix	6, 9-999	999
SLC 500 Fixed I/O	6, 9-255	255
SLC 500 Modular I/O	6, 9-999	999
PLC-5 Series	3-999	1999

Examples

Example	Description
R6:0.LEN	Length field of control 0 file 6
R6:10.DN	Done bit of control 10 file 6
R15:18.POS	Position field of control 18 file 15

Integer Files

To access integer files, specify a file number, a word and an optional bit in the word. The default data types are shown in **bold**.

Syntax	Data Type	Access
N<file>:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Read/Write
N<file>:<word> [rows][cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
N<file>:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array type)	Read/Write
N<file>:<word>/<bit>	**Boolean**	Read/Write
N<file>/bit	**Boolean**	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that array size cannot exceed 16 words given a block request size of 32 bytes.

Ranges

PLC Model	File Number	Max Word
Micrologix	7, 9-999	999
SLC 500 Fixed I/O	7, 9-255	255
SLC 500 Modular I/O	7, 9-999	999
PLC-5 Series	3-999	1999

The maximum word location is one less when accessing as a 32 bit data type (Long, DWord or Long BCD).

Examples

Example	Description
N7:0	Word 0
N7/26	Bit 26
N12:4/15	Bit 15 word 4
N7:10 [8]	8 element array starting at word 10
N15:0 [4] [5]	4 by 5 element array starting at word 0

Float Files

To access float files, specify a file number and an element. The default data types are shown in **bold**.

Syntax	Data Type	Access
F<file>:<element>	**Float**	Read/Write
F<file>:<element> [rows][cols]	**Float** (array type)	Read/Write
F<file>:<element> [cols]	**Float** (array type)	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that array size cannot exceed 8 Floats given a block request size of 32 bytes.

Ranges

PLC Model	File Number	Max Word
Micrologix	8-999	999

SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	8-999	999
PLC-5 Series	3-999	1999

Examples

Example	Description
F8:0	Float 0
F8:10 [16]	16 element array starting at word 10
F15:0 [4] [4]	16 element array starting at word 0

ASCII Files

To access ASCII file data, specify a file number and a character location. The default data types are shown in **bold**.

Syntax	Data Type	Access
A<file>:<char>	**Char**, Byte*	Read/Write
A<file>:<char> [rows][cols]	**Char**, Byte*	Read/Write
A<file>:<char> [cols]	**Char**, Byte*	Read/Write
A<file>:<word offset>/length	String**	Read/Write

*The number of array elements cannot exceed the block request size specified. Internally, the PLC packs two characters per word in the file, with the high byte containing the first character and the low byte containing the second character. The PLC programming software allows access at the word level or two-character level. The Allen-Bradley ControlLogix Ethernet driver allows accessing to the character level.

Using the programming software, **A10:0 = AB**, would result in 'A' being stored in the high byte of A10:0 and 'B' being stored in the low byte. Using the Allen-Bradley ControlLogix Ethernet driver, two assignments would be made: **A10:0 = A** and **A10:1 = B**. This would result in the same data being stored in the PLC memory.

**Referencing this file as string data allows access to data at word boundaries like the programming software. The length can be up to 232 characters. If a string that is sent to the device is smaller in length than the length specified by the address, the driver null terminates the string before sending it down to the controller.

Ranges

PLC Model	File Number	Max Character
Micrologix	3-255	511
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	9-999	1999
PLC-5 Series	3-999	1999

Note: Not all Micrologix and SLC 500 PLC devices support ASCII file types. For more information, refer to the PLC documentation.

Examples

Example	Description
A9:0	character 0 (high byte of word 0)
A27:10 [80]	80 character array starting at character 10
A15:0 [4] [16]	4 by 16 character array starting at character 0
A62:0/32	32 character string starting at word offset 0

String Files

To access string files, specify a file number and an element. Strings are 82 character null terminated arrays. The driver places the null terminator based on the string length returned by the PLC. The default data types are shown in **bold**.

Note: Arrays are not supported for String files.

Syntax	Data Type	Access
ST<file>:<element>.<field>	**String**	Read/Write

Ranges

PLC Model	File Number	Max Word
Micrologix	9-999	999
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	9-999	999
PLC-5 Series	3-999	999

Examples

Example	Description
ST9:0	String 0
ST18:10	String 10

BCD Files

To access BCD files, specify a file number and a word. The default data types are shown in **bold**.

PLC-5 Syntax

Syntax	Data Type	Access
D<file>:<word>	**BCD**, LBCD	Read/Write
D<file>:<word> [rows][cols]	**BCD**, LBCD (array type)	Read/Write
D<file>:<word> [cols]	**BCD**, LBCD (array type)	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that array size cannot exceed 16 BCD, given a block request size of 32 bytes.

Ranges

PLC Model	File Number	Max Word
Micrologix	NA	NA
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	NA	NA
PLC-5 Series	3-999	999

Examples

Example	Description
D9:0	word 0
D27:10 [16]	16 element array starting at word 10
D15:0 [4][8]	32 element array starting at word 0

Long Files

To access long integer files, specify a file number and an element. The default data types are shown in **bold**.

Syntax	Data Type	Access
L<file>:<DWord>	Long, **DWord**, LBCD	Read/Write
L<file>:<DWord> [rows][cols]	Long, **DWord**, LBCD (array type)	Read/Write
L<file>:<DWord> [cols]	Long, **DWord**, LBCD (array type)	Read/Write

The number of array elements (in bytes) cannot exceed the block request size specified. This means that array size cannot exceed 8 longs given a block request size of 32 bytes.

Ranges

PLC Model	File Number	Max Word
Micrologix	9-999	999
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	NA	NA
PLC-5 Series	NA	NA

Examples

Example	Description
L9:0	word 0
L9:10 [8]	8 element array starting at word 10
L15:0 [4] [5]	4 by 5 element array starting at word 0

MicroLogix PID Files

PID files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold**.

Syntax	Data Type	Access
PD<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. Refer to the PLC documentation for the meaning of each field.

Element Field	Data Type	Access
SPS	**Word**, Short	Read/Write
KC	**Word**, Short	Read/Write
TI	**Word**, Short	Read/Write
TD	**Word**, Short	Read/Write
MAXS	**Word**, Short	Read/Write
MINS	**Word**, Short	Read/Write
ZCD	**Word**, Short	Read/Write
CVH	**Word**, Short	Read/Write
CVL	**Word**, Short	Read/Write
LUT	**Word**, Short	Read/Write
SPV	**Word**, Short	Read/Write
CVP	**Word**, Short	Read/Write
TM	**Boolean**	Read/Write
AM	**Boolean**	Read/Write
CM	**Boolean**	Read/Write
OL	**Boolean**	Read/Write
RG	**Boolean**	Read/Write
SC	**Boolean**	Read/Write
TF	**Boolean**	Read/Write
DA	**Boolean**	Read/Write
DB	**Boolean**	Read/Write
UL	**Boolean**	Read/Write
LL	**Boolean**	Read/Write
SP	**Boolean**	Read/Write
PV	**Boolean**	Read/Write
DN	**Boolean**	Read/Write
EN	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	3-255	255
All SLC	NA	NA
PLC-5	**PID Files**	**PID Files**

Examples

Example	Description
PD14:0.KC	Proportional gain of PD 0 file 14
PD18:6.EN	PID enable bit of PD 6 file 18

PID Files

PID files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

PLC-5 Syntax

Syntax	Data Type	Access
PD<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
SP	**Real**	Read/Write
KP	**Real**	Read/Write
KI	**Real**	Read/Write
KD	**Real**	Read/Write
BIAS	**Real**	Read/Write
MAXS	**Real**	Read/Write
MINS	**Real**	Read/Write
DB	**Real**	Read/Write
SO	**Real**	Read/Write
MAXO	**Real**	Read/Write
MINO	**Real**	Read/Write
UPD	**Real**	Read/Write
PV	**Real**	Read/Write
ERR	**Real**	Read/Write
OUT	**Real**	Read/Write
PVH	**Real**	Read/Write
PVL	**Real**	Read/Write
DVP	**Real**	Read/Write
DVN	**Real**	Read/Write
PVDB	**Real**	Read/Write
DVDB	**Real**	Read/Write
MAXI	**Real**	Read/Write
MINI	**Real**	Read/Write
TIE	**Real**	Read/Write
FILE	**Word**, Short	Read/Write
ELEM	**Word**, Short	Read/Write
EN	**Boolean**	Read/Write
CT	**Boolean**	Read/Write
CL	**Boolean**	Read/Write
PVT	**Boolean**	Read/Write
DO	**Boolean**	Read/Write
SWM	**Boolean**	Read/Write
CA	**Boolean**	Read/Write
MO	**Boolean**	Read/Write
PE,	**Boolean**	Read/Write
INI	**Boolean**	Read/Write
SPOR	**Boolean**	Read/Write
OLL	**Boolean**	Read/Write
OLH	**Boolean**	Read/Write
EWD	**Boolean**	Read/Write
DVNA	**Boolean**	Read/Write
DVHA	**Boolean**	Read/Write
PVLA	**Boolean**	Read/Write
PVHA	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	NA	NA
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	NA	NA
PLC-5 Series	3-999	999

Examples

Example	Description
PD14:0.SP	Set point field of PD 0 file 14
PD18:6.EN	Status enable bit of PD 6 file 18

MicroLogix Message Files

Message files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold**.

Syntax	Data Type	Access
MG<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. Refer to the PLC documentation for the meaning of each field.

Element Field	Data Type	Access
IA	**Word**, Short	Read/Write
RBL	**Word**, Short	Read/Write
LBN	**Word**, Short	Read/Write
RBN	**Word**, Short	Read/Write
CHN	**Word**, Short	Read/Write
NOD	**Word**, Short	Read/Write
MTO	**Word**, Short	Read/Write
NB	**Word**, Short	Read/Write
TFT	**Word**, Short	Read/Write
TFN	**Word**, Short	Read/Write
ELE	**Word**, Short	Read/Write
SEL	**Word**, Short	Read/Write
TO	**Boolean**	Read/Write
CO	**Boolean**	Read/Write
EN	**Boolean**	Read/Write
RN	**Boolean**	Read/Write
EW	**Boolean**	Read/Write
ER	**Boolean**	Read/Write
DN	**Boolean**	Read/Write
ST	**Boolean**	Read/Write
BK	**Boolean**	Read/Write

The following file numbers and maximum element are allowed for each model.

Ranges

PLC Model	File Number	Max Element
Micrologix	3-255	255
All SLC	NA	NA
PLC5	**Message Files**	**Message Files**

Examples

Example	Description
MG14:0.TO	Ignore if timed out bit of MG 0 file 14
MG18:6.CO	Continue bit of MG 6 file 18

Message Files

Message files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

PLC-5 Syntax

Syntax	Data Type	Access
MG<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
ERR	**Short**, Word	Read/Write
RLEN	**Short**, Word	Read/Write
DLEN	**Short**, Word	Read/Write
EN	**Boolean**	Read/Write
ST	**Boolean**	Read/Write
DN	**Boolean**	Read/Write
ER	**Boolean**	Read/Write
CO	**Boolean**	Read/Write
EW	**Boolean**	Read/Write
NR	**Boolean**	Read/Write
TO	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	NA	NA
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	NA	NA
PLC-5 Series	3-999	999

Examples

Example	Description
MG14:0.RLEN	Requested length field of MG 0 file 14
MG18:6.CO	Continue bit of MG 6 file 18

Block Transfer Files

Block transfer files are a structured type whose data is accessed by specifying a file number, an element and a field. The default data types are shown in **bold** where appropriate.

PLC-5 Syntax

Syntax	Data Type	Access
BT<file>:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For more information on the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
RLEN	**Word**, Short	Read/Write
DLEN	**Word**, Short	Read/Write
FILE	**Word**, Short	Read/Write
ELEM	**Word**, Short	Read/Write
RW	**Boolean**	Read/Write
ST	**Boolean**	Read/Write
DN	**Boolean**	Read/Write
ER	**Boolean**	Read/Write
CO	**Boolean**	Read/Write

EW	**Boolean**	Read/Write
NR	**Boolean**	Read/Write
TO	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	NA	NA
SLC 500 Fixed I/O	NA	NA
SLC 500 Modular I/O	NA	NA
PLC-5 Series	3-999	1999

Examples

Example	Description
BT14:0.RLEN	Requested length field of BT 0 file 14
BT18:6.CO	Continue bit of BT 6 file 18

Function File Listing

The following are links to all the files supported by the ENI MicroLogix and MicroLogix 1100 device model.

High Speed Counter File (HSC)
Real-Time Clock File (RTC)
Channel 0 Communication Status File (CS0)
Channel 1 Communication Status File (CS1)
I/O Module Status File (IOS)

Note: For more information on device models and their supported files, refer to **Address Descriptions**.

High Speed Counter File (HSC)

The HSC files are a structured type whose data is accessed by specifying an element and a field. The default data types are shown in **bold** where appropriate.

See Also: **ENI DF1/ DH+/ControlNet Gateway Communications Parameters**

Syntax	Data Type	Access
HSC:<element>.<field>	Depends on field.	Depends on field.

The following fields are allowed for each element. For the meaning of each field, refer to the PLC documentation.

Element Field	Default Type	Access
ACC	**DWord**, Long	Read Only
HIP	**DWord**, Long	Read/Write
LOP	**DWord**, Long	Read/Write
OVF	**DWord**, Long	Read/Write
UNF	**DWord**, Long	Read/Write
PFN	**Word**, Short	Read Only
ER	**Word**, Short	Read Only
MOD	**Word**, Short	Read Only
OMB	**Word**, Short	Read Only
HPO	**Word**, Short	Read/Write
LPO	**Word**, Short	Read/Write
UIX	**Boolean**	Read Only
UIP	**Boolean**	Read Only
AS	**Boolean**	Read Only
ED	**Boolean**	Read Only
SP	**Boolean**	Read Only
LPR	**Boolean**	Read Only
HPR	**Boolean**	Read Only

DIR	**Boolean**	Read Only
CD	**Boolean**	Read Only
CU	**Boolean**	Read Only
UIE	**Boolean**	Read/Write
UIL	**Boolean**	Read/Write
FE	**Boolean**	Read/Write
CE	**Boolean**	Read/Write
LPM	**Boolean**	Read/Write
HPM	**Boolean**	Read/Write
UFM	**Boolean**	Read/Write
OFM	**Boolean**	Read/Write
LPI	**Boolean**	Read/Write
HPI	**Boolean**	Read/Write
UFI	**Boolean**	Read/Write
OFI	**Boolean**	Read/Write
UF	**Boolean**	Read/Write
OF	**Boolean**	Read/Write
MD	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	N/A	254
All SLC	N/A	N/A
PLC5	N/A	N/A

Examples

Example	Description
HSC:0.OMB	Output mask setting for high speed counter 0.
HSC:1.ED	Error detected indicator for high speed counter 1.

Real-Time Clock File (RTC)

The RTC files are a structured type whose data is accessed by specifying an element and a field. The default data types are shown in **bold** where appropriate.

See Also: **ENI DF1/ DH+/ControlNet Gateway Communications Parameters**

Syntax	Data Type	Access
RTC:<element>.<field>	Depends on field	Depends on field

The following fields are allowed for each element. For the meaning of each field, refer to the PLC documentation.

Element Field	Data Type	Access
YR	**Word**, Short	Read/Write
MON	**Word**, Short	Read/Write
DAY	**Word**, Short	Read/Write
HR	**Word**, Short	Read/Write
MIN	**Word**, Short	Read/Write
SEC	**Word**, Short	Read/Write
DOW	**Word**, Short	Read/Write
DS	**Boolean**	Read Only
BL	**Boolean**	Read Only
_SET (for block writes)	**Boolean**	Read/Write

Ranges

PLC Model	File Number	Max Element
Micrologix	N/A	254

All SLC	N/A	N/A
PLC5	N/A	N/A

Examples

Example	Description
RTC:0.YR	Year setting for real-time clock 0.
RTC:0.BL	Battery low indicator for real-time clock 0.

Channel 0 Communication Status File (CS0)

To access the communication status file for channel 0, specify a word and optionally a bit in the word. The default data types are shown in **bold**.

See Also: **ENI DF1/ DH+/ControlNet Gateway Communications Parameters**

Syntax	Data Type	Access
CS0:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Depends on <word> and <bit>
CS0:<word>/<bit>	**Boolean**	Depends on <word> and <bit>
CS0/bit	**Boolean**	Depends on <word> and <bit>

Ranges

PLC Model	File Number	Max Element
Micrologix	N/A	254
All SLC	N/A	N/A
PLC5	N/A	N/A

Examples

Example	Description
CS0:0	Word 0.
CS0:4/2	Bit 2 word 4 = MCP.

Note: For more information on CS0 words/bit meanings, refer to the Rockwell documentation.

Channel 1 Communication Status File (CS1)

To access the communication status file for channel 1, specify a word and optionally a bit in the word. The default data types are shown in **bold**.

See Also: **ENI DF1/ DH+/ControlNet Gateway Communications Parameters**

Syntax	Data Type	Access
CS1:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Depends on <word> and <bit>
CS1:<word>/<bit>	**Boolean**	Depends on <word> and <bit>
CS1/bit	**Boolean**	Depends on <word> and <bit>

Ranges

PLC Model	File Number	Max Element
Micrologix	N/A	254
All SLC	N/A	N/A
PLC5	N/A	N/A

Examples

Example	Description
CS1:0	Word 0.
CS1:4/2	Bit 2 word 4 = MCP.

Note: For more information on CS1 words/bit meanings, refer to the Rockwell documentation.

I/O Module Status File (IOS)

To access an I/O module status file, specify a word and optionally a bit. The default data type for each syntax is shown in **bold**.

See Also: **ENI DF1/ DH+/ControlNet Gateway Communications Parameters**

Syntax	Data Type	Access
IOS:<word>	Short, **Word**, BCD, DWord, Long, LBCD	Depends on <word> and <bit>
IOS:<word>/<bit>	**Boolean**	Depends on <word> and <bit>
IOS/bit	**Boolean**	Depends on <word> and <bit>

Ranges

PLC Model	File Number	Max Element
Micrologix	N/A	254
All SLC	N/A	N/A
PLC5	N/A	N/A

Examples

Example	Description
IOS:0	Word 0.
IOS:4/2	Bit 2 word 4.

Note: For a listing of 1769 expansion I/O status codes, refer to the instruction manual.

Automatic Tag Database Generation

This driver can be configured to automatically build a list of server tags within the OPC server that correspond to device specific data. The automatically generated OPC tags can then be browsed from the OPC client. The server tags that are generated are based on the Logix tags defined in the given Logix device. Logix tags can be atomic or structured.

Note: ENI/DH+/ControlNet Gateway/MicroLogix 1100 models do not support automatic tag database generation.

Atomic tag -> **one-to-one**-> Server tag
Structure tag -> **one-to-many** -> Server tags
Array tag -> **one-to-many**> -> Server tags

Note: Structure and array tags can quickly increase the number of tags imported and hence the number of tags available in the OPC server.

Database Creation Settings
1. When to generate database.
2. What to do with previously generated tags.

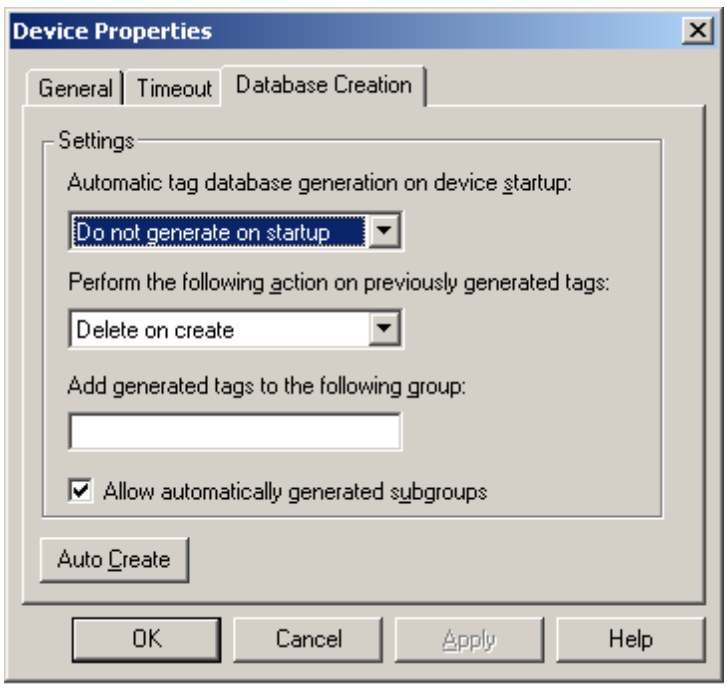
Tag Hierarchy
General layout of tags/tag groups created in the server based on Logix tags imported.

Controller-to-Server Name Conversions
Name conversions made during database creation.

Preparing for Automatic Tag Database Generation
Steps to take in RSLogix 5000 and in the OPC server before initiating the database creation process.

Database Creation Settings

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 condition, prevents the driver from adding any OPC tags to the tag space of the server.

- **Always generate on startup**causes 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** causes 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.

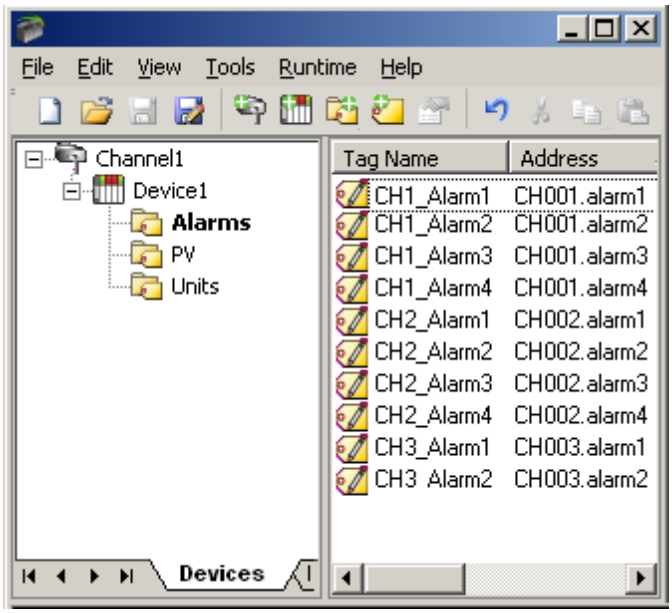
When the automatic generation of OPC tags is selected, any tags that are added to the server's tag space must be saved with the project. The project can be configured to auto save from the **Tools** | **Options** menu.

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 have been added or modified after the communications driver added them originally. 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 the project. This feature prevents automatically generated tags from accumulating in the server. For example, using the Ethernet I/O example mentioned above, the I/O modules in the rack continued to change 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. The **Perform the following action** setting tailors the server's operation to best fit the application's needs:

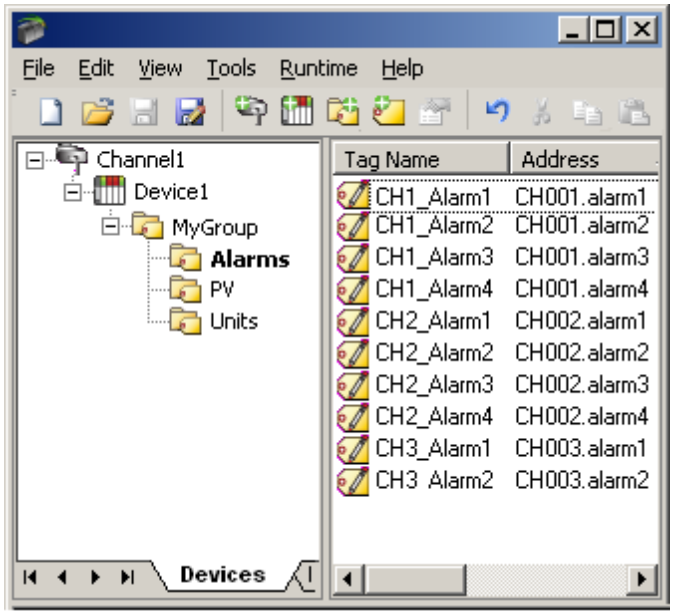
- With **Delete on create**, the default condition, any tags that had previous been added to the tag space will be deleted before the communications driver adds any new tags.
- **Overwrite as necessary**instructs the server to remove only those tags that the communications driver is replacing with new tags. Any tags that are not being overwritten will remain in the server's tag space.
- **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.
- **Do not overwrite, log error** has the same effect as Do not overwrite; however in addition, an error message will be posted to the server's Event Log when a tag overwrite would have occurred.

Note: The removal of OPC tags effects tags that have been automatically generated by the communications driver and any tags that have been added using names that match generated tags. It is recommended that users avoid adding tags to the server using names that match tags that may be automatically generated by the driver.

The parameter **Add generated tags to the following group**can be used to keep automatically generated tags from mixing with tags that have been entered manually. This parameter is used to specify a subgroup that will be used when adding all automatically generated tags for this device. The name of the subgroup can be up to 256 characters in length. The following screens demonstrate how this parameter works; that is, 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.

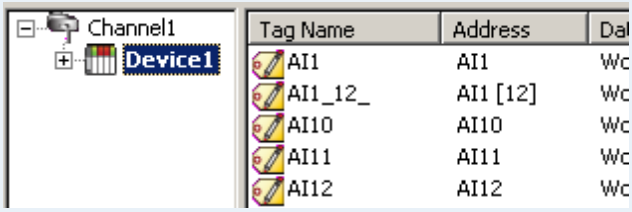


Add generated tags to the following group is blank.



MyGroup was entered in **Add generated tags to the following group**.

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

Allow automatically generated subgroups	
Checked (default)	The server will auto-generate the device's tags and organize them into subgroups. In the server project, the resulting tags will retain their tag names. 
Unchecked	The server will auto-generate the device's tags in a simple list without any subgrouping. In the server project, the resulting tags will be named with the address value; that is, 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.  **Note:** As the server is generating tags, if a tag would be assigned the same name as an existing tag, the system will automatically increment to the next highest number so that the tag name is not duplicated. For example, if the auto-generation process were to create a tag named AI22 but there already existed a tag with that name, the auto-generation process would create the tag as AI23.

The **Auto Create** button is used to manually initiate the creation of automatically generated OPC tags. It can be used to forced the communications driver to reevaluate the device for possible tag changes. The Auto Create feature can also be accessed from the system tags for this device, which allows OPC client application to initiate tag database creation.

Tag Hierarchy

The server tags created by automatic tag generation can follow one of two hierarchies: expanded or condensed. To enable this functionality, make sure "Allow Automatically Generated Subgroups" in **Device Properties** is turned on. The default setting is expanded.

Expanded Mode

In Expanded Mode, the server tags created by automatic tag generation follow a group/tag hierarchy consistent with the tag hierarchy in RSLogix 5000. Groups are created for every segment preceding the "." (period) as in Condensed mode, but groups are also created in "logical" groupings. Groups created include the following:

- Global (controller) scope
- Program scope
- Structures and substructures
- Arrays

Note: Groups are not created for .bit addresses.

The root level groups (or subgroup levels of the group specified in "Add generated tags to the following group") are Prgm_<program name> and Global.

Each program in the controller will have its own Prgm_<program name> group. The driver recognizes this as the first group level.

Basic global tags (or non-structure, non-array tags) are placed under the Global group; basic program tags are placed under their respective program group. Each structure and array tag is provided in its own subgroup of the parent group. By organizing the data in this fashion, the OPC server's tag view mimics RSLogix5000.

The name of the structure/array subgroup also provides a description of the structure/array. For instance, an array tag1[1,6] defined in the controller would have a subgroup name tag1_x_y; x signifies dimension 1 exists, y signifies dimension 2 exists. The tags within an array subgroup are all the elements of that array (unless explicitly limited in the **Database Settings**). The tags within a structure subgroup are the structure members themselves. If a structure contains an array, an array subgroup of the structure group will be created as well.

With a complex project, the tag hierarchy could require a number of group levels. The maximum number of group levels created by automatic tag generation is seven (which does not include the group specified in "Add generated tags to the following group"). When more than seven levels are required, the tags will be placed in the seventh group; thus, the hierarchy will plateau.

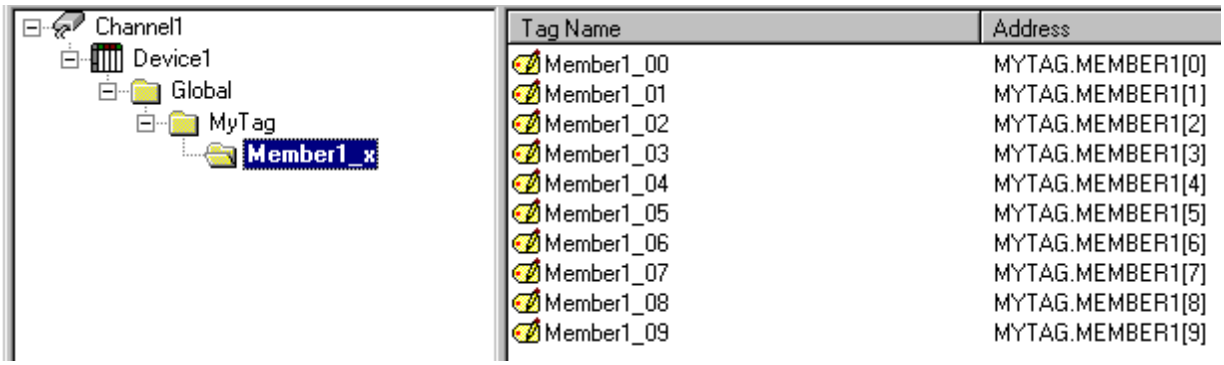
Array Tags
A group is created for each array and contains the array's elements. Group names will have the notation: <array name>_x_y_z where:

x_y_z = 3 dimensional array
x_y = 2 dimensional array
x = 1 dimensional array

Array tags will have the notation: <tag element>_XXXXX_YYYYY_ZZZZZ. For example, element tag1[12,2,987] would have the tag name tag1_12_2_987.

Simple Example

Name	Value	Force Mask	Style	Data Type
MyTag	{...}	{...}		MyDataType
MyTag.Member1	{...}	{...}	Decimal	DINT[10]
MyTag.Member1[0]	0		Decimal	DINT
MyTag.Member1[1]	0		Decimal	DINT
MyTag.Member1[2]	0		Decimal	DINT
MyTag.Member1[3]	0		Decimal	DINT



Complex Example
Logix tag is defined with address "Local:1:O.Slot[9].Data". This would be represented in the groups "Global" - "Local_1_O" - "Slot_x" - "Slot_09". Within the last group would be the tag "Data".

The static reference to "Data" would be:
Channel1.Device1.Global.Local_1_O.Slot_x.Slot_09.Data

The dynamic reference to "Data" would be:
Channel1.Device1.Local:1:O.Slot[9].Data

Condensed Mode

In Condensed Mode, the server tags created by automatic tag generation follow a group/tag hierarchy consistent with the tag's address. Groups are created for every segment preceding the "." (period). Groups created include the following:

- Program scope
- Structures and substructures

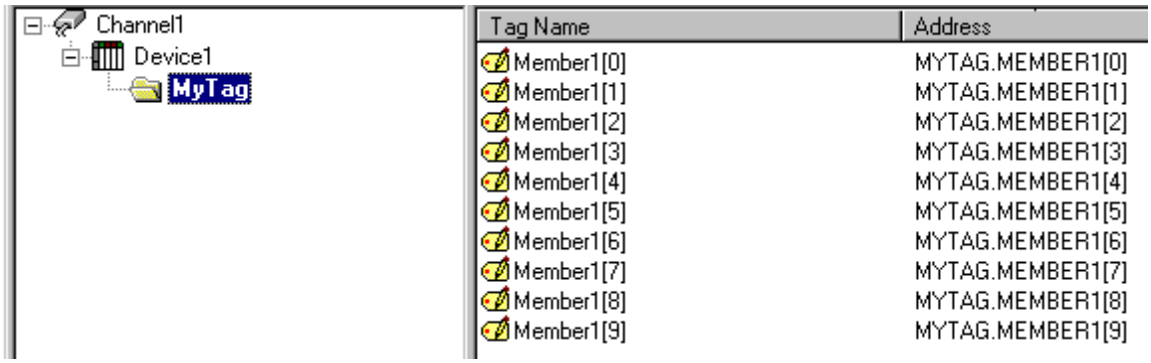
Note: Groups are not created for arrays or .bit addresses.

With a complex project, it is easy to see that the tag hierarchy could require a number of group levels. The maximum number of group levels created by automatic tag generation is seven (which does not include the group specified in "Add generated tags to the following group"). When more than seven levels are required, the tags will be placed in the seventh group; thus, the hierarchy will plateau.

Note: Tag or structure member names leading off with an underscore '_' will be converted to 'U_'. This is required as the server does not support leading underscores.

Simple Example

Name	Value	Force Mask	Style	Data Type
MyTag	{...}	{...}		MyDataType
MyTag.Member1	{...}	{...}	Decimal	DINT[10]
MyTag.Member1[0]	0		Decimal	DINT
MyTag.Member1[1]	0		Decimal	DINT
MyTag.Member1[2]	0		Decimal	DINT
MyTag.Member1[3]	0		Decimal	DINT



Complex Example
Logix tag is defined with address "Local:1:O.Slot[9].Data". This would be represented in the groups "Local:1:O" -> "Slot[9]". Within the last group would be the tag "Data".

The static reference to "Data" would be:
Channel1.Device1.Local:1:O.Slot[9].Data

The dynamic reference would be:
Channel1.Device1.Local:1:O.Slot[9].Data

Note: I/O module tags cannot be directly imported in Offline mode. Since aliases can be imported, it is recommended that they be created for I/O module tags of interest in RSLogix5000.

Controller-to-Server Name Conversions

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

Long Names (OPC Server Version 4.64 and below)
Under older OPC server versions, the Allen-Bradley ControlLogix Ethernet driver was limited to 31 character group and tag names. Therefore, if a controller program or tag name exceeded 31 characters, it needed to be clipped. (OPC server Version 4.70 and above have a 256-character limit and thus the following clipping rules do not apply.) If the device setting **Limit Tag/Group Names to 31 Characters?** is selected, despite being able to support 256 character names, the following rules still apply.

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_45_8
3. Clip tag at 31 while holding on to the element values: ThisIsALongTagNameAndPr_23_45_8
4. Room is made for the Unique ID: ThisIsALongTagName#####_23_45_8
5. Insert this id: ThisIsALongTagName00001_23_45_8

Long program names are clipped in the same manner as long non-array tag names. For every tag/program name that is clipped, the Unique ID is incremented. Array tag names (elements) of a clipped array name will have the same Unique ID. This provides for 100000 unique tag/program names.

Preparing for Automatic Tag Database Generation

To use Automatic Tag Database Generation, follow the steps below.

Online
It is recommended that all communications to the Logix CPU of interest are halted during the database creation process.

In RSLogix5000
Set project OFFLINE.

In the OPC Server

1. Open the Device Properties of the device for which tags will be generated.
2. Click **Database Settings** | **Create tag database from device**.
3. Select the **Options** tab and make any desired changes.
4. Select the **Filtering** tab and make any desired changes.
5. Select the **Database Creation** tab and utilize as instructed in **Database Creation Settings**.

Offline
The ControlLogix driver uses a file generated from RSLogix5000 called an L5K/L5X import/export file to generate the tag database.

In RSLogix5000

1. Open the project containing the tags which will be ported over to OPC server.
2. Click **File** | **Save As**.
3. Select **L5K/L5X Import/Export File** and then specify a name. RSLogix will export the project's contents into this L5K/L5X file.

In the OPC Server

1. Open the Device Properties of the device for which tags will be generated.
2. Select **Database Settings** | **Create tag database from import file**.
3. Enter or browse for the location of the **L5K/L5X** previously created.
4. Select the **Options** tab and make any desired changes.
5. Select the **Filtering** tab and make any desired changes.
6. Select the **Database Creation** tab and utilize as instructed in **Database Creation Settings**.

Note: Imported pre-defined tag types are based on the latest version supported by this driver. For more information, refer to **Firmware Versions**.

Error Codes

The following sections define error codes that may be encountered in the Event Log of the server. Refer to the Event Log section within the "Server Options" chapter of the server help file for detailed information on how the event logger works. Click on a link below for more information about specific error codes.

Encapsulation Error Codes
CIP Error Codes

Encapsulation Error Codes

Encapsulation Protocol Error Codes

Error Code (hex)	Description
0001	Command not handled.
0002	Memory not available for command.
0003	Poorly formed or incomplete data.
0064	Invalid Session ID.
0065	Invalid length in header.
0069	Requested protocol version not supported.
0070	Invalid Target ID.

CIP Error Codes

General CIP Error Codes

Error Code (hex)	Description
0001	Connection Failure.*
0002	Insufficient resources.
0003	Value invalid.
0004	IOI could not be deciphered or tag does not exist.
0005	Unknown destination.
0006	Data requested would not fit in response packet.
0007	Loss of connection.
0008	Unsupported service.
0009	Error in data segment or invalid attribute value.
000A	Attribute list error.
000B	State already exists.
000C	Object model conflict.
000D	Object already exists.
000E	Attribute not settable.
000F	Permission denied.
0010	Device state conflict.
0011	Reply will not fit.
0012	Fragment primitive.
0013	Insufficient command data / parameters specified to execute service.
0014	Attribute not supported.
0015	Too much data specified.
001A	Bridge request too large.
001B	Bridge response too large.
001C	Attribute list shortage.
001D	Invalid attribute list.
001E	Embedded service error.
001F	Failure during connection.*
0022	Invalid reply received.
0025	Key segment error.
0026	Number of IOI words specified does not match IOI word count.
0027	Unexpected attribute in list.

*See Also: Extended Error Codes

Logix5000-Specific (1756-L1) Error Codes

Error Code (hex)	Description
00FF	General Error.*

*See Also: Extended Error Codes

Note: For unlisted error codes, refer to the Rockwell documentation.

0x0001 Extended Error Codes

Error Code (hex)	Description
0100	Connection in use.
0103	Transport not supported.
0106	Ownership conflict.
0107	Connection not found.
0108	Invalid connection type.
0109	Invalid connection size.
0110	Module not configured.
0111	EPR not supported.
0114	Wrong module.
0115	Wrong device type.
0116	Wrong revision.
0118	Invalid configuration format.
011A	Application out of connections.
0203	Connection timeout.
0204	Unconnected message timeout.
0205	Unconnected send parameter error.
0206	Message too large.
0301	No buffer memory.
0302	Bandwidth not available.
0303	No screeners available.
0305	Signature match.
0311	Port not available.
0312	Link address not available.
0315	Invalid segment type.
0317	Connection not scheduled.
0318	Link address to self is invalid.

Note: For unlisted error codes, refer to the Rockwell documentation.

0x001F Extended Error Codes

Error Code (hex)	Description
0203	Connection timed out.

Note: For unlisted error codes, refer to the Rockwell documentation.

0x00FF Extended Error Codes

Error Code (hex)	Description
2104	Address out of range.
2105	Attempt to access beyond end of data object.
2106	Data in use.
2107	Data type is invalid or not supported.

Note: For unlisted error codes, refer to the Rockwell documentation.

Error Descriptions

The following is a list of sub type error topics. Click on a link for more information about that specific error message.

Address Validation Errors
Communication Errors
Device Specific Error Messages
ControlLogix Specific Error Messages
ENI/DH+/ControlNet Gateway Specific Error Messages
Automatic Tag Database Generation Errors

Address Validation Errors

The following is a list of sub type error topics. Click on a link for more information about that specific error 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
Array size is out of range for address '<address>'
Array support is not available for the specified address: '<address>'
Memory could not be allocated for tag with address '<address>' on device '<device name>'

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 of the following errors.

1. Address doesn't conform to the tag address naming conventions.
2. Address is invalid according to the address format and underlying controller tag data type.
3. A program tag was specified incorrectly.
4. An invalid address format was used.

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

See Also:
Entering Tag Names & Addresses
Addressing Atomic Data Types
Tag Addressing
Address Formats

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 references a location that is beyond the range of the device's supported locations.

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

Note:
For valid bit and array element ranges, refer to **Address Formats**.

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 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:
A tag address that has been specified statically is requesting an array size that is too large.

Solution:
Specify a smaller value for the array or a different starting point by re-entering the address in the client application.

Note:
For valid array size ranges, refer to **Address Formats**.

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.

Memory could not be allocated for tag with address '<address>' on device '<device name>'

Error Type:
Warning

Possible Cause:
Resources needed to build a tag could not be allocated. Tag will not be added to the project.

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

Communication Errors

The following is a list of sub type error topics. Click on a link for more information about that specific error message.

Communication Errors
Winsock initialization failed (OS Error = n)
Winsock V1.1 or higher must be installed to use the Allen-Bradley ControlLogix Ethernet device driver
Unable to bind to adapter: '<adapter>'. Connect failed

Winsock V1.1 or higher must be installed to use the Allen-Bradley ControlLogix Ethernet device driver

Error Type:
Fatal

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

Solution:
Upgrade Winsock to version 1.1 or higher.

Winsock initialization failed (OS Error = n)

Error Type:
Fatal

OS Error:	Indication	Possible Solution
10091	Indicates that the underlying network subsystem is not ready for network communication.	Wait a few seconds and restart the driver.
10067	Limit on the number of tasks supported by the Windows Sockets implementation has been reached.	Close one or more applications that may be using Winsock and restart the driver.

Unable to bind to adapter: '<adapter>'. Connect failed

Error Type:
Fatal

Possible Cause:

The driver was unable to bind to the specified network adapter, which is necessary for communications with the device.

Reasons:
1. Adapter is disabled or no longer exists.
2. Network system failure, such as Winsock or network adapter failure.
3. No more available ports.

Solution:
1. For network adapters available on the system, check the Channel Properties | Network Interface | Network Adapter list in the communications server application. If '<adapter>' is not in this list, steps should be taken to make it available to the system. This includes verifying that the network connection is enabled and connected in the PC's Network Connections.

2. Determine how many channels are using the same '<adapter>' in the communications server application. Reduce this number so that only one channel is referencing '<adapter>'. If the error still occurs, check to see if other applications are using that adapter and shut down those applications.

Device Specific Error Messages

The following is a list of device specific error topics. Click on a link for more information about that specific error message.

Device Specific Error Messages
Device '<device name>' is not responding
Encapsulation error occurred during a request to device '<device name>'. [Encap. Error=<code>]
Error occurred during a request to device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]
Frame received from device '<device name>' contains errors

Device '<device name>' is not responding

Error Type:
Warning

Possible Cause:
1. The Ethernet connection between the device and the Host PC is broken.
2. The communications parameters for the Ethernet connection are incorrect.
3. The named device may have been assigned an incorrect IP address.

Solution:
1. Verify the cabling between the PC and the device.
2. Verify that the correct port is specified for the named device.
3. Verify that the IP address given to the named device matches that of the actual device.

Encapsulation error occurred during a request to device '<device name>'. [Encap. Error=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the Encapsulation portion of the Ethernet/IP packet during a request. All reads and writes within the request are failed.

Solution:
The driver will attempt to recover from such an error but if the problem persists contact Technical Support with the encapsulation error (except for error 0x02 which is device related, not driver related.)

See Also:
Encapsulation Error Codes

Error occurred during a request to device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]

Error Type:

Warning

Possible Cause:
Device '<device name>' returned an error within the CIP portion of the Ethernet/IP packet during a request. All reads and writes within the request are failed.

Solution:
The solution depends on the error code(s) returned.

See Also:
CIP Error Codes

Frame received from device '<device name>' contains errors

Error Type:
Warning

Possible Cause:
1. Misalignment of packets due to connection/disconnection between PC and device.
2. Bad cabling connecting the device, causing noise.

Solution:
1. Place device on less noisy network if that is the case.
2. Increase the request timeout and/or attempts

ControlLogix Specific Error Messages

The following sections pertain to messaging from the ControlLogix driver level source.

ControlLogix Specific Error Messages
Read Errors (Non-Blocking)
Read Errors (Blocking)
Write Errors
Project Upload Errors

Read Errors (Non-Blocking)

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

Read Errors (Non-Blocking) Error Messages
Read request for tag '<tag address>' on device '<device name>' failed due to a framing error. Tag deactivated
Unable to read '<tag address>' on device '<device name>'. Tag deactivated
Unable to read tag '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]
Unable to read tag '<tag address>' on device '<device name>'. Controller tag data type '<type>' unknown. Tag deactivated
Unable to read tag '<tag address>' on device '<device name>'. Data type '<type>' not supported. Tag deactivated
Unable to read tag '<tag address>' on device '<device name>'. Data type '<type>' is illegal for this tag. Tag deactivated
Unable to read tag '<tag address>' on device '<device name>'. Tag does not support multi-element arrays. Tag deactivated

Read request for tag '<tag address>' on device '<device name>' failed due to a framing error. Tag deactivated

Error Type:
Warning

Possible Cause:
A read request for the specified tag failed due to one of the following reasons:

1. Incorrect request service code.
2. Received more or less bytes than expected.

Solution:
If this error occurs frequently, there may be an issue with the cabling or the device itself. If the error occurs frequently for a specific tag, contact Technical Support. Increasing the request attempts will also give the driver more opportunities to recover from this error. In response to this error, the tag will be deactivated; thus, it will not be processed again.

Unable to read '<tag address>' on device '<device name>'. Tag deactivated

Error Type:
Warning

Possible Cause:
1. The Ethernet connection between the device and the Host PC is broken.
2. The communication parameters for the Ethernet connection are incorrect.
3. The named device may have been assigned an incorrect IP address.

Solution:
1. Verify the cabling between the PC and the device.
2. Verify that the correct port has been specified for the named device.
3. Verify that the IP address given to the named device matches that of the actual device.

Note:
In response to this error, the tag will be deactivated and will not be processed again.

Unable to read tag '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the CIP portion of the Ethernet/IP packet during a read request for tag '<tag address>'.

Solution:
The solution depends on the error code(s) returned.

See Also:
CIP Error Codes

Unable to read tag '<tag address>' on device '<device name>'. Controller tag data type '<type>' unknown. Tag deactivated

Error Type:
Warning

Possible Cause:
A read request for the specified tag failed because the controller's tag data type is not currently supported.

Solution:
Contact Technical Support so that support may be added for this type. In response to this error, the tag will be deactivated; thus, it will not be processed again.

Unable to read tag '<tag address>' on device '<device name>'. Data type '<type>' not supported. Tag deactivated

Error Type:
Warning

Possible Cause:
A read request for the specified tag failed because the client's tag data type is not supported.

Solution:

Change the tag's data type to one that is supported. In response to this error, the tag will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Unable to read tag '<tag address>' on device '<device name>'. Data type '<type>' is illegal for this tag. Tag deactivated

Error Type:
Warning

Possible Cause:
A read request for the specified tag failed because the client's tag data type is illegal for the given controller tag.

Solution:
Change the tag's data type to one that is supported. For example, data type Short is illegal for a BOOL array controller tag. Changing the data type to Boolean would remedy this problem. In response to this error, the tag will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Unable to read tag '<tag address>' on device '<device name>'. Tag does not support multi-element arrays. Tag deactivated

Error Type:
Warning

Possible Cause:
A read request for the specified tag failed because the driver does not support multi-element array access to the given controller tag.

Solution:
Change the tag's data type or address to one that is supported. In response to this error, the tag will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Read Errors (Blocking)

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

Read Errors (Blocking) Error Messages

Read request for '<count>' element(s) starting at '<tag address>' on device '<device name>' failed due to a framing error. Block Deactivated
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Block Deactivated
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Controller tag data type '<type>' unknown. Block Deactivated
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Data type '<type>' not supported. Block Deactivated
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Data type '<type>' is illegal for this block. Block Deactivated
Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Block does not support multi-element arrays. Block Deactivated

Read request for '<count>' element(s) starting at '<tag address>' on device '<device name>' failed due to a framing error. Block Deactivated

Error Type:

Warning

Possible Cause:
A read request for tags <tag address> to <tag address>+<count> failed due to one of the following reasons:

1. Incorrect request service code.
2. Received more or less bytes than expected.

Solution:
If this error occurs frequently, there may be an issue with the cabling or the device itself. If the error occurs frequently for a specific tag, contact Technical Support. Increasing the request attempts will also give the driver more opportunities to recover from this error. In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Block Deactivated

Error Type:
Warning

Possible Cause:
1. The Ethernet connection between the device and the Host PC is broken.
2. The communication parameters for the Ethernet connection are incorrect.
3. The named device may have been assigned an incorrect IP address.

Solution:
1. Verify the cabling between the PC and the device.
2. Verify that the correct port has been specified for the named device.
3. Verify that the IP address given to the named device matches that of the actual device.

Note:
In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Error=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the CIP portion of the Ethernet/IP packet during a read request for tag '<tag address>'.

Solution:
The solution depends on the error code(s) returned.

See Also:
CIP Error Codes

Unable to read '<count>' element(s) starting at '<address>' on device '<device>'. Controller tag data type '<type>' unknown. Block deactivated

Error Type:
Warning

Possible Cause:
A read request for tags <tag address> to <tag address>+<count>, failed because the controller's tag data type is not currently supported.

Solution:
Contact Technical Support so that support may be added for this type. In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

Unable to read '<count>' element(s) starting at '<address>' on device '<device>'. Data type '<type>' not supported

Error Type:
Warning

Possible Cause:
A read request for tags <tag address> to <tag address>+<count> failed because the client's tag data type is not supported.

Solution:
Change the data type for tags within this block to one that is supported. In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Unable to read '<count>' element(s) starting at '<address>' on device '<device>'. Data type '<type>' is illegal for this block

Error Type:
Warning

Possible Cause:
A read request for tags <tag address> to <tag address>+<count>, failed because the client's tag data type is illegal for the given controller tag.

Solution:
Change the data type for tags within this block to one that is supported. For example, data type Short is illegal for a BOOL array controller tag. Changing the data type to Boolean would remedy this problem. In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Unable to read '<count>' element(s) starting at '<tag address>' on device '<device name>'. Block does not support multi-element arrays. Block Deactivated

Error Type:
Warning

Possible Cause:
A read request for tags <tag address> to <tag address>+<count>, failed because the driver does not support multi-element array access to the given controller tag.

Solution:
Change the data type or address for tags within this block to one that is supported. In response to this error, <count> elements of the block will be deactivated; thus, it will not be processed again.

See Also:
Addressing Atomic Data Types

Write Errors

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

Write Errors
Write request for tag '<tag address>' on device '<device name>' failed due to a framing error
Unable to write to '<tag address>' on device '<device name>'
Unable to write to tag '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Status=<code>]

Unable to write to tag '<tag address>' on device '<device name>'. Controller tag data type '<type>' unknown
Unable to write to tag '<tag address>' on device '<device name>'. Data type '<type>' not supported
Unable to write to tag '<tag address>' on device '<device name>'. Data type '<type>' is illegal for this tag
Unable to write to tag '<tag address>' on device '<device name>'. Tag does not support multi-element arrays

Write request for tag '<tag address>' on device '<device name>' failed due to a framing error

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed after so many retries due to one of the following reasons:

1. Incorrect request service code.
2. Received more or less bytes than expected.

Solution:
If this error occurs frequently, there may be an issue with the cabling or the device itself. Increasing the Retry Attempts will also give the driver more opportunities to recover from this error.

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

Error Type:
Warning

Possible Cause:
1. The Ethernet connection between the device and the Host PC is broken.
2. The communication parameters for the Ethernet connection are incorrect.
3. The named device may have been assigned an incorrect IP address.

Solution:
1. Verify the cabling between the PC and the device.
2. Verify that the correct port has been specified for the named device.
3. Verify that the IP address given to the named device matches that of the actual device.

Unable to write to tag '<tag address>' on device '<device name>'. [CIP Error=<code>, Ext. Status=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the CIP portion of the Ethernet/IP packet during a write request for tag '<tag address>'.

Solution:
The solution depends on the error code(s) returned.

See Also:
CIP Error Codes

Unable to write to tag '<tag address>' on device '<device name>'. Controller tag data type '<type>' unknown

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed because the controller's tag data type is not currently supported.

Solution:
Contact Technical Support so that support may be added for this type.

Unable to write to tag '<tag address>' on device '<device name>'. Data type '<type>' not supported

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed because the client's tag data type is not supported.

Solution:
Change the tag's data type to one that is supported.

See Also:
Addressing Atomic Data Types

Unable to write to tag '<tag address>' on device '<device name>'. Data type '<type>' is illegal for this tag

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed because the client's tag data type is illegal for the given controller tag.

Solution:
Change the tag's data type to one that is supported. For example, data type Short is illegal for a BOOL array controller tag. Changing the data type to Boolean would remedy this problem.

See Also:
Addressing Atomic Data Types

Unable to write to tag '<tag address>' on device '<device name>'. Tag does not support multi-element arrays

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed because the driver does not support multi-element array access to the given controller tag.

Solution:
Change the tag's data type or address to one that is supported.

See Also:
Addressing Atomic Data Types

Project Upload Errors

A project upload is required for the Physical Addressing modes. Without it, the driver does not have the information necessary to perform Physical Addressing reads/writes. Each error below is preceded with the following:

"The following error(s) occurred uploading controller project from device '<device name>'. Resorting to symbolic addressing."

Project Upload Errors
Low memory resources
Invalid or corrupt controller project
Encapsulation error occurred while uploading project information. [Encap. Error=<code>]
Error occurred while uploading project information. [CIP Error=<code>, Ext. Error=<code>]
Framing error occurred while uploading project information

Low memory resources

Error Type:
Warning

Possible Cause:
Memory required for controller project upload could not be allocated.

Solution:
Close any unused applications and/or increase the amount of virtual memory. Then, restart the server and try again. A project upload is required for the Physical Addressing modes.

Invalid or corrupt controller project

Error Type:
Warning

Possible Cause:
The controller project was considered to be invalid or corrupt at the time of the upload.

Solution:
Re-download the project to the controller, restart the server and try again. A project upload is required for the Physical Addressing modes.

Encapsulation error occurred while uploading project information. [Encap. Error=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the Encapsulation portion of the Ethernet/IP packet while uploading the controller project.

Solution:
Solution depends on the error code returned. If the problem persists contact Technical Support with the error. A project upload is required for the Physical Addressing modes.

See Also:
Encapsulation Error Codes

Error occurred while uploading project information. [CIP Error=<code>, Ext. Error=<code>]

Error Type:
Warning

Possible Cause:
Device '<device name>' returned an error within the CIP portion of the Ethernet/IP packet while uploading the controller project.

Solution:
The solution depends on the error code(s) returned. If the problem persists contact Technical Support with the error. A project upload is required for the Physical Addressing modes.

See Also:
CIP Error Codes

Framing error occurred while uploading project information

Error Type:
Warning

Possible Cause:
1. Misalignment of packets due to connection/disconnection between PC and device.
2. Bad cabling connecting the device, causing noise.

Solution:
1. Place device on less noisy network if that is the case.
2. Increase the request timeout and/or attempts
3. Restart the server and try again.

Note:
A project upload is required for the Physical Addressing modes.

ENI/DH+/ControlNet Gateway Specific Error Messages

The following is a list of sub type error topics. Click on a link for more information about that specific error message.

ENI/DH+/ControlNet Gateway Specific Error Messages

Unable to read '<block size>' element(s) starting at '<address>' on device '<device name>'. Frame received contains errors
Unable to read '<block size>' element(s) starting at '<address>' on device '<device name>'. [DF1 STS=<value>, EXT STS=<value>]. Tag(s) deactivated
Unable to write to address <address> on device '<device name>'. Frame received contains errors
Unable to write to address <address> on device '<device name>'. [DF1 STS=<value>, EXT STS=<value>]
Device '<device name>' is not responding. Local node responded with error '[DF1 STS=<value>]'
Unable to write to address <address> on device '<device name>'. Local node responed with error '[DF1 STS=<value>]'
Unable to write to function file <address> on device '<device name>'. Local node responed with error '[DF1 STS=<value>]'

Unable to read '<block size>' element(s) starting at '<address>' on device '<device name>'. Frame received contains errors

Error Type:
Warning

The Error Could Be:
1. Incorrect frame size received.
2. TNS mismatch.
3. Invalid response command returned from device.

Possible Cause:
1. Misalignment of packets due to connection/disconnection between PC and device.
2. There is bad cabling connecting the devices causing noise.

Solution:
The driver will recover from this error without intervention. If this error occurs frequently, there may be an issue with the cabling or the device itself.

Unable to read '<block size>' element(s) starting at '<address>' on device '<device name>'. [DF1 STS=<value>, EXT STS=<value>]. Tag(s) deactivated

Error Type:
Warning

Possible Cause:
The address requested in the block does not exist in the PLC.

Solution:
Check the status and extended status codes that are being returned by the PLC. Note that an extended status code may not always be returned and thus the error information is contained within the status code. The codes are displayed in hexadecimal.

Status code errors in the low nibble of the status code indicate errors found by the local node. The driver will continue to retry reading these blocks of data periodically. Errors found by the local node occur when the KF module cannot see the destination plc on the network for some reason.

Status code errors in the high nibble of the status code indicate errors found by the PLC. These errors are generated when the block of data the driver is asking for is not available in the PLC. The driver will not ask for these blocks again after receiving this kind of error. This kind of error can be generated if the address does not exist in the PLC.

Note:
The block starting at address <address> may be deactivated in the process depending on the severity of the error. The error message will state this as it does above.

See Also:
A-B documentation for STS and Ext. STS error code definitions.

Unable to write to address <address> on device '<device name>'. Frame received contains errors

The type of error could be
1. Incorrect frame size received.
2. TNS mismatch.
3. Invalid response command returned from device.

Error Type:
Warning

Possible Cause:
1. Misalignment of packets due to connection/disconnection between PC and device.
2. There is bad cabling connecting the devices causing noise.

Solution:
The driver will recover from this error without intervention. If this error occurs frequently, there may be an issue with the cabling or the device itself.

Unable to write to address <address> on device '<device name>'. '[DF1 STS=<value>, EXT STS=<value>]'

Error Type:
Warning

Possible Cause:
The address written to does not exist in the PLC.

Solution:
Check the status and extended status codes that are being returned by the PLC. Note that an extended status code may not always be returned and thus the error information is contained within the status code. The codes are displayed in hexadecimal.

Status code errors in the low nibble of the status code indicate errors found by the local node. Errors found by the local node occur when the KF module cannot see the destination PLC on the network for some reason.

Status code errors in the high nibble of the status code indicate errors found by the PLC. These errors are generated when the data location is not available in the PLC or not write able.

See Also:
A-B documentation for STS and Ext. STS error code definitions.

Device '<device name>' is not responding. Local node responded with error '[DF1 STS=<value>]'

Error Type:
Warning

Possible Cause:

This error means that the PLC did not respond to the read request from the local node. A local node could be an intermediate node like 1756-DHRIO, 1756-CNB, 1761-NET-ENI and and so forth. Refer to A-B documentation for STS error code definitions.

Solution:
Depends on the STS error code. For example, if STS code '0x02'(hex) is returned, verify the cabling between the remote node (PLC) and the local node.

Unable to write to address <address> on device '<device name>'. Local node responded with error '[DF1 STS=<value>]'

Error Type:
Warning

Possible Cause:
This error means that the PLC did not respond to the write request from the local node. A local node could be an intermediate node like 1756-DHRIO, 1756-CNB, 1761-NET-ENI and and so forth. Refer to A-B documentation for STS error code definitions.

Solution:
Depends on the STS error code. For example, if the STS code '0x02'(hex) is returned, verify the cabling between the remote node (PLC) and the local node.

Unable to write to function file <address> on device '<device name>'. Local node responded with error '[DF1 STS=<value>]'

Error Type:
Warning

Possible Cause:
This error means that the PLC did not respond to the write request from the local node. A local node could be an intermediate node like 1756-DHRIO, 1756-CNB, 1761-NET-ENI and and so forth. Refer to A-B documentation for STS error code definitions.

Solution:
Depends on the STS error code. For example, if the STS code '0x02'(hex) is returned, verify the cabling between the remote node (PLC) and the local node.

Automatic Tag Database Generation Errors

The following is a list of sub type error topics. Click on a link for more information about that specific error message.

Automatic Tag Database Generation Errors

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 Tag Import file. Tag not added
Database Error: Data type for Ref. Tag '<tag name>' unknown. Setting Alias Tag '<tag name>' data type to Default ('<type>')
Database Error: Error occurred processing Alias Tag '<tag name>'. Tag not added
Database Error: Member data type '<type>' for UDT '<UDT name>' not found in Tag Import file. Setting to Default Type '<type>'
Database Error: Program group '<orig. program name>' exceeds 31 characters. Program group renamed to '<new program name>'
Database Error: Tag '<orig. tag name>' exceeds 31 characters. Tag renamed to '<new tag name>'
Database Error: Unable to resolve CIP data type '<hex value>' for tag '<tag name>'. Setting to Default Type '<logix data type>'
Unable to generate a tag database for device <device name>. Reason: Import file not found
Unable to generate a tag database for device <device name>. Reason: L5K File is invalid or corrupt
Unable to generate a tag database for device <device name>. Reason: Low memory resources

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 tag name in the controller. 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, XXX_YYY_ZZZ for 3. The number of X's, Y's and Z's approximates the number of elements for the respective dimensions. Since such an error will occur for each element, generalizing with XXX, YYY and ZZZ implies all array elements will be affected.

Solution:
None.

See Also:
Controller-to-Server Name Conversions

Database Error: Data type '<type>' for tag '<tag name>' not found in Tag Import file. Tag not added

Error Type:
Warning

Possible Cause:
The definition of data type '<type>', for tag <tag name>, could not be found in the Tag Import file. Tag will not be added to the database.

Solution:
Contact Technical Support.

Database Error: Data type for Ref. Tag '<tag name>' unknown. Setting Alias Tag '<tag name>' data type to Default ('<type>')

Error Type:
Warning

Possible Cause:
The data type of the "Alias For" *tag referenced in the Alias Tag's declaration could not found in the Tag Import file. This data type is necessary to generate the alias tag correctly.

Solution:
The Alias Tag will take on the default type specified in the **Default Type** in Device Properties.

Note:
In RSLogix5000, "Alias For" is a column in the tag view under the Edit Tags tab. This is where the reference to the tag, structure tag member, or bit that the alias tag will represent is entered.

Database Error: Error occurred processing Alias Tag '<tag name>'. Tag not added

Error Type:
Warning

Possible Cause:
An internal error occurred processing alias tag <tag name>. Alias tag could not be generated.

Solution:
None.

Database Error: Member data type '<type>' for UDT '<UDT name>' not found in Tag Import file. Setting to Default Type '<type>'

Error Type:
Warning

Possible Cause:
The definition of data type '<type>', for a member in the user-defined type <UDT name>, could not be found in the Tag Import file.

Solution:
This member will take on the default type specified in the **Default Type** in Device Properties.

Database Error: Program group '<orig. program name>' exceeds 31 characters. Program group renamed to '<new program name>'

Error Type:
Warning

Possible Cause:
Each Program is assigned its own group. The name assigned to this group is the Program name. This name exceeds the 31-character limitation and will be renamed to one that is valid.

Solution:
None.

See Also:
Controller-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 tag name in the controller. This name exceeds the 31-character limitation and will be renamed to one that is valid.

Solution:
None.

See Also:
Controller-to-Server Name Conversions

Database Error: Unable to resolve CIP data type '<hex value>' for tag '<tag name>'. Setting to Default Type '<logix data type>'

Error Type:
Warning

Possible Cause:
1. The CIP data type in the import file is unknown.
2. The import file may contain an error.

Solution:
Resolve any errors in RSLogix. Then, retry the tag export process in order to produce a new tag import file.

See Also:
Preparing for Automatic Tag Database Generation

Unable to generate a tag database for device <device name>. Reason: Import file not found

Error Type:
Warning

Possible Cause:
The file specified as the Tag Import File in the **Database Settings** Device Properties page cannot be found.

Solution:
Select a valid Tag Import file or retry the tag export process in RSLogix to produce a new Tag Import file.

See Also:
Automatic Tag Database Generation Preparation

Unable to generate a tag database for device <device name>. Reason: L5K 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 not an L5K file or is a corrupt L5K file.

Solution:
Select a valid L5K file or retry the tag export process in RSLogix to produce a new L5K file.

See Also:
Automatic Tag Database Generation Preparation

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.

Technical Notes

RSLogix 5000 Project Edit Warning
1. Information on downloading a project while clients are connected.
2. Information on making online edits while clients are connected.

SoftLogix 5800 Connection Notes
1. Information on preventing communication errors.
2. Instructions for connecting to a SoftLogix Soft PLC on the same PC as the OPC server.

RSLogix 5000 Project Edit Warning

There are three primary concerns with the Controller project: making online edits, downloading a project while clients are connected and accessing active tags.

Online Edits

There is no mechanism for detecting and handling project correlation errors resulting from online edits made to a project.

Caution: If online edits are made while clients are accessing active tags, the Allen-Bradley ControlLogix Ethernet driver will access incorrect data for tags modified and will not be flagged as invalid. This applies to Physical Addressing modes only.

Project Download

The Allen-Bradley ControlLogix Ethernet Driver has been designed to monitor for project correlation errors resulting from downloads. The only caveat is that there must be data access occurring while the download occurs. When a download is detected, the following actions take place:

Symbolic Addressing Mode
1. Download occurs and is detected.
2. Tags in progress are invalidated.
3. During download process, device is polled on a 2 second interval to detect if download is complete.
4. Upon download completion, normal tag transactions resume.

Physical Addressing Mode
1. Download occurs and is detected.
2. Tags in progress are invalidated.
3. During download process, device is polled on a 2 second interval to detect if download is complete.
4. Upon download completion, tags processed are demoted to Symbolic Addressing Mode.
5. 60 seconds after project download, tags are promoted back to Physical Addressing Mode as normal tag transactions resume.

Caution: If data access is not occurring on a device while a download occurs, the download operation will not be detected. This will result in invalid access to the controllers memory. To prevent this, have at least 1 tag accessing the controller every 500-1000ms so that downloads can be detected and handled properly.

Example
Only 1 tag is being accessed on a given device whose scan rate is 10 seconds.
Scan x @ time t
Download starts @ time t + 3 seconds
Download finishes @ time t + 8 seconds
Scan x+1 @ time t + 10

In this example, the download operation is not caught.

SoftLogix 5800 Connection Notes

For proper operation, no Ethernet-based drivers (such as ethernet devices, remote devices via Gateway and and so forth.) should be installed in RSLinx on the SoftLogix PC. It has been shown that with one or more Ethernet-based drivers installed, requests return with CIP Error 0x5 Ext. Error 0x1 and CIP Error 0x8.

Connecting to a SoftLogix Soft PLC on the Same PC as the OPC Server

To connect the Allen-Bradley ControlLogix Ethernet driver to a SoftLogix Soft PLC running on the same PC as the OPC server, follow the instructions below.

1. Ensure that there are no Ethernet-based drivers currently running in **RSLinx** on the PC.
2. Verify that the **Ethernet/IP Message Module** is installed in the SoftLogix virtual chassis.

3. Open the OPC server's **Device Propeties**. In the **General** tab, locate the Device ID value. It should not be "127.0.0.1, 1, <PLC_CPU_slot>". The Device ID should be set to "<specific_IP_address_of_PC>, 1, <PLC_CPU_slot>".

   For example, if the PC's IP address is 192.168.3.4 and the SoftLogix CPU is in slot 2 of the virtual chassis, then the correct Device ID would be: "192.168.3.4, 1, 2".

Glossary

Device Setup

Term	Definition
Protocol Mode	The means by which Controller tag addresses are specified in data access communication packets.
Default Type	Due to the symbolic nature of Logix Tag-Based Addressing, tags can be of any data type. This is in contrast to DF1 where file access (for example, N7:0) is always a given set of data types (Word, Short). Because of this flexibility, there needs to be a data type that tags default to when no data type is explicitly set. This is the case when a tag is created in a client and assigned the data type "Native" or created in the server and assigned the data type "Default". In these cases, the tag in question will be assigned the data type set as the Default Type. There are also cases in Automatic Tag Database Generation where the Default Type is used to set a server tag's data type.
Gateway	Utilizing an EtherNet/IP communication module to obtain access to a DH+ or ControlNet network from the same backplane. Rack must contain an EtherNet/IP communication module and a DHRIO or CNB module.
Link Address	Unique identifier for an interface module (for example, Node ID, IP address and and so forth.).
Packet	Stream of data bytes on the wire representing the request(s) being made. Packets are limited in size.
Physical Mode	A Protocol Mode in which Controller tag addresses are represented by their actual memory location in the Controller. This provides a performance increase over Symbolic Mode but requires a project upload to gather these memory locations. Non-Blocking: Each client/server Tag is requested individually using its corresponding Controller Tag's physical memory address. Similar to Symbolic in nature but much faster in performance. Blocking: Each Controller Tag is requested as a single block of data. Each client/server Tag is updated via cache storage of this data in the server. Much faster performance over Symbolic Mode.
Port ID	Specifies a way out of the interface module in question (for example, channel).
Project Upload	Initialization sequence required for Physical addressing modes. All tags, programs and data types are uploaded from the controller in the process.
Routing	Utilizing one or more Logix racks to hop to another Logix rack.
Symbolic Mode	A Protocol Mode in which Controller tag addresses are specified by their ASCII character equivalent. Each client/server Tag is requested individually. This provides immediate access to Controller data without a project upload but is overall slower in performance when compared to any of the Physical Modes.
Tag Division	Special assignment of tags to devices whose Protocol Mode is set for Physical Blocking or Physical Non-Blocking mode. Assignment is based on rules that maximize the performance of access to these tags.*

*Tag Division rules are outlined in **Performance Statistics and Tuning** and **Optimizing Your Communications**.

Logix Tag-Based Addressing

Term	Definition
Array Element	Element within a Logix Array. For client/server access, the element must be an atomic. For example, ARRAYTAG [0].
Array with Offset	Client/Server array tag whose address has an Array Element specified. For example, ARRAYTAG [0] {5}.
Array w/o Offset	Client/Server array tag whose address has no Array Element specified. For example, ARRAYTAG {5}.
Atomic Data Type	A Logix, pre-defined, non-structured data type (for example, SINT, DINT).
Atomic Tag	A Logix tag defined with an Atomic Data Type.
Client	An HMI/SCADA or data bridging software package utilizing OPC,DDE, or proprietary client/server protocol to interface with the server.
Client/Server Data Type	Data type for tags defined statically in the server or dynamically in a client. Supported data types in the server are listed in Data Type Descriptions. Supported data types in the client depends on the client in use.
Client/Server Tag	Tag defined statically in the server or dynamically in a client. These tags are different entities

	than Logix tags. A Logix tag name becomes a client/server tag address when referencing such Logix tag.
Client/Server Array	Row x column data presentation format supported by the server and by some clients. Not all clients support arrays.
Logix Data Type	A data type defined in RSLogix 5000 for Logix-platform controllers.
Logix Tag	Tag defined in RSLogix 5000 for Logix-platform controllers.
Logix Array	Multi-dimensional array (1, 2 or 3 dimensions possible) support within RSLogix 5000 for Logix-platform controllers. All Logix atomic data types support Logix Arrays. Not all Logix structure data types support Logix Arrays.
Logix Pre-Defined Data Type	Logix Data Type pre-defined for use in RSLogix 5000.*
	Logix Data Type defined by the user for use in the given controller.*
Server	The OPC/DDE/proprietary server utilizing this Allen-Bradley ControlLogix Ethernet Driver.
Structure Data Type	A Logix, pre-defined or user-defined data type, consisting of members whose data types are atomic or structure in nature.
Structure Tag	A Logix tag defined with a Structure Data Type.

***See Also:** Logix Data Type

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