Allen-Bradley ControlLogix Ethernet Driver Help

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Help version 1.040

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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 a 1756-ENBT/ENET module for Ethernet communications or through a 1761-NET-ENI module for Ethernet-to-serial communications using the controllers 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 controllers 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 controllers 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, a 1756-ENBT 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, a 1756-ENBT 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 **ControlLogix 5500 Series***, **CompactLogix 5300 Series***, **FlexLogix 5400 Series***, **Micrologix Series**, **SLC 500 Fixed I/O Processor**, **SLC 500 Modular I/O Series**, and **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**
MicroLogix for ENI	**1761-NET-ENI (DF1) Quick Links**
MicroLogix 1100	**MicroLogix 1100 Ethernet Quick Links**

ControlLogix 5500 Ethernet Quick Links

- Device Setup
  - Logix Setup
    - ControlLogix 5500 Ethernet Device ID
    - Logix Communications Parameters

CompactLogix 5300 Ethernet Quick Links

FlexLogix 5400 Ethernet Quick Links

SoftLogix 5800 Quick Links

DH+ Gateway Quick Links

ControlNet Gateway Quick Links

1761-NET-ENI (DF1) Quick Links

1761-NET-ENI (Logix) Quick Links

MicroLogix 1100 Ethernet Quick Links

Device Setup

Supported Devices

Device	Communications
ControlLogix 5550 / 5553 / 5555 / 5561 / 5562 / 5563 / 5564 / 5565 processors	Via 1756-ENBT / ENET Ethernet module Via 1761-NET-ENI Series B using Channel 0 (Serial)
CompactLogix 5320 / 5330/ 5535E processors	Built-in EtherNet/IP port on processors with E suffix (i.e. 1769-L35E) 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	Via MicroLogix 1100 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

*Any SLC 500 series PLC that supports DH+ or can be interfaced to a DH+ network (i.e. KF2 interface module) is supported in this driver.

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.17.3.59
ControlLogix 5562 (1756-L62): ver.12.31 - ver.17.3.59
ControlLogix 5563 (1756-L63): ver.11.26 - ver.17.3.59
ControlLogix 5564 (1756-L64): ver.16.03 - ver.17.3.59
ControlLogix 5565 (1756-L65): ver.16.03 - ver.17.3.59

CompactLogix 5320 (1769-L20): ver.11.27 - ver.13.18
CompactLogix 5330 (1769-L30): ver.11.27 - ver.13.18
CompactLogix 5335E (1769-L35E): ver.16.04
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.15.00
1761-NET-ENI Series B required for ControlLogix, CompactLogix and FlexLogix serial communications
MicroLogix 1100 (1763-L16AWA/BWA/BBB): ver.1.1

Communication Protocol

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 the appropriate topic for help 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

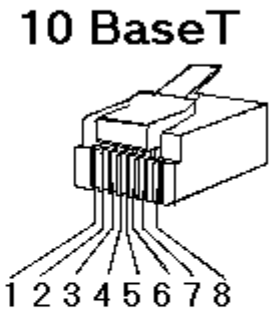
Cable Diagrams

Patch Cable (Straight Through)

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

Crossover Cable

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



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 (i.e. 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 a 1756-ENBT Ethernet module to obtain access to a DH+ or ControlNet network from the same backplane. Rack must contain an ENBT module and a DHRIO or CNB module.
Link Address	Unique Identifier for an interface module (i.e. Node ID, IP address, etc)
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 (i.e. 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 ENBT 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. Import Method
2. Database Options
3. Database Filtering

Logix Options

1. Project Options
   a. Default Type
   b. Enable Performance Statistics
2. Protocol Options
   a. Protocol Mode

Attention ENI ControlLogix/CompactLogix/FlexLogix Users:
Refer to **1761-NET-ENI Setup** for Device ID Setup.

ControlLogix 5500 Ethernet Device ID

The Device ID is used to specify the device IP address along with the slot number the controller CPU resides in. Device IDs are specified as:

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

Designator	Description	Formats	Valid Values
IP Address	1756-ENBT IP Address	Decimal	0 - 255
Port ID	Specifies a way out of the 1756-ENBT 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 1756-ENBT IP of 123.123.123.123, Port ID is 1 and CPU resides in slot 0.

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

Advanced Users:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote ControlLogix back plane.

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 along with the slot number the controller CPU resides in. Device IDs are specified as:

<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, Port ID is 1 and CPU resides in slot 0.

Advanced Users:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote ControlLogix back plane.

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 along with the slot number the controller CPU resides in. 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, Port ID is 1 and CPU resides in slot 0.

Advanced Users:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote ControlLogix back plane.

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 along with the virtual slot number the controller CPU resides in. 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, Port ID is 1 and CPU resides in slot 1.

Advanced Users:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote SoftLogix back plane.

Logix Communications Parameters

Port Number

Specifies the port number the device (1756-ENBT, 1788-ENBT, SoftLogix PC, or 1761-NET-ENI) 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 (no 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 a Inactivity Watchdog value of 32 seconds is preferred.

Array Block Size

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. Thus setting the block size to 30 elements translates to 960 bit elements, while 3840 elements translate to 122880 bit elements.

Logix Database Settings

Use the following links to guide you in preparing for tag database import.

Database Import Method

1. Online vs. Offline tag import
2. Pros/Cons of each method.
3. Offline import file specification

Options

Tag name length restrictions (Compatibility with older OPC Server versions)

Filtering

Limit on the number of array elements imported. For large arrays.

Logix Database Import Method

Create Tag Database from Device

This feature will retrieve the tags directly from the controller over the same Ethernet connection used for data access.

Pros
- Fast.
- Comprehensive. All tags including I/O tags are imported.

*Cons**
- Access to the controller is necessary.
- Descriptions are not imported.

Create Tag Database from Import File

This feature will retrieve the tags directly from an RSLogix L5K/L5X file.

Pros
- Access to the controller is not necessary. Ability to work offline.
- Descriptions are imported.

*Cons**
- Slow.
- 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.

Tag Import File

Enter the exact location of the L5K/L5X import file from which tags will be imported. It is this file that 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

Check if you would like tag descriptions imported. Descriptions will be imported for non-structure, non-array tags only. Also, if necessary, a description will be given to tags with long names stating the original tag name.

Logix Database Options

Limit Tag/Group Names to 31 Characters?

Prior to OPC Server Version 4.70, tag/group name lengths were restricted to 31 characters. The current tag/group name length restriction is 256 characters, more than enough room to fit Logix 40 character native tag names.

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 clipped due to this 31-character limit . If this is the case, select this option to preserve the server tag names. This is recommended. OPC Client tag references will not be affected. If you do not select this option under the current conditions, new, longer tag names will be created for those that were clipped. OPC Clients referencing this clipped tag would have to be changed to reference the new tag in place of the previous clipped 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**.

If tags were imported via L5K/L5X with OPC Server Version 4.70 or above, **do not select this option**.

See Also: **Controller-to-Server Name Conversions**

Tag Hierarchy

Condensed or Expanded (default):

Condensed
In Condensed mode, the server tags that are 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:

- Program scope
- Structures and substructures

Note: To enable this functionality, make sure "Allow Automatically Generated Subgroups" in Device Properties is turned on.

See Also: **Tag Hierarchy**

Expanded (default)
In Expanded mode, the server tags that are 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 to represent "logical" groupings.

Groups created:

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

Note: To enable this functionality, make sure "Allow Automatically Generated Subgroups" in Device Properties is turned on.

Logix Database Filtering

Impose Limit

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 (checkbox checked), only a specified number of elements from each dimension will be generated. Such a limit only takes effect when the array dimension size exceeds the limit.

Array Element Limit

Enter the desired limit discussed above.

Logix Options

Use the following links for setting up some of the options available for the given Logix device.

Project Options

1. Default Type
2. Enable Performance Statistics

Protocol Options

Protocol Mode: Symbolic/Physical Protocol Modes

Logix Project Options

Default Type

This specifies the data type that will be assigned to a Client/Server tag when the default type is selected during tag addition/modification/import. Client/Server tags are assigned the default data type when any of the following conditions occur:

1. Dynamic tag created in the client with Native as its assigned data type.

2. Static tag 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 off-line 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.*

Since the majority of I/O module tags are non 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. (i.e. If 75% of alias I/O module tags are INT tags, set Default Type to INT.)

Enable Performance Statistics

The Allen-Bradley ControlLogix Ethernet driver has the ability to gather communication statistics useful in determining the performance of the driver's operation. By default the Perfomance Statistics is disabled. To enable this option select the device and edit its properties. Under the CLX Options tab, check the Enable Performance Statistics box. By selecting this option, the driver will 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. Once a project configuration is designed for optimal performance, it is recommended that you disable Performance Statistics.

Note: Since the statistics are outputted to the event log on shutdown, the server will need to be re-launched in order to view the results.

See Also: See **Performance Statistics and Tuning** for more information.

Logix Protocol Options

Protocol Mode

The protocol mode determines how Logix Tag data is read from the controller. This option should only be changed by advanced users who are looking to increase Client/Server Tag update performance. There are three options, Symbolic mode, Physical Non-Blocking mode, and Physical Blocking mode. The server project is interchangeable between these three modes.

Symbolic Mode

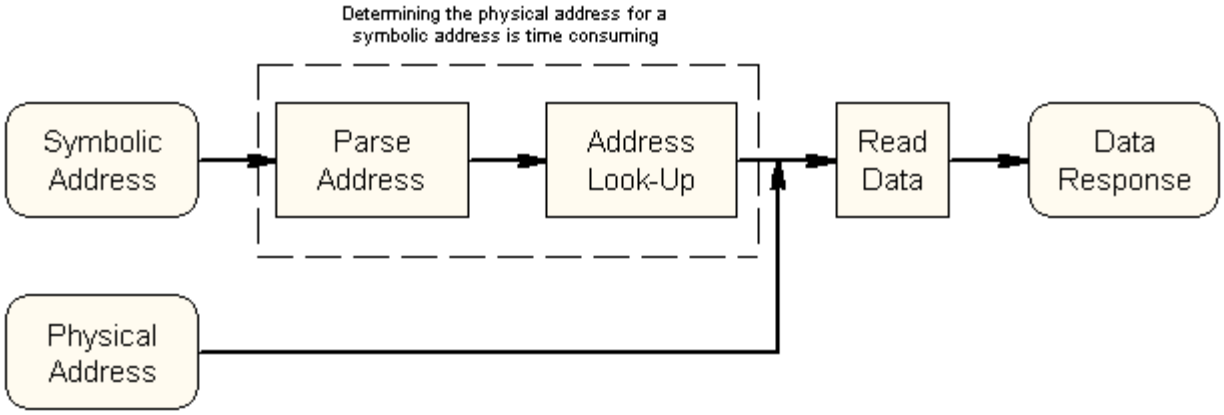
Each Client/Server Tag address is represented in the packet by its ASCII character name. Prior to Allen-Bradley ControlLogix Ethernet Driver Version 4.6.0.xx, the driver was using Symbolic mode. Symbolic mode is convenient in that all the information needed to make a data request lies in the Client/Server Tag's address. To take advantage of the Multi-Request Packet optimization, you want as many tags 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.

Pros
- Low initialization overhead. All information needed lies in Client/Server Tag's address.
- Only the data being accessed in Client/Server tags is requested from the PLC.
- Backward compatibility.

Cons
- High device turnaround time to process symbolic address.
- 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.

Pros
- Low device turnaround time to process physical address.
- Maximum request per Multi-Request Packet since each request is a fixed size.
- 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.

Pros
- If majority (1/3 or greater) of Logix tags are referenced, faster than Physical Non-Blocking.
- Low device turnaround time to process physical address.
- Maximum request per Multi-Request Packet since each request is a fixed size.

Cons
- Initialization overhead uploading project to determine physical addresses.
- If minority (1/3 or less) of Logix tags are referenced, slower than Physical Non-Blocking; more data being accessed from PLC than referenced in Client/Server tags.

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

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

1756-ENBT or 1756-ENET 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**.

Specification of the 1756-ENBT IP address, slot number of the 1756-DHRIO module, DH+ Channel to use, and destination DH+ Node ID.

DH+ Gateway Communications Parameters
1. ENBT 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 along with 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	1756-ENBT IP Address	Decimal	0 - 255

Port ID	Specifies a way out of the 1756-ENBT 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. *See Node ID Octal Addressing below.*	Decimal	0 - 99

Example

123.123.123.123,1,2.A.3

This equates to 1756-ENBT IP of 123.123.123.123, 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 thus requires a conversion to Decimal format for use in the DH+ Gateway Device ID. The Node ID can be located in RSWho within RSLinx and is also displayed is 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 above example, if 10 was entered as the DH+ Node ID in the DH+ 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 DHRIO module will return DF1 STS 0x02 which means 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:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote DH+ node.

DH+ Gateway Communications Parameters

Port Number

Specifies the port number the remote device (i.e. 1756-ENBT) is configured to use. 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 the performance of this driver, 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.

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 the Device Properties dialog. Check the checkbox labeled "Perform Block Writes for Function Files supporting Block Writes?". This notifies the driver to utilize block writes on function files supporting block writes. The changes will be effective immediately after hitting the "OK" or "Apply" buttons.

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 drivers 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). Immediately after setting the tag to "true", it will be automatically reset to "false", its default state. Setting this tag's value to "false" performs no action.

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

1756-ENBT or 1756-ENET Interface Module
1756-CNB or 1756-CNBR Interface Module
PLC-5C series PLC on ControlNet Network

Use the following links to aid in setting up a ControlNet Gateway:

ControlNet Gateway Device ID

1. Specification of the 1756-ENBT IP address, slot number of the 1756-CNB module, ControlNet Channel to use, and destination ControlNet Node ID.

ControlNet Gateway Communications Parameters

1. ENBT 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 along with 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	1756-ENBT IP Address	Decimal	0 - 255
Port ID	Specifies a way out of the 1756-ENBT interface 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. *See Node ID Octal Addressing below.*	Decimal	0 - 99

Example

123.123.123.123,1,2.A.3

This equates to 1756-ENBT IP of 123.123.123.123, 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 thus requires a conversion to Decimal format for use in the ControlNet Gateway Device ID. The Node ID can be located in RSWho within RSLinx and is also displayed is 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 above example, 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 which means 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:

See **Communications Routing** for details on how to supplement a Device ID with a routing path to a remote ControlNet node.

ControlNet Gateway Communications Parameters

Port Number

Specifies the port number the remote device (i.e. 1756-ENBT) is configured to use. 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 the performance of this driver, 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.

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 the Device Properties dialog. Check the checkbox labeled "Perform Block Writes for Function Files supporting Block Writes?". This notifies the driver to utilize block writes on function files supporting block writes. The changes will be effective immediately after hitting the "OK" or "Apply" buttons.

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 drivers 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). Immediately after setting the tag to "true", it will be automatically reset to "false", its default state. Setting this tag's value to "false" performs no action.

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

Specification of the 1761-NET-ENI IP address

ENI DF1 Communications Parameters

1. ENBT 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
- Project and 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:

Please 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 DF1 Communications Parameters

Port Number

Specifies the port number the remote device (i.e. 1756-ENBT) is configured to use. 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 the performance of this driver, 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.

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 the Device Properties dialog. Check the checkbox labeled "Perform Block Writes for Function Files supporting Block Writes?". This notifies the driver to utilize block writes on function files supporting block writes. The changes will be effective immediately after hitting the "OK" or "Apply" buttons.

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 drivers 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). Immediately after setting the tag to "true", it will be automatically reset to "false", its default state. Setting this tag's value to "false" performs no action.

ENI Logix Communications Parameters

Port Number

This parameter specifies the port number the device (1756-ENBT, 1788-ENBT, SoftLogix PC, or 1761-NET-ENI) 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 (no 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 a Inactivity Watchdog value of 32 seconds is preferred.

Array Block Size

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. Thus 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 to help set up theControlLogix driver:

MicroLogix 1100 Device ID

Specification of the MicroLogix 1100 IP address

MicroLogix 1100 Communications Parameters

1. ENBT 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

Specifies the port number the remote device (i.e. 1756-ENBT) is configured to use. 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 the performance of this driver, 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.

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 the Device Properties dialog. Check the checkbox labeled "Perform Block Writes for Function Files supporting Block Writes?". This notifies the driver to utilize block writes on function files supporting block writes. The changes will be effective immediately after hitting the "OK" or "Apply" buttons.

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 drivers 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

Attention ENI ControlLogix/CompactLogix/FlexLogix and MicroLogix 1100 Users:
Routing is not supported for ENI and MicroLogix 1100 models.

The concept behind routing is to provide a means of communicating with a remote device over various networks. Routing can be thought of as a bridge between your 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

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

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 results 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 (i.e. Channel A of 1756-DHRIO) to another DH+ link (i.e. 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.

Refer to the following links for aid in setting up Communications Routing.

Connection Path Specification

1. Introduction
2. Port/Link description
3. Single and Multi-Hop Syntax

Routing Examples

Illustrated examples ranging from simple to complex routing scenarios

Port Reference

Ports for 1756-DHRIO, CNB, ENBT and SoftLogix EtherNet/IP interface modules

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 (1756-ENBT or SoftLogix EtherNet/IP 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. From there the routing path will direct the message to the desired Logix back plane. The remainder of the Device ID will determine what device to communicate 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. **See Ports**.	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 you wish to go out of. If the corresponding port is an interface module port, then the link address specifies a destination node as follows. - DH+/ControlNet: **node id** - 1756-ENBT module: **IP address**. - SoftLogix EtherNet/IP module: **IP address**	Decimal	0 - 255

The general syntax for the connection path is shown in bold below.

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: 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).

The syntax not shown in bold was discussed in the **Device ID** section and is not explained here for brevity. Remember that 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.

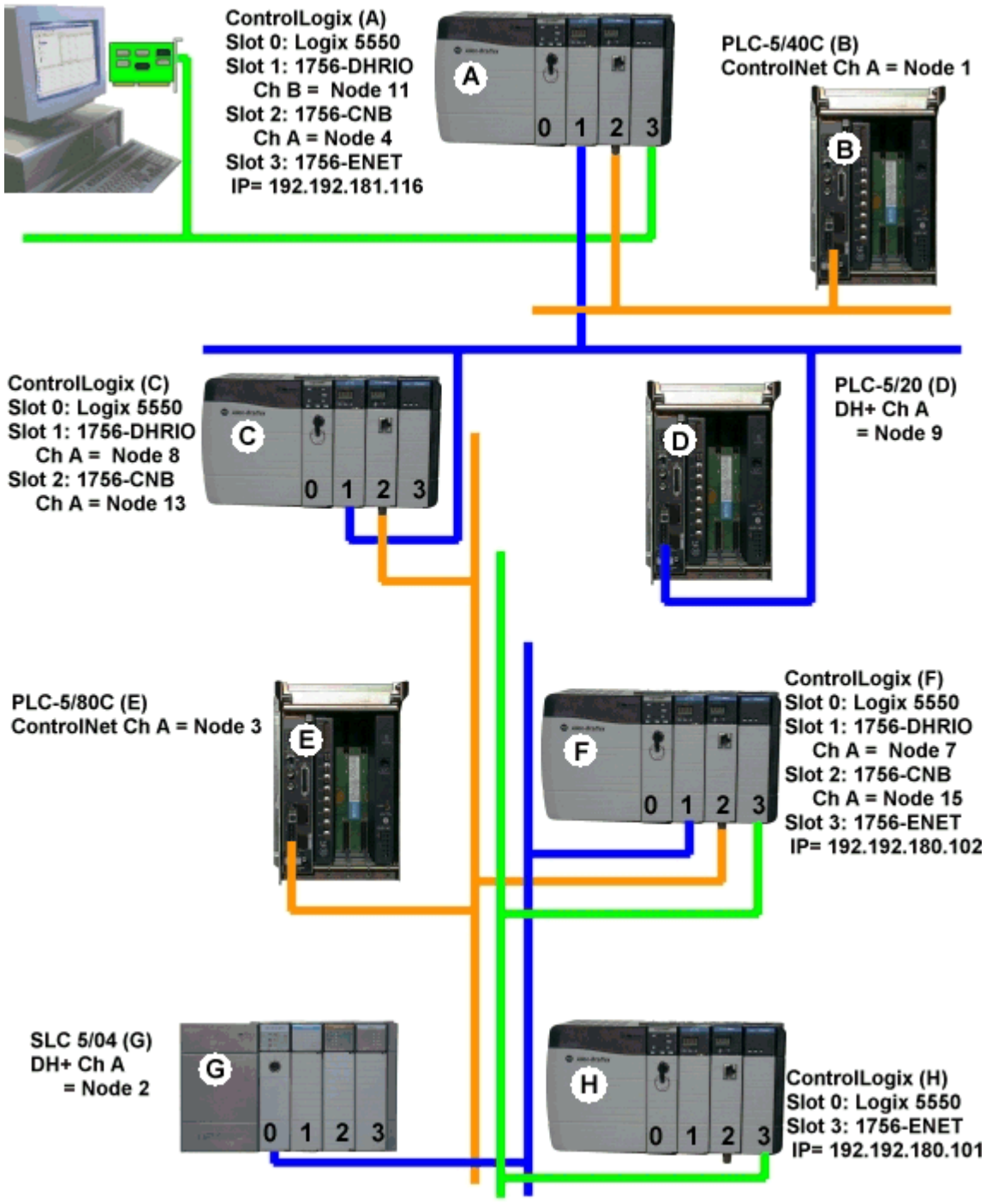
Routing Examples

Due to the complex nature of this feature, examples may be the best tutorial. The examples below will include the entire **Device ID** minus the IP of the local 1756-ENBT. Again, the perspective of the Device ID/Routing Path is from the local 1756-ENBT Module. Hop descriptions are in the 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, not Octal. 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
1756-ENBT	Back plane	Ethernet Network	N/A
SoftLogix EtherNet/IP Messaging Module	Virtual Backplane	Ethernet Network	N/A
1756-DHRIO	Back plane	DH+ Network on Ch. A	DH+ Network on Ch. B
1756-CNB	Back plane	ControlNet Network	N/A

SLC 500 Slot Configuration

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

- **Before Adding a Module**
- **Add A Module**
- **Remove A Module**
- **Modular I/O Selection Guide**

Before Adding a Module

Knowledge of the number of input and output words in each slot 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) is needed to address I/O in that slot. For example, if you are only going to access slot 3, you have to configure all slots up to 3 (slots 1 and 2) if they contain any I/O and slot 3 (but not slot 4 or greater).

Add A Module

For directions on how to add a module, refer to the instructions below.

1. In **Device Properties**, click the **General** dialog.

2. Select either a device model type of **DH+Gateway SLC 5/04** or **ENI: SLC Modular I/O**.

3. Next, go back to Device Properties and click the **SLC Slot Configuration dialog**.

4. Select a module from the **Available Modules** list box.

5. Click **Add**.

Remove A Module

To remove a module, first select the slot in the slot/module list box and then click **Remove**. The available module selections are the same as those in the Allen Bradley APS software.

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

While the Allen-Bradley ControlLogix Ethernet driver is fast, there are a couple of guidelines that can be applied in order to control and optimize the application (and gain maximum performance). The following sections discuss what can be done at both the communication and application level to get the most out of the ControlLogix driver.

- **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. The following are some suggestions to help users get started.

Protocol Mode

The Protocol Mode determines how Logix Tag data is accessed from the controller. In **Symbolic Mode**, each Client/Server Tag address is represented in the packet by its ASCII character name. In **Physical Non-Blocking Mode**, each is represented by its physical memory address in the PLC. In **Physical Blocking Mode**, the Logix Tag is accessed as a single chunk of data. Each Client/Server Tag (i.e. 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. In general, it is **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, note the following rules:

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 these tags should be assigned to the Physical Blocking device.

*1/3 is not a hard nor exact limit. This is a round figure that has been shown in a number of studies to hold true.
**A PID_ENHANCED structure has 165 tags, 1/3 = 55 tags.

UDT Substructure Aliasing

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

System Overhead Time Slice

Set in RSLogix5000, the system overhead time slice (SOTS) is the percentage of time allocated to perform communication tasks (i.e. OPC driver communications). 100% - SOTS is the percentage of time for controller tasks (i.e. 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. What value the "SOTS" is set to, defines the priority of your task. If controller tasks (i.e. ladder logic) are of higher priority, then the SOTS should be set below 30%. If the communication tasks (i.e. OPC application) are of higher priority, then the SOTS should be set at or above 30%. Inspection of performance test results shows that the SOTS should be set to 10% - 40% for the best balance of communications performance and CPU utilization.

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.

Attention Symbolic Mode Users:
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)

Reading of Logix atomic array elements is optimized. This is done by reading a block of the array in a single request as opposed to reading each element 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. By requesting element 0, you're 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 is dependent 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 drivers 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.

Optimized String Writes

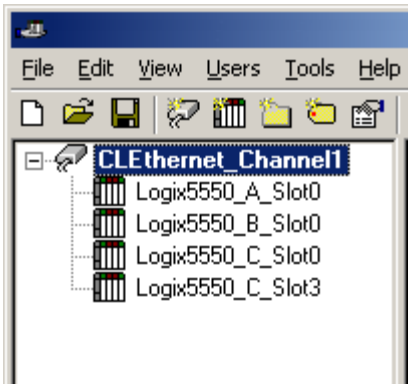
In the Physical Addressing modes, a write to STRING.DATA will also write to STRING.LEN with the proper length value. This optimization is automatic and cannot be turned off.

Attention Symbolic Mode Users:
This optimization is not available in Symbolic Mode.

Optimizing Your Application

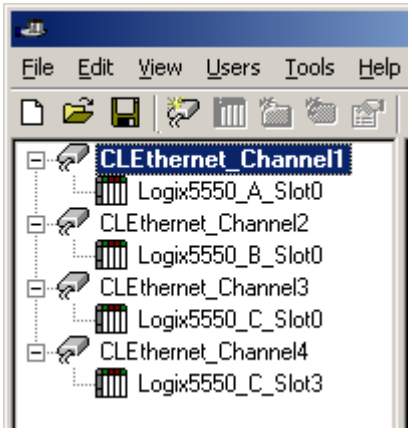
The Allen-Bradley ControlLogix Ethernet driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the Allen-Bradley ControlLogix Ethernet driver is fast, there are a couple of guidelines that can be used in order to control and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

Our 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. The FAQ below should help users decide whether or not Performance Statistics is right for them.

It is important to note that the performance of the server can be affected when Performance Statistics is enabled, as it is an additional layer of processing that occurs with server communications. By default, the Performance Statistics feature is turned off.

Where do I enable Performance Statistics?

The Performance Statistics feature is disabled by default. To enable this option, select the device and edit its properties. Under the **CLX Options** tab, check the **Enable Performance Statistics** box.

Why would I want to enable Performance Statistics?

Performance Statistics will provide meaningful numerical results across three scopes, the device, channel and driver. **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, the 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 these statistics?

Server statistics are outputted to the Server's Event Log upon shutdown of the Server. This will require a shutdown and a reopening of the Server in order to view the statistics results.

How do these Performance Statistics differ from Server Statistics?

Server statistics exist at the Channel scope only, while Performance Statistics exist at the Device, Channel and Driver level. Performance Statistics provide the makeup of the types of reads performed (i.e. symbolic vs. physical, device reads vs. cache reads) while Server Statistics provide a general read count value.

How do I tune my application for increased performance?

Optimizing Your Communications discusses ways to increase Device and Channel Statistic results. The information below is a summary.

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 composing 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 composing 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 in length.
5. Use Logix Arrays as often as possible.
6. Allocate only the necessary amount of System Overhead Time Slice for Ladder Logic/FBD needs. Leave the rest for driver communications.

Optimizing Your Application discusses ways to increase Driver Statistic results. The information below is a summary.

1. Spread devices across channels. Do not put more than one device on a channel unless absolutely necessary.
2. Spread the load evenly across devices. Do not overload a single device unless absolutely necessary.
3. Do not reference the same Logix tag across different devices.

A Note on Performance Statistics

There are general rules above to help optimize performance, but ultimately it depends on the application at hand. One thing that can obscure results is the tag scan rate. 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 your application for maximum performance. The following is an example to help get you started in tuning your own application.

See Also: **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

Once the procedure of statistics gathering and tuning is understood, it can be applied to any application. This example uses the Quick Client 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).

The statistics gathered are relative. Start with a Server project layout, gather the statistics and tune. More than 1 trial is required to properly assess the results for a given layout.

Once the most efficient layout is determined, the Client application can now be built with reassurance that the Server is optimal.

Caution: Performance results obtained using the Quick Client will not equate to performance results obtained using other Client applications. How many tags are being read/written at any given time, tag scan rates, and 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.

Additionally, performance tuning can be performed with your 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. **Using the Quick Client to tune your application before developing the Client application is therefore highly recommended.**

1. Given the controller project below:

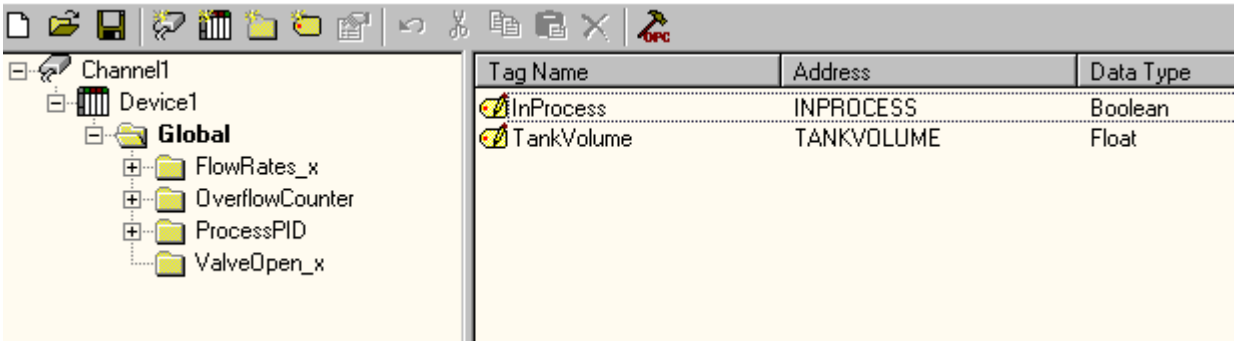
P	Tag Name	Alias For	Base Tag	Type
	InProcess			BOOL
	+-OverflowCounter			COUNTER
	+-ValveOpen			DINT[10]
	+-ProcessPID			PIDLoop
	+-FlowRates			ProcessVariable[2]
	TankVolume			REAL

This project consists of

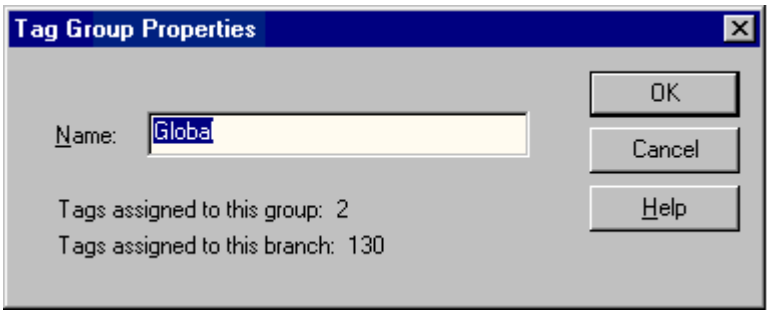
2 Atomics
1 Atomic array
1 UDT
1 UDT array
1 Pre-Defined Type

Overhead Time Slice (OTS) = 10%

2. After doing an Automatic Tag Database Generation from this controller, the Server produces the following project:

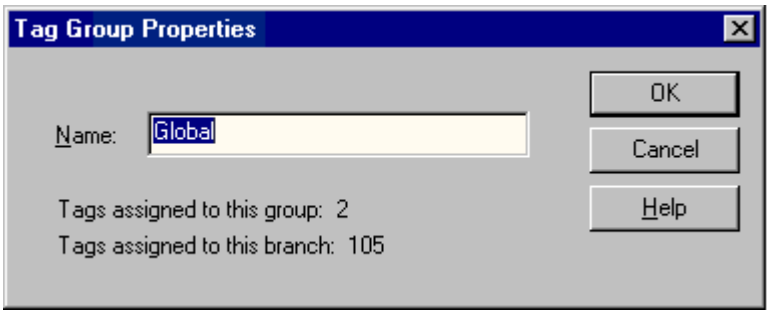


Global contains 130 tags as depicted below:

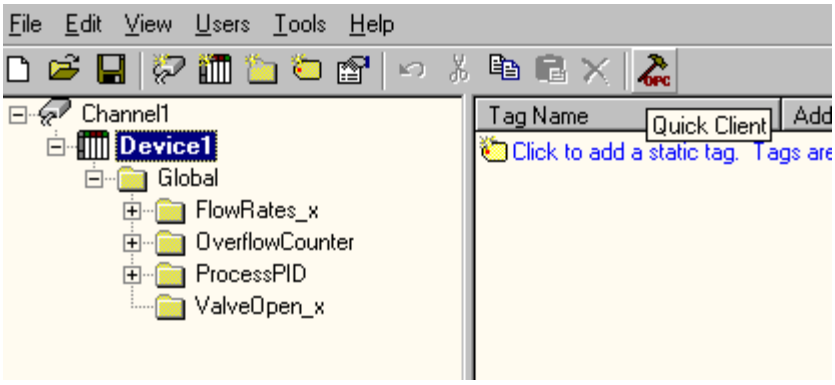


3. For the sake of this example, not all tags will be referenced. This is so we can illustrate the benefits of Tag Division as discussed in **Optimizing Your Communications**. More than 1/3 of the ProcessPID tags and less than 1/3 of the FlowRates tags will be referenced. All other tags will be referenced.

The new tag count is 105:



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

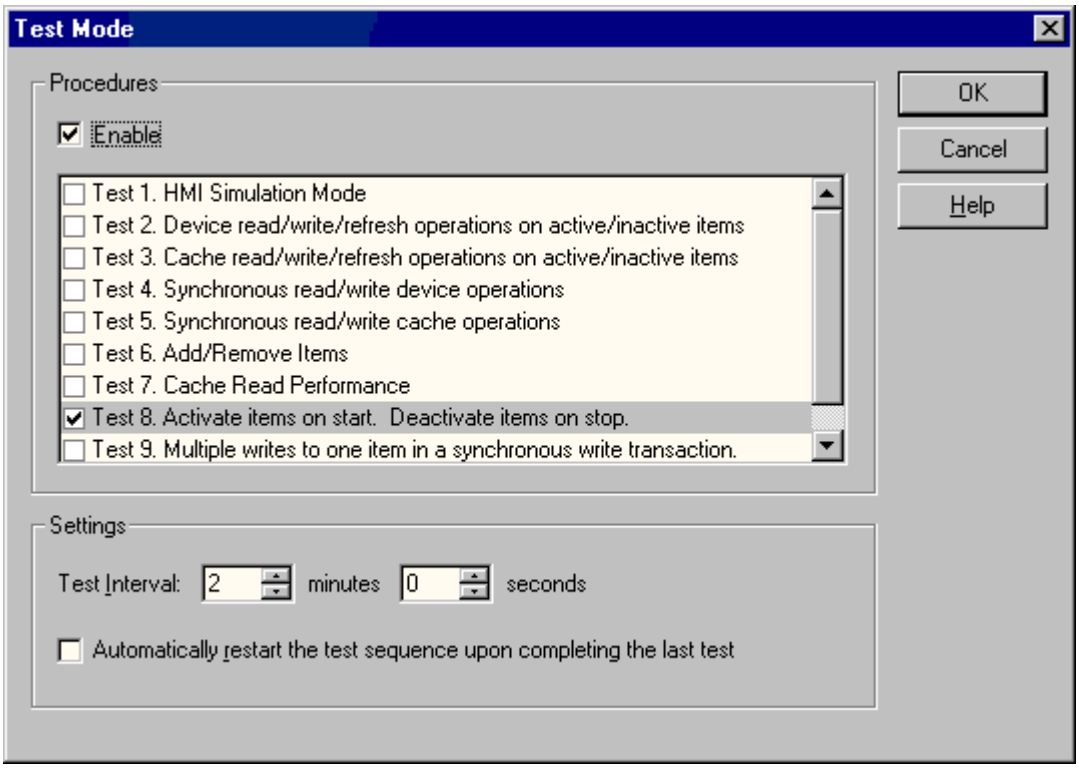


5. Once the project is loaded in the Quick Client, remove all Groups except the ones containing the tags of interest. For example, Statistics and System tags are not needed. Set the **Group Update Rate** to 0 - 10ms for small projects. For large projects 10 -50ms will suffice.

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 should be increased to get a more accurate reading.

8. Enable **Test Mode**.



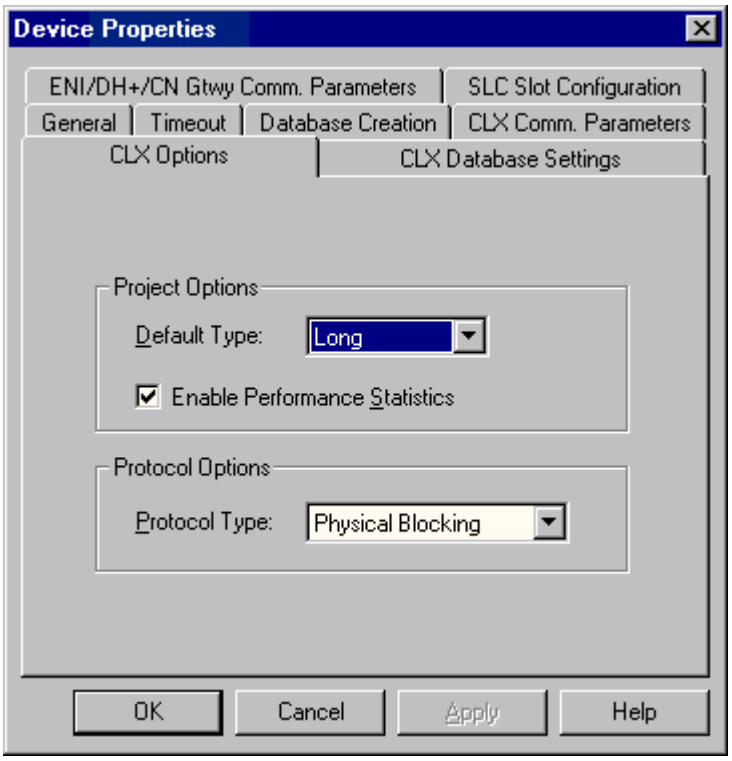
9. Return to **Tools** | **Test Mode** and disable test mode. All tags should be deactivated. Disconnect the Quick Client. Time trials can now begin.

10. Shutdown the Server.

Try Physical Blocking Mode

11. Launch the Server and set the protocol type to **Physical Blocking**. This is the default setting.

12. Select **Enable Performance Statistics**.



13. In Quick Client, connect to the Server. Click **Tools** | **Test Mode** and then enable test mode. Data reading will begin. When the test interval expires, all tags will be deactivated. The driver will cease all statistics gathering. The results can now be viewed.

14. Disconnect the Quick Client from the Server.

15. Shutdown the Server.

16. Launch the Server and search the **Server Event Log** for statistics. The image shown below is a capture of this 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 utilising 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
```

This is the control set to compare to.

Try Physical Non-Blocking Mode

17. From the Server, set the protocol type to **Physical Non-Blocking** in order to see if the application would benefit using this mode instead.

18. In Quick Client, connect to the Server. Click **Tools** | **Test Mode** and then enable test mode. Data reading will begin. When the test interval expires, all tags will be deactivated. The driver will cease all statistics gathering. The results can now be viewed.

19. Disconnect the Quick Client from the Server.

20. Shutdown the Server.

21. Launch the Server and search the **Server Event Log** for statistics. The image shown below is a capture of this 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 this 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
```

Try Symbolic Mode

22. 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.

23. In Quick Client, connect to the Server. Click **Tools** | **Test Mode** and then enable test mode. Data reading will begin. When the test interval expires, all tags will be deactivated. The driver will cease all statistics gathering. The results can now be viewed.

24. Disconnect the Quick Client from the Server.

25. Shutdown the Server.

26. Launch the Server and search the **Server Event Log** for statistics. The image shown below is a capture of this 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 this 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
```

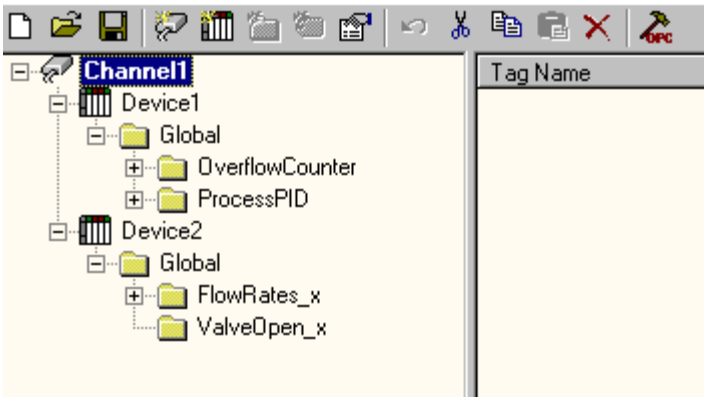
It appears that Physical Blocking is most optimal for the given application. To further refine performance, utilize the tips in **Optimizing Your Communications** and **Optimizing Your Application**.

Optimize Communications

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

Physical Blocking (Device 1)
ProcessPID
OverflowCounter

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



27. Repeat Steps 4 through 15. In Step 11, make sure Device 1 is Physical Blocking and 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 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
```

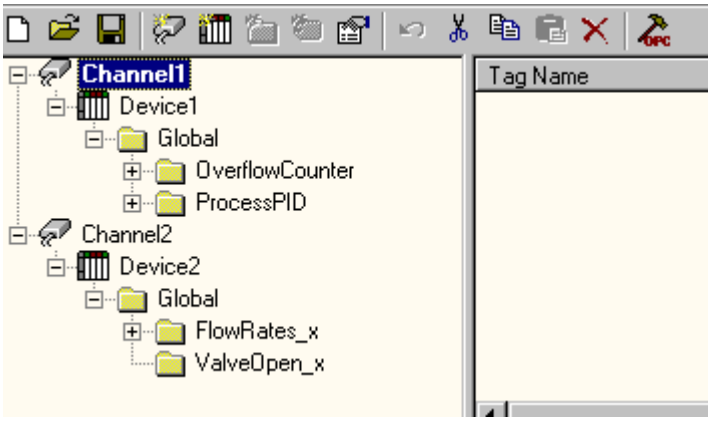
The individual Device statistics do not look impressive because the two devices are running on separate statistic counters. The key to this test is that the Channel and Driver statistics are better (6126) than using one channel/one device with either Physical Blocking (5972) or Physical Non-Blocking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



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

30. 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

We started out with a single channel/single device. This is default behavior since we are dealing with a single controller

in this example. All tags are imported from this controller to this channel.device. With this layout, we explored all 3 protocol types to see which would give us the best performance. In 3 trials it was determined that Physical Blocking protocol was the clear winner. 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 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.

We also took measures to optimize communications using the tips outlined in **Optimizing Your Communications**. Most notably, we used Tag Division to place Physical Blocking type tags in a device assigned Physical Blocking and 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.

We then took measures to optimize the application. This was done by placing devices on their own channel. Using the devices created in the previous trial, we placed a Physical Blocking device on one channel and a Physical Non-Blocking device on another. Our 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.

Using these 3 optimization methods (Protocol Type, Tag Division, and Multiple Channels), we have an 827% performance increase over Allen-Bradley ControlLogix Ethernet Driver version early than 4.6.0.xx. Also, Tag Division and Multiple Channels improved our performance over the single channel/single device scenario by 107%. This performance increase 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

See **Logix Data Types** for a description of Logix-platform-specific 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	**Logix Tag-Based Addressing**
	CompactLogix 5300 Ethernet	**Logix Tag-Based Addressing**
	FlexLogix 5400 Ethernet	**Logix Tag-Based Addressing**
	SoftLogix 5800	**Logix Tag-Based Addressing**
DH+ Gateway	DH+ Gateway: PLC-5	**PLC-5 Series Addressing for DH+**

	DH+ Gateway: SLC 5/04	**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	**Logix Tag-Based Addressing**
	ENI: CompactLogix 5300	**Logix Tag-Based Addressing**
	ENI: FlexLogix 5400	**Logix Tag-Based Addressing**
	ENI: MicroLogix	**MicroLogix Addressing for ENI**
	ENI: SLC 500 Fixed I/O	**SLC 500 Fixed I/O Addressing for ENI**
	ENI: SLC 500 Modular I/O	**SLC 500 Modular I/O Addressing for ENI**
	ENI: PLC-5	**PLC-5 Series Addressing for ENI**
MicroLogix 1100 Ethernet	MicroLogix 1100	**MicroLogix 1100 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 is dependent 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 is dependent 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

SLC 500 Fixed I/O Addressing for ENI

File Specific Addressing

PLC-5 Series Addressing for DH+

File Specific Addressing

PLC-5 Series Addressing for ControlNet

File Specific Addressing

PLC-5 Series Addressing for ENI

File Specific Addressing

MicroLogix Addressing for ENI

Open Addressing

The actual number of addresses available is dependent 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

Function Files

MicroLogix 1100 Addressing

Open Addressing

The actual number of addresses available is dependent 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

Function Files

MicroLogix 1400 Addressing

Open Addressing

The actual number of addresses available is dependent 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

Function Files

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 proceeding, familiarize yourself with **terminology** specific to Logix Addressing.

The Allen-Bradley ControlLogix Ethernet driver allows you 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, you cannot assign a TIMER to a server tag but you can assign an atomic member of the TIMER to the tag (i.e. TIMER.EN, TIMER.ACC, etc.) 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**.

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 and are listed below:

- 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
The rules for tag name assignment in the server differ from address assignment as follows:
- Cannot begin with an underscore

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, you're ensuring that the tag request remains complete and valid.

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.

See also: **Performance Optimizations**

<< Back << **>> Next >>**
Table Of Contents **Address Formats**

Terminology

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 (i.e. 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 is dependent 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. See Logix Data Type
Logix User-Defined Data Type	Logix Data Type defined by the user for use in the given controller. See **Logix Data Types**.
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.

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, you would use the bit format 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. Below is a table summarizing 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}	See Array Element Notes See Array w/o Offset Notes The array begins at an offset specified by the dimensions in the array element tag. The array always covers the highest dimension. So 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>/<string length>	tag_1/4	Length Range = 1 to 65535 The number of characters to read/write equals the string length.

*Since this format may request more than one element, the order in which array data is passed is dependent 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.

See **Ordering of Array Data** for more details on how elements are referenced for 1, 2 and 3 dimensional arrays.

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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 its defined in. Program tags follow the same addressing rules and limitations as global tags. The only difference is that program tags 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 1 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: These are a few of the many addressing possibilities involving structures and are shown here only to provide an introduction to structure addressing. Consult the Allen-Bradley or Rockwell documentation for further assistance.

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Address Formats	Addressing Atomic Data Types

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)	See **Advanced**
Client/Server Tag Example **More**	INTTAG	INTARR[0]	INTARR[0]{4}	INTTAG.0	
DINT					
Client/Server Data Type **Advanced**	DWord, Long	DWord, Long	DWord Array, Long Array	Boolean (Bit w/i DINT)	See **Advanced**
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	See Advanced	See **Advanced**
Client/Server Tag Example **More**	REALTAG	REALARR[0]	REALARR[0]{4}		

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Tag Scope	Addressing Structure Data Types

Addressing Structure Data Types

Structures cannot be referenced at the structure level, rather only the atomic structure members can be addressed.

Example:

Logix Tag
MyTimer @ TIMER

Client/Server Tag
Invalid
TimerTag address = MyTimer
TimerTag data type = ??

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.

Ordering of Logix Array Data

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

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

2. Dimensional Arrays - array [dim1, dim2]
The order in which 2 dimensional array data is passed to and from the controller is in ascending order as such:
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]
The order in which 3 dimensional array data is passed to and from the controller is in ascending order as such:
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. Click on a link below for infomation on a specific data type.

BOOL
SINT
INT
DINT
LINT
REAL

Advanced Addressing: BOOL

BOOL

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean Byte, Char Word, Short, BCD DWord, Long, LBCD Float $	None
Array Element	Boolean	Controller tag must be a 1-Dimensional array
Array w/o Offset	Boolean Array	1. Controller tag must be a 1-Dimensional array 2. Number of elements must be a factor of 32
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. Controller tag must be a 1-Dimensional array 2. Offset must lie on 32-bit boundary 3. Number of elements must be a factor of 32

Bit	Boolean	1. Controller tag must be a 1-Dimensional array 2. Range is limited from 0 to 31
String	String	Not Supported

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

See Also: **BOOL Examples**

Advanced Addressing: SINT

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 $	Controller tag must be an array
Array w/o Offset	Boolean Array	1. Use this case if you want 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. (i.e. tag_1.0{8}) 3. .bit + array size cannot exceed 8 bits (i.e. 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 #,$	Controller tag must be an array.
Bit	Boolean	1. Range is limited from 0 to 7 2. If controller tag is an array, bit class reference must be prefixed by an array element class reference. (i.e 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

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 $	Controller tag must be an array
Array w/o Offset	Boolean Array	1. Use this case if you want 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. (i.e. tag_1.0{16}) 3. .bit + array size cannot exceed 16 bits (i.e. 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 #,$	Controller tag must be an array.
Bit	Boolean	1. Range is limited from 0 to 15 2. If controller tag is an array, bit class reference must be prefixed by an array element class reference. (i.e 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 it is recommended that SINT strings or the STRING structure is used 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

DINT

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean*	None

	Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $	
Array Element	Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $	Controller tag must be an array
Array w/o Offset	Boolean Array	1. Use this case if you want 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. (i.e. tag_1.0{32}) 3. .bit + array size cannot exceed 32 bits (i.e. 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 $	Controller tag must be an array.
Bit	Boolean	1. 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. (i.e 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 DINT strings are not packed. For greater efficiency it is recommended that SINT strings or the STRING structure is used 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

LINT

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

REAL

Format	Supported Data Types	Requirements / Limitations / Notes
Standard	Boolean* Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $$	None
Array Element	Byte, Char** Word, Short, BCD*** DWord, Long, LBCD Float $$	Controller tag must be an array
Array w/o Offset	Boolean Array	1. Use this case if you want 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. (i.e. tag_1.0{32}) 3. .bit + array size cannot exceed 32 bits (i.e. 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 $$	If accessing more than a single element, the controller tag must be an array
Array w/ Offset	Byte Array, Char Array** Word Array, Short Array, BCD Array*** DWord Array, Long Array, LBCD Array Float Array $$	Controller tag must be an array.
Bit	Boolean	1. 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. (i.e 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 REAL strings are not packed. For greater efficiency it is recommended that SINT strings or the STRING structure is used 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

Addressing Examples are available 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 32
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 = [0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,...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 Offset	Byte	Value = [82,69,65,76,255,255,255,255,9,10]
realarraytag {2} {5}	Array w/o Offset	Float	Value = [82.1,69.2,65.3,76.4,256.5] [257.6,258.7,259.8,9,10]
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

ALARM

Member	Base Data Type
EnableIn	BOOL
In	REAL
HHLimit	REAL
HLimit	REAL
LLimit	REAL
LLLimit	REAL
Deadband	REAL
ROCPosLimit	REAL
ROCNegLimit	REAL
ROCPeriod	REAL
EnableOut	BOOL
HHAlarm	BOOL
HAlarm	BOOL
LAlarm	BOOL
LLAlarm	BOOL
ROCPosAlarm	BOOL

ROCNegAlarm	BOOL
ROC	REAL
Status	DINT
InstructFault	BOOL
DeadbandInv	BOOL
ROCPosLimitInv	BOOL
ROCNegLimitInv	BOOL
ROCPeriodInv	BOOL

ALARM_ANALOG

Member	Base Data Type
EnableIn	BOOL
In	REAL
InFault	BOOL
HHEnabled	BOOL
HEnabled	BOOL
LEnabled	BOOL
LLEnabled	BOOL
AckRequired	BOOL
ProgAckAll	BOOL
OperAckAll	BOOL
HHProgAck	BOOL
HHOperAck	BOOL
HProgAck	BOOL
HOperAck	BOOL
LProgAck	BOOL
LOperAck	BOOL
LLProgAck	BOOL
LLOperAck	BOOL
ROCPosProgAck	BOOL
ROCPosOperAck	BOOL
ROCNegProgAck	BOOL
ROCNegOperAck	BOOL
ProgSuppress	BOOL
OperSuppress	BOOL
ProgUnsuppress	BOOL
OperUnsuppress	BOOL
ProgDisable	BOOL
OperDisable	BOOL
ProgEnable	BOOL
OperEnable	BOOL
AlarmCountReset	BOOL
HHLimit	REAL
HHSeverity	DINT
HLimit	REAL
HSeverity	DINT
LLimit	REAL

LSeverity	DINT
LLLimit	REAL
LLSeverity	DINT
MinDurationPRE	DINT
Deadband	REAL
ROCPosLimit	REAL
ROCPosSeverity	DINT
ROCNegLimit	REAL
ROCNegSeverity	DINT
ROCPeriod	REAL
EnableOut	BOOL
InAlarm	BOOL
AnyInAlarmUnack	BOOL
HHInAlarm	BOOL
HInAlarm	BOOL
LInAlarm	BOOL
LLInAlarm	BOOL
ROCPosInAlarm	BOOL
ROCNegInAlarm	BOOL
ROC	REAL
HHAcked	BOOL
HAcked	BOOL
LAcked	BOOL
LLAcked	BOOL
ROCPosAcked	BOOL
ROCNegAcked	BOOL
HHInAlarmUnack	BOOL
HInAlarmUnack	BOOL
LInAlarmUnack	BOOL
LLInAlarmUnack	BOOL
ROCPosInAlarmUnack	BOOL
ROCNegInAlarmUnack	BOOL
Suppressed	BOOL
Disabled	BOOL
MinDurationACC	DINT
HHInAlarmTime	LINT
HHAlarmCount	DINT
HInAlarmTime	LINT
HAlarmCount	DINT
LInAlarmTime	LINT
LAlarmCount	DINT
LLInAlarmTime	LINT
LLAlarmCount	DINT
ROCPosInAlarmTime	LINT
ROCPosAlarmCount	DINT
ROCNegInAlarmTime	LINT
ROCNegAlarmCount	DINT
AckTime	LINT

RetToNormalTime	LINT
AlarmCountResetTime	LINT
DeliveryER	BOOL
DeliveryDN	BOOL
DeliveryEN	BOOL
NoSubscriber	BOOL
NoConnection	BOOL
CommError	BOOL
AlarmBuffered	BOOL
Subscribers	DINT
SubscNotified	DINT
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
SeverityInv	BOOL
AlarmLimitsInv	BOOL
DeadbandInv	BOOL
ROCPosLimitInv	BOOL
ROCNegLimitInv	BOOL
ROCPeriodInv	BOOL

ALARM_DIGITAL

Member	Base Data Type
EnableIn	BOOL
In	BOOL
InFault	BOOL
Condition	BOOL
AckRequired	BOOL
Latched	BOOL
ProgAck	BOOL
OperAck	BOOL
ProgReset	BOOL
OperReset	BOOL
ProgSuppress	BOOL
OperSuppress	BOOL
ProgUnsuppress	BOOL
OperUnsuppress	BOOL
ProgDisable	BOOL
OperDisable	BOOL
ProgEnable	BOOL
OperEnable	BOOL
AlarmCountReset	BOOL
UseProgTime	BOOL
ProgTime	LINT
Severity	DINT
MinDurationPRE	DINT
EnableOut	BOOL

InAlarm	BOOL
Acked	BOOL
InAlarmUnack	BOOL
Suppressed	BOOL
Disabled	BOOL
MinDurationACC	DINT
AlarmCount	DINT
InAlarmTime	LINT
AckTime	LINT
RetToNormalTime	LINT
AlarmCountResetTime	LINT
DeliveryER	BOOL
DeliveryDN	BOOL
DeliveryEN	BOOL
NoSubscriber	BOOL
NoConnection	BOOL
CommError	BOOL
AlarmBuffered	BOOL
Subscribers	DINT
SubscNotified	DINT
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
SeverityInv	BOOL

AXIS

Member	Base Data Type
MotionFault	DINT
MotionStatus	DINT
ServoFault	DINT
ServoStatus	DINT
EventStatus	DINT
UpdateStatus	DINT
ACAsyncConnFault	BOOL
ACSyncConnFault	BOOL
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL

GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
POtrvlFault	BOOL
NOtrvlFault	BOOL
PosErrorFault	BOOL
EncCHALossFault	BOOL
EncCHBLossFault	BOOL
EncCHZLossFault	BOOL
EncNsFault	BOOL
DriveFault	BOOL
SyncConnFault	BOOL
HardFault	BOOL
ServoActStatus	BOOL
DriveEnableStatus	BOOL
OutLmtStatus	BOOL
PosLockStatus	BOOL
HomeSwitchStatus	BOOL
TuneStatus	BOOL
TestStatus	BOOL
ShutdownStatus	BOOL
WatchEvArmStatus	BOOL
WatchEvStatus	BOOL
RegEvArmStatus	BOOL
RegEvStatus	BOOL
HomeEvArmStatus	BOOL
HomeEvStatus	BOOL
AxisTypeStatus	BOOL
PosUnwindStatus	BOOL
MaxPTrvlStatus	BOOL
MaxNTrvlStatus	BOOL
PosErrorTolStatus	BOOL
PosLockTolStatus	BOOL
PosPGainStatus	BOOL
PosIGainStatus	BOOL
VelFfGainStatus	BOOL
AccFfGainStatus	BOOL
VelPGainStatus	BOOL
VelIGainStatus	BOOL
OutFiltBwStatus	BOOL
OutScaleStatus	BOOL
OutLimitStatus	BOOL
OutOffsetStatus	BOOL
FricCompStatus	BOOL
POtrvlFaultActStatus	BOOL
PosErrorFaultActStatus	BOOL
EncLossFaultActStatus	BOOL
EncNsFaultActStatus	BOOL
DriveFaultActStatus	BOOL

ServoConfigBitsStatus	BOOL

AXIS_CONSUMED

Member	Base Data Type
InhibitStatus	BOOL
CoordinatedMotionStatus	BOOL
TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL

StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL
Registration1Position	REAL
Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT
InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL
ModuleFaults	DINT
ControlSyncFault	BOOL

AXIS_GENERIC

Member	Base Data Type
InhibitStatus	BOOL
CoordinatedMotionStatus	BOOL
TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL

AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL
StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL
Registration1Position	REAL
Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT
InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL

AXIS_GENERIC_DRIVE

Member	Base Data Type
AxisFault	DINT

PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
InhibitStatus	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
CoordinatedMotionStatus	BOOL
TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL
StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL

Registration1Position	REAL
Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT
InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL
ModuleFaults	DINT
ControlSyncFault	BOOL
ModuleSyncFault	BOOL
TimerEventFault	BOOL
ModuleHardwareFault	BOOL
SERCOSRingFault	BOOL
AttributeErrorCode	INT
AttributeErrorID	INT
DriveStatus	DINT
ProcessStatus	BOOL
HomeInputStatus	BOOL
Reg1InputStatus	BOOL
Reg2InputStatus	BOOL
PosOvertravelInputStatus	BOOL
NegOvertravelInputStatus	BOOL
EnableInputStatus	BOOL
AccelLimitStatus	BOOL
AbsoluteReferenceStatus	BOOL
VelocityLockStatus	BOOL
VelocityStandstillStatus	BOOL
VelocityThresholdStatus	BOOL
TorqueThresholdStatus	BOOL
TorqueLimitStatus	BOOL
VelocityLimitStatus	BOOL
PositionLockStatus	BOOL
PowerLimitStatus	BOOL
LowVelocityThresholdStatus	BOOL
HighVelocityThresholdStatus	BOOL
DriveFault	DINT
PosSoftOvertravelFault	BOOL
NegSoftOvertravelFault	BOOL
PosHardOvertravelFault	BOOL
NegHardOvertravelFault	BOOL

MotFeedbackFault	BOOL
MotFeedbackNoiseFault	BOOL
AuxFeedbackFault	BOOL
AuxFeedbackNoiseFault	BOOL
DriveEnableInputFault	BOOL
GroundShortFault	BOOL
DriveHardFault	BOOL
OverSpeedFault	BOOL
OverloadFault	BOOL
DriveOvertempFault	BOOL
MotorOvertempFault	BOOL
DriveCoolingFault	BOOL
DriveControlVoltageFault	BOOL
FeedbackFault	BOOL
CommutationFault	BOOL
DriveOvercurrentFault	BOOL
DriveOvervoltageFault	BOOL
DriveUndervoltageFault	BOOL
PowerPhaseLossFault	BOOL
PositionErrorFault	BOOL
SERCOSFault	BOOL
SERCOSErrorCode	INT

AXIS_SERVO

Member	Base Data Type
InhibitStatus	BOOL
TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL

TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
CoordinatedMotionStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL
StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL
Registration1Position	REAL
Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT
InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL
ServoStatus	DINT
ProcessStatus	BOOL
OutputLimitStatus	BOOL
PositionLockStatus	BOOL
HomeInputStatus	BOOL
Reg1InputStatus	BOOL

Reg2InputStatus	BOOL
DriveFaultInputStatus	BOOL
ServoFault	DINT
PosSoftOvertravelFault	BOOL
NegSoftOvertravelFault	BOOL
FeedbackFault	BOOL
FeedbackNoiseFault	BOOL
PositionErrorFault	BOOL
DriveFault	BOOL
ModuleFaults	DINT
ControlSyncFault	BOOL
ModuleSyncFault	BOOL
TimerEventFault	BOOL
ModuleHardwareFault	BOOL
InterModuleSyncFault	BOOL
AttributeErrorCode	INT
AttributeErrorID	INT
PositionCommand	REAL
PositionFeedback	REAL
AuxPositionFeedback	REAL
PositionError	REAL
PositionIntegratorError	REAL
VelocityCommand	REAL
VelocityFeedback	REAL
VelocityError	REAL
VelocityIntegratorError	REAL
AccelerationCommand	REAL
AccelerationFeedback	REAL
ServoOutputLevel	REAL
MarkerDistance	REAL
VelocityOffset	REAL
TorqueOffset	REAL

AXIS_SERVO_DRIVE

Member	Base Data Type
InhibitStatus	BOOL
CoordinatedMotionStatus	BOOL
TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AnalogInput1	REAL
AnalogInput2	REAL
BusReadyStatus	BOOL
SafeOffModeActiveStatus	BOOL
DriveEnableInputFault	BOOL
CommonBusFault	BOOL
PreChargeOverloadFault	BOOL
AxisFault	DINT

PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL
StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL
Registration1Position	REAL
Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT

InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL
ModuleFaults	DINT
ControlSyncFault	BOOL
ModuleSyncFault	BOOL
TimerEventFault	BOOL
ModuleHardwareFault	BOOL
SERCOSRingFault	BOOL
AttributeErrorCode	INT
AttributeErrorID	INT
PositionCommand	REAL
PositionFeedback	REAL
AuxPositionFeedback	REAL
PositionError	REAL
PositionIntegratorError	REAL
VelocityCommand	REAL
VelocityFeedback	REAL
VelocityError	REAL
VelocityIntegratorError	REAL
AccelerationCommand	REAL
AccelerationFeedback	REAL
MarkerDistance	REAL
VelocityOffset	REAL
TorqueOffset	REAL
TorqueCommand	REAL
TorqueFeedback	REAL
PosDynamicTorqueLimit	REAL
NegDynamicTorqueLimit	REAL
MotorCapacity	REAL
DriveCapacity	REAL
PowerCapacity	REAL
BusRegulatorCapacity	REAL
MotorElectricalAngle	REAL
TorqueLimitSource	DINT
DCBusVoltage	DINT
DriveStatus	DINT
ProcessStatus	BOOL
HomeInputStatus	BOOL
Reg1InputStatus	BOOL

Reg2InputStatus	BOOL
PosOvertravelInputStatus	BOOL
NegOvertravelInputStatus	BOOL
EnableInputStatus	BOOL
AccelLimitStatus	BOOL
AbsoluteReferenceStatus	BOOL
VelocityLockStatus	BOOL
VelocityStandstillStatus	BOOL
VelocityThresholdStatus	BOOL
TorqueThresholdStatus	BOOL
TorqueLimitStatus	BOOL
VelocityLimitStatus	BOOL
PositionLockStatus	BOOL
PowerLimitStatus	BOOL
LowVelocityThresholdStatus	BOOL
HighVelocityThresholdStatus	BOOL
DriveFault	DINT
PosSoftOvertravelFault	BOOL
NegSoftOvertravelFault	BOOL
PosHardOvertravelFault	BOOL
NegHardOvertravelFault	BOOL
MotFeedbackFault	BOOL
MotFeedbackNoiseFault	BOOL
AuxFeedbackFault	BOOL
AuxFeedbackNoiseFault	BOOL
GroundShortFault	BOOL
DriveHardFault	BOOL
OverSpeedFault	BOOL
OverloadFault	BOOL
DriveOvertempFault	BOOL
MotorOvertempFault	BOOL
DriveCoolingFault	BOOL
DriveControlVoltageFault	BOOL
FeedbackFault	BOOL
CommutationFault	BOOL
DriveOvercurrentFault	BOOL
DriveOvervoltageFault	BOOL
DriveUndervoltageFault	BOOL
PowerPhaseLossFault	BOOL
PositionErrorFault	BOOL
SERCOSFault	BOOL
SERCOSErrorCode	INT

AXIS_VIRTUAL

Member	Base Data Type
InhibitStatus	BOOL
CoordinatedMotionStatus	BOOL

TransformStateStatus	BOOL
ControlledByTransformStatus	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
AxisStatus	DINT
ServoActionStatus	BOOL
DriveEnableStatus	BOOL
ShutdownStatus	BOOL
ConfigUpdateInProcess	BOOL
MotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
MoveStatus	BOOL
JogStatus	BOOL
GearingStatus	BOOL
HomingStatus	BOOL
StoppingStatus	BOOL
AxisHomedStatus	BOOL
PositionCamStatus	BOOL
TimeCamStatus	BOOL
PositionCamPendingStatus	BOOL
TimeCamPendingStatus	BOOL
GearingLockStatus	BOOL
PositionCamLockStatus	BOOL
MasterOffsetMoveStatus	BOOL
AxisEvent	DINT
WatchEventArmedStatus	BOOL
WatchEventStatus	BOOL
RegEvent1ArmedStatus	BOOL
RegEvent1Status	BOOL
RegEvent2ArmedStatus	BOOL
RegEvent2Status	BOOL
HomeEventArmedStatus	BOOL
HomeEventStatus	BOOL
OutputCamStatus	DINT
OutputCamPendingStatus	DINT
OutputCamLockStatus	DINT
OutputCamTransitionStatus	DINT
ActualPosition	REAL
StrobeActualPosition	REAL
StartActualPosition	REAL
AverageVelocity	REAL
ActualVelocity	REAL
ActualAcceleration	REAL
WatchPosition	REAL
Registration1Position	REAL

Registration2Position	REAL
Registration1Time	DINT
Registration2Time	DINT
InterpolationTime	DINT
InterpolatedActualPosition	REAL
MasterOffset	REAL
StrobeMasterOffset	REAL
StartMasterOffset	REAL
CommandPosition	REAL
StrobeCommandPosition	REAL
StartCommandPosition	REAL
CommandVelocity	REAL
CommandAcceleration	REAL
InterpolatedCommandPosition	REAL

CAM

Member	Base Data Type
Master	REAL
Slave	REAL
SegmentType	DINT

CAM_PROFILE

Member	Base Data Type
Status	DINT

CONNECTION_STATUS

Member	Base Data Type
RunMode	BOOL
ConnectionFaulted	BOOL

CONTROL

Member	Base Data Type
LEN	DINT
POS	DINT
EN	BOOL
EU	BOOL
DN	BOOL
EM	BOOL
ER	BOOL
UL	BOOL
IN	BOOL
FD	BOOL

COORDINATE_SYSTEM

Member	Base Data Type
AxisInhibitStatus	BOOL
TransformSourceStatus	BOOL
TransformTargetStatus	BOOL
AxesInhibitedStatus	DINT
CoordinateSystemStatus	DINT
ShutdownStatus	BOOL
ReadyStatus	BOOL
MotionStatus	BOOL
CoordinateMotionStatus	DINT
AccelStatus	BOOL
DecelStatus	BOOL
ActualPosToleranceStatus	BOOL
CommandPosToleranceStatus	BOOL
StoppingStatus	BOOL
MoveStatus	BOOL
MoveTransitionStatus	BOOL
MovePendingStatus	BOOL
MovePendingQueueFullStatus	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
PhysicalAxesFaulted	DINT
ModulesFaulted	DINT
AxesConfigurationFaulted	DINT
AxesShutdownStatus	DINT
AxesServoOnStatus	DINT
ActualPosition	REAL [8]

COUNTER

Member	Base Data Type
PRE	DINT
ACC	DINT
CU	BOOL
CD	BOOL
DN	BOOL
OV	BOOL
UN	BOOL

DEADTIME

Member	Base Data Type
EnableIn	BOOL
In	REAL
InFault	BOOL
Deadtime	REAL
Gain	REAL
Bias	REAL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
DeadtimeInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

DERIVATIVE

Member	Base Data Type
EnableIn	BOOL
In	REAL
Gain	REAL
ByPass	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

DISCRETE_2STATE

Member	Base Data Type
EnableIn	BOOL
ProgCommand	BOOL
Oper0Req	BOOL
Oper1Req	BOOL
State0Perm	BOOL
State1Perm	BOOL
FB0	BOOL
FB1	BOOL
HandFB	BOOL
FaultTime	REAL
FaultAlarmLatch	BOOL
FaultAlmUnlatch	BOOL
OverrideOnInit	BOOL
OverrideOnFault	BOOL
OutReverse	BOOL
OverrideState	BOOL
FB0State0	BOOL
FB0State1	BOOL
FB1State0	BOOL
FB1State1	BOOL
ProgProgReq	BOOL
ProgOperReq	BOOL
ProgOverrideReq	BOOL
ProgHandReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
ProgValueReset	BOOL
EnableOut	BOOL
Out	BOOL
Device0State	BOOL
Device1State	BOOL
CommandStatus	BOOL
FaultAlarm	BOOL
ModeAlarm	BOOL
ProgOper	BOOL
Override	BOOL
Hand	BOOL
Status	DINT
InstructFault	BOOL
FaultTimeInv	BOOL
OperReqInv	BOOL

DISCRETE_3STATE

Member	Base Data Type
EnableIn	BOOL
Prog0Command	BOOL
Prog1Command	BOOL
Prog2Command	BOOL
Oper0Req	BOOL
Oper1Req	BOOL
Oper2Req	BOOL
State0Perm	BOOL
State1Perm	BOOL
State2Perm	BOOL
FB0	BOOL
FB1	BOOL
FB2	BOOL
FB3	BOOL
HandFB0	BOOL
HandFB1	BOOL
HandFB2	BOOL
FaultTime	REAL
FaultAlarmLatch	BOOL
FaultAlmUnlatch	BOOL
OverrideOnInit	BOOL
OverrideOnFault	BOOL
Out0State0	BOOL
Out0State1	BOOL
Out0State2	BOOL
Out1State0	BOOL
Out1State1	BOOL
Out1State2	BOOL
Out2State0	BOOL
Out2State1	BOOL
Out2State2	BOOL
OverrideState	DINT
FB0State0	BOOL
FB0State1	BOOL
FB0State2	BOOL
FB1State0	BOOL
FB1State1	BOOL
FB1State2	BOOL
FB2State0	BOOL
FB2State1	BOOL
FB2State2	BOOL
FB3State0	BOOL
FB3State1	BOOL
FB3State2	BOOL
ProgProgReq	BOOL
ProgOperReq	BOOL
ProgOverrideReq	BOOL

ProgHandReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
ProgValueReset	BOOL
EnableOut	BOOL
Out0	BOOL
Out1	BOOL
Out2	BOOL
Device0State	BOOL
Device1State	BOOL
Device2State	BOOL
Command0Status	BOOL
Command1Status	BOOL
Command2Status	BOOL
FaultAlarm	BOOL
ModeAlarm	BOOL
ProgOper	BOOL
Override	BOOL
Hand	BOOL
Status	DINT
InstructFault	BOOL
FaultTimeInv	BOOL
OverrideStateInv	BOOL
ProgCommandInv	BOOL
OperReqInv	BOOL
HandCommandInv	BOOL

DIVERSE_INPUT

Member	Base Data Type
EnableIn	BOOL
ResetType	BOOL
ChannelA	BOOL
ChannelB	BOOL
CircuitReset	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
CI	BOOL
CRHO	BOOL
II	BOOL
FP	BOOL

DOMINANT_RESET

Member	Base Data Type
EnableIn	BOOL

Set	BOOL
Reset	BOOL
EnableOut	BOOL
Out	BOOL
OutNot	BOOL

DOMINANT_SET

Member	Base Data Type
EnableIn	BOOL
Set	BOOL
Reset	BOOL
EnableOut	BOOL
Out	BOOL
OutNot	BOOL

ENABLE_PENDANT

Member	Base Data Type
EnableIn	BOOL
ResetType	BOOL
ChannelA	BOOL
ChannelB	BOOL
CircuitReset	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
CI	BOOL
CRHO	BOOL
II	BOOL
FP	BOOL

EMERGENCY_STOP

Member	Base Data Type
EnableIn	BOOL
ResetType	BOOL
ChannelA	BOOL
ChannelB	BOOL
CircuitReset	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
CI	BOOL
CRHO	BOOL
II	BOOL

FP	BOOL

EXT_ROUTINE_CONTROL

Member	Base Data Type
ErrorCode	SINT
NumParams	SINT
ParameterDefs	EXT_ROUTINE_PARAMETERS[10]
ReturnParamDef	EXT_ROUTINE_PARAMETERS
EN	BOOL
ReturnsValue	BOOL
DN	BOOL
ER	BOOL
FirstScan	BOOL
EnableOut	BOOL
EnableIn	BOOL
User1	BOOL
User0	BOOL
ScanType1	BOOL
ScanType0	BOOL

EXT_ROUTINE_PARAMETERS

Member	Base Data Type
ElementSize	DINT
ElementCount	DINT
ParamType	DINT

FBD_BIT_FIELD_DISTRIBUTE

Member	Base Data Type
EnableIn	BOOL
Source	DINT
SourceBit	DINT
Length	DINT
DestBit	DINT
Target	DINT
EnableOut	BOOL
Dest	DINT

FBD_BOOLEAN_AND

Member	Base Data Type
EnableIn	BOOL
In1	BOOL
In2	BOOL

In3	BOOL
In4	BOOL
In5	BOOL
In6	BOOL
In7	BOOL
In8	BOOL
EnableOut	BOOL
Out	BOOL

FBD_BOOLEAN_NOT

Member	Base Data Type
EnableIn	BOOL
In	BOOL
EnableOut	BOOL
Out	BOOL

FBD_BOOLEAN_OR

Member	Base Data Type
EnableIn	BOOL
In1	BOOL
In2	BOOL
In3	BOOL
In4	BOOL
In5	BOOL
In6	BOOL
In7	BOOL
In8	BOOL
EnableOut	BOOL
Out	BOOL

FBD_BOOLEAN_XOR

Member	Base Data Type
EnableIn	BOOL
In1	BOOL
In2	BOOL
EnableOut	BOOL
Out	BOOL

FBD_COMPARE

Member	Base Data Type
EnableIn	BOOL
SourceA	REAL

SourceB	REAL
EnableOut	BOOL
Dest	BOOL

FBD_CONVERT

Member	Base Data Type
EnableIn	BOOL
Source	DINT
EnableOut	BOOL
Dest	DINT

FBD_COUNTER

Member	Base Data Type
EnableIn	BOOL
CUEnable	BOOL
CDEnable	BOOL
PRE	DINT
Reset	BOOL
EnableOut	BOOL
ACC	DINT
CU	BOOL
CD	BOOL
DN	BOOL
OV	BOOL
UN	BOOL

FBD_LIMIT

Member	Base Data Type
EnableIn	BOOL
LowLimit	REAL
Test	REAL
HighLimit	REAL
EnableOut	BOOL
Dest	BOOL

FBD_LOGICAL

Member	Base Data Type
EnableIn	BOOL
SourceA	DINT
SourceB	DINT
EnableOut	BOOL
Dest	DINT

FBD_MASKED_MOVE

Member	Base Data Type
EnableIn	BOOL
Source	DINT
Mask	DINT
Target	DINT
EnableOut	BOOL
Dest	DINT

FBD_MASK_EQUAL

Member	Base Data Type
EnableIn	BOOL
Source	DINT
Mask	DINT
Compare	DINT
EnableOut	BOOL
Dest	BOOL

FBD_MATH

Member	Base Data Type
EnableIn	BOOL
SourceA	REAL
SourceB	REAL
EnableOut	BOOL
Dest	REAL

FBD_MATH_ADVANCED

Member	Base Data Type
EnableIn	BOOL
Source	REAL
EnableOut	BOOL
Dest	REAL

FBD_ONESHOT

Member	Base Data Type
EnableIn	BOOL
InputBit	BOOL
EnableOut	BOOL
OutputBit	BOOL

FBD_TIMER

Member	Base Data Type
EnableIn	BOOL
TimerEnable	BOOL
PRE	DINT
Reset	BOOL
EnableOut	BOOL
ACC	DINT
EN	BOOL
TT	BOOL
DN	BOOL
Status	DINT
InstructFault	BOOL
PresetInv	BOOL

FBD_TRUNCATE

Member	Base Data Type
EnableIn	BOOL
Source	REAL
EnableOut	BOOL
Dest	DINT

FILTER_HIGH_PASS

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
WLead	REAL
Order	DINT
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
WLeadInv	BOOL
OrderInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL

DeltaTInv	BOOL

FILTER_LOW_PASS

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
WLag	REAL
Order	DINT
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
WLagInv	BOOL
OrderInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

FILTER_NOTCH

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
WNotch	REAL
QFactor	REAL
Order	DINT
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
WNotchInv	BOOL
QFactorInv	BOOL

OrderInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

FIVE_POS_MODE_SELECTOR

Member	Base Data Type
EnableIn	BOOL
Input1	BOOL
Input2	BOOL
Input3	BOOL
Input4	BOOL
Input5	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
O2	BOOL
O3	BOOL
O4	BOOL
O5	BOOL
NM	BOOL
MMS	BOOL
FP	BOOL

FLIP_FLOP_D

Member	Base Data Type
EnableIn	BOOL
D	BOOL
Clear	BOOL
Clock	BOOL
EnableOut	BOOL
Q	BOOL
QNot	BOOL

FLIP_FLOP_JK

Member	Base Data Type
EnableIn	BOOL
Clear	BOOL
Clock	BOOL
EnableOut	BOOL
Q	BOOL

QNot	BOOL

FUNCTION_GENERATOR

Member	Base Data Type
EnableIn	BOOL
In	REAL
XY1Size	DINT
XY2Size	DINT
Select	BOOL
EnableOut	BOOL
Out	REAL
Status	DINT
InstructFault	BOOL
XY1SizeInv	BOOL
XY2SizeInv	BOOL
XisOutofOrder	BOOL

HL_LIMIT

Member	Base Data Type
EnableIn	BOOL
In	REAL
HighLimit	REAL
LowLimit	REAL
SelectLimit	DINT
EnableOut	BOOL
Out	REAL
HighAlarm	BOOL
LowAlarm	BOOL
Status	DINT
InstructFault	BOOL
LimitsInv	BOOL
SelectLimitInv	BOOL

INTEGRATOR

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
InitialValue	REAL
IGain	REAL
HighLimit	REAL
LowLimit	REAL
HoldHigh	BOOL

HoldLow	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
HighAlarm	BOOL
LowAlarm	BOOL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
IGainInv	BOOL
HighLowLimsInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

LEAD_LAG

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
Lead	REAL
Lag	REAL
Gain	REAL
Bias	REAL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
LeadInv	BOOL
LagInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

LEAD_LAG_SEC_ORDER

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
WLead	REAL
WLag	REAL
ZetaLead	REAL
ZetaLag	REAL
Order	DINT
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
WLeadInv	BOOL
WLagInv	BOOL
ZetaLeadInv	BOOL
ZetaLagInv	BOOL
OrderInv	BOOL
WLagRatioInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

LIGHT_CURTAIN

Member	Base Data Type
EnableIn	BOOL
ResetType	BOOL
ChannelA	BOOL
ChannelB	BOOL
MuteLightCurtain	BOOL
CircuitReset	BOOL
FaultReset	BOOL
InputFilterTime	DINT
EnableOut	BOOL
O1	BOOL
CI	BOOL
CRHO	BOOL

LCB	BOOL
LCM	BOOL
II	BOOL
FP	BOOL

MAXIMUM_CAPTURE

Member	Base Data Type
EnableIn	BOOL
In	REAL
Reset	BOOL
ResetValue	REAL
EnableOut	BOOL
Out	REAL

MESSAGE

Member	Base Data Type
ERR_SRC	SINT
DestinationLink	INT
DestinationNode	INT
SourceLink	INT
Class	INT
Attribute	INT
Instance	INT
LocalIndex	DINT
Channel	SINT
Rack	SINT
Group	SINT
Slot	SINT
Path	String
RemoteIndex	DINT
RemoteElement	String
UnconnectedTimeout	DINT
ConnectionRate	DINT
TimeoutMultiplier	SINT
Flags	INT
ERR	INT
EXERR	INT
REQ_LEN	INT
DN_LEN	INT
EW	BOOL
ER	BOOL
DN	BOOL
ST	BOOL
EN	BOOL
TO	BOOL

EN_CC	BOOL

MINIMUM_CAPTURE

Member	Base Data Type
EnableIn	BOOL
In	REAL
Reset	BOOL
ResetValue	REAL
EnableOut	BOOL
Out	REAL

MOTION_GROUP

Member	Base Data Type
AxisInhibitStatus	BOOL
CSTLossFault	BOOL
GroupTaskLoadingFault	BOOL
AxisFault	DINT
PhysicalAxisFault	BOOL
ModuleFault	BOOL
ConfigFault	BOOL
GroupStatus	DINT
MotionFault	DINT
ServoFault	DINT
GroupFault	DINT
InhibStatus	BOOL
GroupSynced	BOOL
ACAsyncConnFault	BOOL
ACSyncConnFault	BOOL
POtrvlFault	BOOL
NOtrvlFault	BOOL
PosErrorFault	BOOL
EncCHALossFault	BOOL
EncCHBLossFault	BOOL
EncCHZLossFault	BOOL
EncNsFault	BOOL
DriveFault	BOOL
SyncConnFault	BOOL
HardFault	BOOL
GroupOverlapFault	BOOL

MOTION_INSTRUCTION

Member	Base Data Type
FLAGS	DINT

ERR	INT
STATUS	SINT
STATE	SINT
SEGMENT	DINT
EN	BOOL
DN	BOOL
ER	BOOL
PC	BOOL
IP	BOOL
AC	BOOL
ACCEL	BOOL
DECEL	BOOL
EXERR	SINT

MOVING_AVERAGE

Member	Base Data Type
EnableIn	BOOL
In	REAL
InFault	BOOL
Initialize	BOOL
SampleEnable	BOOL
NumberOfSamples	DINT
UseWeights	BOOL
EnableOut	BOOL
Out	REAL
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
NumberOfSampInv	BOOL

MOVING_STD_DEV

Member	Base Data Type
EnableIn	BOOL
In	REAL
InFault	BOOL
Initialize	BOOL
SampleEnable	BOOL
NumberOfSamples	DINT
EnableOut	BOOL
Out	REAL
Average	REAL
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
NumberOfSampInv	BOOL

MULTIPLEXER

Member	Base Data Type
EnableIn	BOOL
In1	REAL
In2	REAL
In3	REAL
In4	REAL
In5	REAL
In6	REAL
In7	REAL
In8	REAL
Selector	DINT
EnableOut	BOOL
Out	REAL
Status	DINT
InstructFault	BOOL
SelectorInv	BOOL

OUTPUT_CAM

Member	Base Data Type
OutputBit	DINT
LatchType	DINT
UnlatchType	DINT
Left	REAL
Right	REAL
Duration	REAL
EnableType	DINT
EnableBit	DINT

OUTPUT_COMPENSATION

Member	Base Data Type
Offset	REAL
LatchDelay	REAL
UnlatchDelay	REAL
Mode	DINT
CycleTime	REAL
DutyCycle	REAL

PHASE

Member	Base Data Type
State	DINT

Running	BOOL
Holding	BOOL
Restarting	BOOL
Stopping	BOOL
Aborting	BOOL
Resetting	BOOL
Idle	BOOL
Held	BOOL
Complete	BOOL
Stopped	BOOL
Aborted	BOOL
Substate	DINT
Pausing	BOOL
Paused	BOOL
AutoPause	BOOL
StepIndex	DINT
Failure	DINT
UnitID	DINT
Owner	DINT
PendingRequest	DINT
DownloadInputParameters	BOOL
DownloadInputParametersSubset	BOOL
UploadOutputParameters	BOOL
UploadOutputParametersSubset	BOOL
DownloadOutputParameterLimits	BOOL
AcquireResources	BOOL
ReleaseResources	BOOL
SendMessageToLinkedPhase	BOOL
SendMessageToLinkedPhaseAndWait	BOOL
ReceiveMessageFromLinkedPhase	BOOL
CancelMessageToLinkedPhase	BOOL
SendMessageToOperator	BOOL
ClearMessageToOperator	BOOL
GenerateESignature	BOOL
DownloadBatchData	BOOL
DownloadMaterialTrackDataContainerInUse	BOOL
DownloadContainerBindingPriority	BOOL
DownloadSufficientMaterial	BOOL
DownloadMaterialTrackDatabaseData	BOOL
UploadMaterialTrackDataContainerInUse	BOOL
UploadContainerBindingPriority	BOOL
UploadMaterialTrackDatabaseData	BOOL
AbortingRequest	BOOL
NewInputParameters	BOOL
Producing	BOOL
Standby	BOOL

PHASE_INSTRUCTION

Member	Base Data Type
Status	DINT
EN	BOOL
ER	BOOL
PC	BOOL
IP	BOOL
WA	BOOL
ABORT	BOOL
ERR	INT
EXERR	INT

PID

Member	Base Data Type
CTL	DINT
SP	REAL
KP	REAL
KI	REAL
KD	REAL
BIAS	REAL
MAXS	REAL
MINS	REAL
DB	REAL
SO	REAL
MAXO	REAL
MINO	REAL
UPD	REAL
PV	REAL
ERR	REAL
OUT	REAL
PVH	REAL
PVL	REAL
DVP	REAL
DVN	REAL
PVDB	REAL
DVDB	REAL
MAXI	REAL
MINI	REAL
TIE	REAL
MAXCV	REAL
MINCV	REAL
MINTIE	REAL
MAXTIE	REAL
DATA	REAL [17]
EN	BOOL

CT	BOOL
CL	BOOL
PVT	BOOL
DOE	BOOL
SWM	BOOL
CA	BOOL
MO	BOOL
PE	BOOL
NDF	BOOL
NOBC	BOOL
NOZC	BOOL
INI	BOOL
SPOR	BOOL
OLL	BOOL
OLH	BOOL
EWD	BOOL
DVNA	BOOL
DVPA	BOOL
PVLA	BOOL
PVHA	BOOL

PIDE_AUTOTUNE

Member	Base Data Type
PVChangeTooSmall	BOOL
StepSizeTooSmall	BOOL
GainTooLarge	BOOL
GainTooSmall	BOOL
LongDeadTime	BOOL
ProcessType	DINT
ResponseSpeed	DINT
TestLength	REAL
PVTuneLimit	REAL
StepSize	REAL
TunedGood	BOOL
TunedUncertain	BOOL
ATuneAcquired	BOOL
UsedProcessType	DINT
Gain	REAL
TimeConstant	REAL
DeadTime	REAL
PGainTunedFast	REAL
IGainTunedFast	REAL
DGainTunedFast	REAL
PGainTunedMed	REAL
IGainTunedMed	REAL
DGainTunedMed	REAL
PGainTunedSlow	REAL

IGainTunedSlow	REAL
DGainTunedSlow	REAL
StepSizeUsed	REAL
AtuneStatus	DINT
ATuneFault	BOOL
PVOutOfLimit	BOOL
ModeInv	BOOL
CVWindupFault	BOOL
StepSizeZeRead Only	BOOL
CVLimitsFault	BOOL
CVInitFault	BOOL
EUSpanChanged	BOOL
CVChanged	BOOL
ATuneTimedOut	BOOL
PVNotSettled	BOOL

PID_ENHANCED

Member	Base Data Type
EnableIn	BOOL
PV	REAL
PVFault	BOOL
PVEUMax	REAL
PVEUMin	REAL
SPProg	REAL
SPOper	REAL
SPCascade	REAL
SPHLimit	REAL
SPLLimit	REAL
UseRatio	BOOL
RatioProg	REAL
RatioOper	REAL
RatioHLimit	REAL
RatioLLimit	REAL
CVFault	BOOL
CVInitReq	BOOL
CVInitValue	REAL
CVProg	REAL
CVOper	REAL
CVOverride	REAL
CVPrevious	REAL
CVSetPrevious	BOOL
CVManLimiting	BOOL
CVEUMax	REAL
CVEUMin	REAL
CVHLimit	REAL
CVLLimit	REAL
CVROCLimit	REAL

FF	REAL
FFPrevious	REAL
FFSetPrevious	BOOL
HandFB	REAL
HandFBFault	BOOL
WindupHIn	BOOL
WindupLIn	BOOL
ControlAction	BOOL
DependIndepend	BOOL
PGain	REAL
IGain	REAL
DGain	REAL
PVEProportional	BOOL
PVEDerivative	BOOL
DSmoothing	BOOL
PVTracking	BOOL
ZCDeadband	REAL
ZCOff	BOOL
PVHHLimit	REAL
PVHLimit	REAL
PVLLimit	REAL
PVLLLimit	REAL
PVDeadband	REAL
PVROCPosLimit	REAL
PVROCNegLimit	REAL
PVROCPeriod	REAL
DevHHLimit	REAL
DevHLimit	REAL
DevLLimit	REAL
DevLLLimit	REAL
DevDeadband	REAL
AllowCasRat	BOOL
ManualAfterInit	BOOL
ProgProgReq	BOOL
ProgOperReq	BOOL
ProgCasRatReq	BOOL
ProgAutoReq	BOOL
ProgManualReq	BOOL
ProgOverrideReq	BOOL
ProgHandReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
OperCasRatReq	BOOL
OperAutoReq	BOOL
OperManualReq	BOOL
ProgValueReset	BOOL
TimingMode	DINT
OversampleDT	REAL

RTSTime	DINT
RTSTimeStamp	DINT
AtuneAcquire	BOOL
AtuneStart	BOOL
AtuneUseGains	BOOL
AtuneAbort	BOOL
AtuneUnacquire	BOOL
EnableOut	BOOL
CVEU	REAL
CV	REAL
CVInitializing	BOOL
CVHAlarm	BOOL
CVLAlarm	BOOL
CVROCAlarm	BOOL
SP	REAL
SPPercent	REAL
SPHAlarm	BOOL
SPLAlarm	BOOL
PVPercent	REAL
E	REAL
EPercent	REAL
InitPrimary	BOOL
WindupHOut	BOOL
WindupLOut	BOOL
Ratio	REAL
RatioHAlarm	BOOL
RatioLAlarm	BOOL
ZCDeadbandOn	BOOL
PVHHAlarm	BOOL
PVHAlarm	BOOL
PVLAlarm	BOOL
PVLLAlarm	BOOL
PVROCPosAlarm	BOOL
PVROCNegAlarm	BOOL
DevHHAlarm	BOOL
DevHAlarm	BOOL
DevLAlarm	BOOL
DevLLAlarm	BOOL
ProgOper	BOOL
CasRat	BOOL
Auto	BOOL
Manual	BOOL
Override	BOOL
Hand	BOOL
DeltaT	REAL
AtuneReady	BOOL
AtuneOn	BOOL
AtuneDone	BOOL

AtuneAborted	BOOL
AtuneBusy	BOOL
Status1	DINT
Status2	DINT
InstructFault	BOOL
PVFaulted	BOOL
CVFaulted	BOOL
HandFBFaulted	BOOL
PVSpanInv	BOOL
SPProgInv	BOOL
SPOperInv	BOOL
SPCascadeInv	BOOL
SPLimitsInv	BOOL
RatioProgInv	BOOL
RatioOperInv	BOOL
RatioLimitsInv	BOOL
CVProgInv	BOOL
CVOperInv	BOOL
CVOverrideInv	BOOL
CVPreviousInv	BOOL
CVEUSpanInv	BOOL
CVLimitsInv	BOOL
CVROCLimitInv	BOOL
FFInv	BOOL
FFPreviousInv	BOOL
HandFBInv	BOOL
PGainInv	BOOL
IGainInv	BOOL
DGainInv	BOOL
ZCDeadbandInv	BOOL
PVDeadbandInv	BOOL
PVROCLimitsInv	BOOL
DevHLLimitsInv	BOOL
DevDeadbandInv	BOOL
AtuneDataInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

POSITION_PROP

Member	Base Data Type
EnableIn	BOOL
SP	REAL
Position	REAL
OpenedFB	BOOL

ClosedFB	BOOL
PositionEUMax	REAL
PositionEUMin	REAL
CycleTime	REAL
OpenRate	REAL
CloseRate	REAL
MaxOnTime	REAL
MinOnTime	REAL
Deadtime	REAL
EnableOut	BOOL
OpenOut	BOOL
CloseOut	BOOL
PositionPercent	REAL
SPPercent	REAL
OpenTime	REAL
CloseTime	REAL
Status	DINT
InstructFault	BOOL
CycleTimeInv	BOOL
OpenRateInv	BOOL
CloseRateInv	BOOL
MaxOnTimeInv	BOOL
MinOnTimeInv	BOOL
DeadtimeInv	BOOL
PositionPctInv	BOOL
SPPercentInv	BOOL
PositionSpanInv	BOOL

PROP_INT

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
InitialValue	REAL
Kp	REAL
Wld	REAL
HighLimit	REAL
LowLimit	REAL
HoldHigh	BOOL
HoldLow	BOOL
ShapeKpPlus	REAL
ShapeKpMinus	REAL
KpInRange	REAL
ShapeWldPlus	REAL
ShapeWldMinus	REAL
WldInRange	REAL
NonLinearMode	BOOL

ParabolicLinear	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
HighAlarm	BOOL
LowAlarm	BOOL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
KpInv	BOOL
WldInv	BOOL
HighLowLimsInv	BOOL
ShapeKpPlusInv	BOOL
ShapeKpMinusInv	BOOL
KpInRangeInv	BOOL
ShapeWldPlusInv	BOOL
ShapeWldMinusInv	BOOL
WldInRangeInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

PULSE_MULTIPLIER

Member	Base Data Type
EnableIn	BOOL
In	DINT
Initialize	BOOL
InitialValue	DINT
Mode	BOOL
WordSize	DINT
Multiplier	DINT
EnableOut	BOOL
Out	REAL
Status	DINT
InstructFault	BOOL
WordSizeInv	BOOL
OutOverflow	BOOL
LostPrecision	BOOL
MultiplierInv	BOOL

RAMP_SOAK

Member	Base Data Type
EnableIn	BOOL
PV	REAL
PVFault	BOOL
NumberOfSegs	DINT
ManHoldAftInit	BOOL
CyclicSingle	BOOL
TimeRate	BOOL
GuarRamp	BOOL
RampDeadband	REAL
GuarSoak	BOOL
SoakDeadband	REAL
CurrentSegProg	DINT
OutProg	REAL
SoakTimeProg	REAL
CurrentSegOper	DINT
OutOper	REAL
SoakTimeOper	REAL
ProgProgReq	BOOL
ProgOperReq	BOOL
ProgAutoReq	BOOL
ProgManualReq	BOOL
ProgHoldReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
OperAutoReq	BOOL
OperManualReq	BOOL
Initialize	BOOL
ProgValueReset	BOOL
EnableOut	BOOL
Out	REAL
CurrentSeg	DINT
SoakTimeLeft	REAL
GuarRampOn	BOOL
GuarSoakOn	BOOL
ProgOper	BOOL
Auto	BOOL
Manual	BOOL
Hold	BOOL
Status	DINT
InstructFault	BOOL
PVFaulted	BOOL
NumberOfSegsInv	BOOL
RampDeadbandInv	BOOL
SoakDeadbandInv	BOOL
CurrSegProgInv	BOOL

SoakTimeProgInv	BOOL
CurrSegOperInv	BOOL
SoakTimeOperInv	BOOL
RampValueInv	BOOL
SoakTimeInv	BOOL

RATE_LIMITER

Member	Base Data Type
EnableIn	BOOL
In	REAL
IncRate	REAL
DecRate	REAL
ByPass	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
IncRateInv	BOOL
DecRateInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

REDUNDANT_INPUT

Member	Base Data Type
EnableIn	BOOL
ResetType	BOOL
ChannelA	BOOL
ChannelB	BOOL
CircuitReset	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
CI	BOOL
CRHO	BOOL
II	BOOL
FP	BOOL

REDUNDANT_OUTPUT

Member	Base Data Type
EnableIn	BOOL
FeedbackType	BOOL
Enable	BOOL
Feedback1	BOOL
Feedback2	BOOL
FaultReset	BOOL
EnableOut	BOOL
O1	BOOL
O2	BOOL
O1FF	BOOL
O2FF	BOOL
FP	BOOL

SCALE

Member	Base Data Type
EnableIn	BOOL
In	REAL
InRawMax	REAL
InRawMin	REAL
InEUMax	REAL
InEUMin	REAL
Limiting	BOOL
EnableOut	BOOL
Out	REAL
MaxAlarm	BOOL
MinAlarm	BOOL
Status	DINT
InstructFault	BOOL
InRawRangeInv	BOOL

SEC_ORDER_CONTROLLER

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
InitialValue	REAL
Gain	REAL
WLag	REAL
WLead	REAL
ZetaLead	REAL
HighLimit	REAL
LowLimit	REAL

HoldHigh	BOOL
HoldLow	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Out	REAL
HighAlarm	BOOL
LowAlarm	BOOL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
GainInv	BOOL
WLagInv	BOOL
WLeadInv	BOOL
ZetaLeadInv	BOOL
HighLowLimsInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

SELECT

Member	Base Data Type
EnableIn	BOOL
In1	REAL
In2	REAL
SelectorIn	BOOL
EnableOut	BOOL
Out	REAL

SELECTABLE_NEGATE

Member	Base Data Type
EnableIn	BOOL
In	REAL
NegateEnable	BOOL
EnableOut	BOOL
Out	REAL

SELECTED_SUMMER

Member	Base Data Type
EnableIn	BOOL

In1	REAL
Gain1	REAL
Select1	BOOL
In2	REAL
Gain2	REAL
Select2	BOOL
In3	REAL
Gain3	REAL
Select3	BOOL
In4	REAL
Gain4	REAL
Select4	BOOL
In5	REAL
Gain5	REAL
Select5	BOOL
In6	REAL
Gain6	REAL
Select6	BOOL
In7	REAL
Gain7	REAL
Select7	BOOL
In8	REAL
Gain8	REAL
Select8	BOOL
Bias	REAL
EnableOut	BOOL
Out	REAL

SELECT_ENHANCED

Member	Base Data Type
EnableIn	BOOL
In1	REAL
In2	REAL
In3	REAL
In4	REAL
In5	REAL
In6	REAL
In1Fault	BOOL
In2Fault	BOOL
In3Fault	BOOL
In4Fault	BOOL
In5Fault	BOOL
In6Fault	BOOL
InsUsed	DINT
SelectorMode	DINT
ProgSelector	DINT
OperSelector	DINT

ProgProgReq	BOOL
ProgOperReq	BOOL
ProgOverrideReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
ProgValueReset	BOOL
EnableOut	BOOL
Out	REAL
SelectedIn	DINT
ProgOper	BOOL
Override	BOOL
Status	DINT
InstructFault	BOOL
InsFaulted	BOOL
InsUsedInv	BOOL
SelectorModeInv	BOOL
ProgSelectorInv	BOOL
OperSelectorInv	BOOL

SERIAL_PORT_CONTROL

Member	Base Data Type
ERROR	DINT
LEN	DINT
POS	DINT
EN	BOOL
EU	BOOL
DN	BOOL
EM	BOOL
ER	BOOL
UL	BOOL
RN	BOOL
FD	BOOL

SFC_ACTION

Member	Base Data Type
Status (as bit array)	BOOL
A	BOOL
Q	BOOL
PRE	DINT
T	DINT
Count	DINT

SFC_STEP

Member	Base Data Type

Status (as bit array)	BOOL
X	BOOL
FS	BOOL
SA	BOOL
LS	BOOL
DN	BOOL
OV	BOOL
AlarmEn	BOOL
AlarmLow	BOOL
AlarmHigh	BOOL
Reset	BOOL
PRE	DINT
T	DINT
TMax	DINT
Count	DINT
LimitLow	DINT
LimitHigh	DINT

SFC_STOP

Member	Base Data Type
X	DINT
Reset	BOOL
Count	DINT

SPLIT_RANGE

Member	Base Data Type
EnableIn	BOOL
In	REAL
CycleTime	REAL
MaxHeatIn	REAL
MinHeatIn	REAL
MaxCoolIn	REAL
MinCoolIn	REAL
MaxHeatTime	REAL
MinHeatTime	REAL
MaxCoolTime	REAL
MinCoolTime	REAL
EnableOut	BOOL
HeatOut	BOOL
CoolOut	BOOL
HeatTimePercent	REAL
CoolTimePercent	REAL
Status	DINT
InstructFault	BOOL
CycleTimeInv	BOOL

MaxHeatTimeInv	BOOL
MinHeatTimeInv	BOOL
MaxCoolTimeInv	BOOL
MinCoolTimeInv	BOOL
HeatSpanInv	BOOL
CoolSpanInv	BOOL

String

Member	Base Data Type
LEN	DINT
DATA	SINT [82]

See Also: **Addressing String Data Type**

S_CURVE

Member	Base Data Type
EnableIn	BOOL
In	REAL
Initialize	BOOL
InitialValue	REAL
AbsAlgRamp	BOOL
AccelRate	REAL
DecelRate	REAL
JerkRate	REAL
HoldMode	BOOL
HoldEnable	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
S_Mode	BOOL
Out	REAL
Rate	REAL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
AccelRateInv	BOOL
DecelRateInv	BOOL
JerkRateInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

TIMER

Member	Base Data Type
PRE	DINT
ACC	DINT
EN	BOOL
TT	BOOL
DN	BOOL
CTL [28] (FS in RSLogix)	BOOL
CTL [27] (LS in RSLogix)	BOOL
CTL [26] (OV in RSLogix)	BOOL
CTL [25] (ER in RSLogix)	BOOL

Note 1: Currently, FS, LS, OV and ER are not directly accessible but may be referenced through the CTL bits noted above.

Note 2: As of driver version 4.0.12, FS, LS, OV and ER will not be generated during **Automatic Tag Database Generation**.

TOTALIZER

Member	Base Data Type
EnableIn	BOOL
In	REAL
InFault	BOOL
TimeBase	DINT
Gain	REAL
ResetValue	REAL
Target	REAL
TargetDev1	REAL
TargetDev2	REAL
LowInCutoff	REAL
ProgProgReq	BOOL
ProgOperReq	BOOL
ProgStartReq	BOOL
ProgStopReq	BOOL
ProgResetReq	BOOL
OperProgReq	BOOL
OperOperReq	BOOL
OperStartReq	BOOL
OperStopReq	BOOL
OperResetReq	BOOL
ProgValueReset	BOOL
TimingMode	DINT
OversampleDT	REAL
RTSTime	DINT
RTSTimeStamp	DINT
EnableOut	BOOL
Total	REAL

OldTotal	REAL
ProgOper	BOOL
RunStop	BOOL
ProgResetDone	BOOL
TargetFlag	BOOL
TargetDev1Flag	BOOL
TargetDev2Flag	BOOL
LowInCutoffFlag	BOOL
DeltaT	REAL
Status	DINT
InstructFault	BOOL
InFaulted	BOOL
TimeBaseInv	BOOL
TimingModeInv	BOOL
RTSMissed	BOOL
RTSTimeInv	BOOL
RTSTimeStampInv	BOOL
DeltaTInv	BOOL

TWO_HAND_RUN_STATION

Member	Base Data Type
EnableIn	BOOL
ActivePinType	BOOL
ActivePin	BOOL
RightButtonNormallyOpen	BOOL
RightButtonNormallyClosed	BOOL
LeftButtonNormallyOpen	BOOL
LeftButtonNormallyClosed	BOOL
FaultReset	BOOL
EnableOut	BOOL
BP	BOOL
SA	BOOL
BT	BOOL
CB	BOOL
SAF	BOOL
RBF	BOOL
LBF	BOOL
FP	BOOL

UP_DOWN_ACCUM

Member	Base Data Type
EnableIn	BOOL
Initialize	BOOL
InitialValue	REAL
InPlus	REAL

InMinus	REAL
Hold	BOOL
EnableOut	BOOL
Out	REAL

File Listing

The following are links to all the files supported by the various device models.

Function File Listing

Note: For more information on device models (and their supported files) refere 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. Below is a table listing 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 we recommend users consult the Micrologix documentation and controller project to determine the true word size of a module. Following the table below are instructions and examples in calculating the word offset.

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

Syntax	Data Type (Default in **Bold**)	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	Addresses are in octal
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)

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. Below is a table listing 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 we recommend that the Micrologix documentation and controller project be consulted in order to determine the true word size of a module. Following the table below are instructions and examples in calculating the word offset.

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	**Addresses are in octal**
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)

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

Specifying a word and an optional bit in the word accesses status files. The feault 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 types)	Read/Write
S:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array types)	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 a binary file, 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 types)	Read/Write
B<file>:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array types)	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 types)	Read/Write
N<file>:<word> [cols]	Short, **Word**, BCD, DWord, Long, LBCD (array types)	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

Specifying a file number and an element accesses Float files. 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 (1)**	Read/Write

A<file>:<char> [rows][cols]	**Char, Byte (1)**	Read/Write
A<file>:<char> [cols]	**Char, Byte (1)**	Read/Write
A<file>:<word offset>/length	String (2)	Read/Write

1. 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 you would make two assignments, **A10:0 = A** and **A10:1 = B**, which would result in the same data being stored in the PLC memory.

2. 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

Specifying a file number and an element accesses data in a String file. 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 types)	Read/Write
D<file>:<word> [cols]	**BCD**, LBCD (array types)	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 types)**	Read/Write
L<file>:<DWord> [cols]	Long, **DWord, LBCD (array types)**	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.

Related Material: ENI/Gateway/MicroLogix 1100 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/Gateway/MicroLogix 1100 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/Gateway/MicroLogix 1100 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: Refer to the Rockwell documentation for detailed information on CS0 words/bit meanings.

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**.

Related Material: **ENI/Gateway/MicroLogix 1100 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: Refer to theRockwell documentation for detailed information on CS1 words/bit meanings.

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/Gateway/MicroLogix 1100 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: Refer to your instruction manual for a listing of 1769 expansion I/O status codes.

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

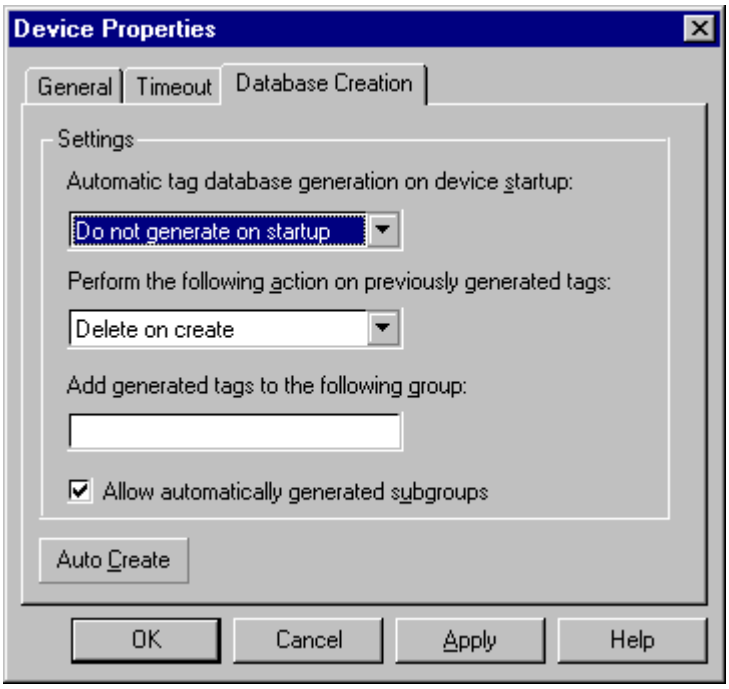
Tag Hierarchy
General layout of tags/tag groups created in the Server based on Logix tags imported.

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

Preparing a 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 allows you 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.

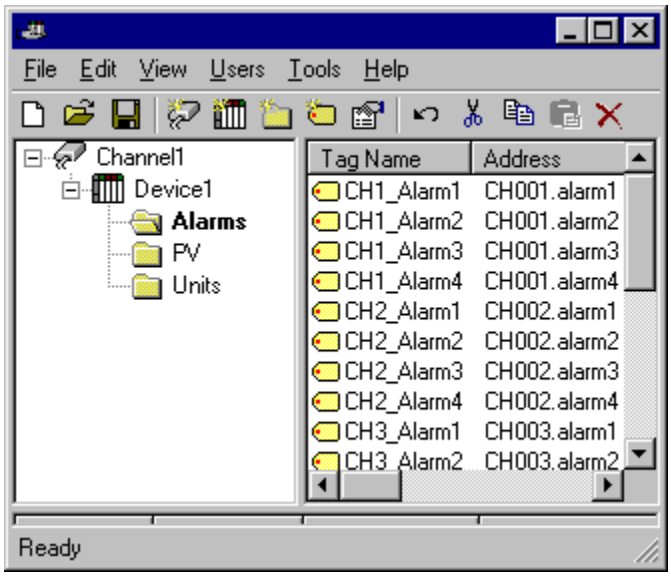
When automatic tag generation is enabled, the server needs to know what to do with OPC tags that it may have added from a previous run or with OPC tags that have been added or modified after the communications driver added them originally. The **Perform the following action** setting is used to control 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, if you continued to change the I/O modules in the rack with the server configured to always generate new OPC tags on startup, new tags would be added to the server every time the communications driver detected a new I/O module. If the old tags were not removed, many unused tags could accumulate in the server's tag space. The Perform the following action setting tailors the server's operation to best fit your 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.

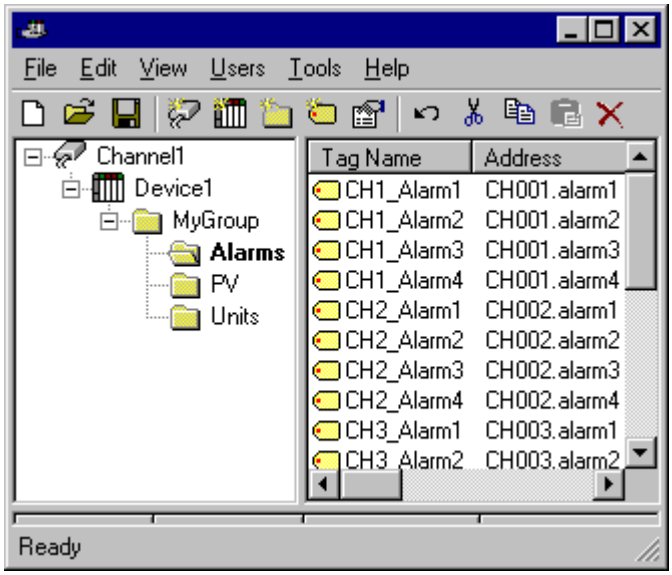
Note: The removal of OPC tags effects tags that have been automatically generated by the communications driver and any tags you have added using names that match generated tags. It is recommended that users avoid adding tags to the server using names that match tags that may be automatically generated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

Add generated tags to the following group can be used to help keep automatically generated tags from mixing with

tags that have been entered manually, the parameter. 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, i.e., 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.

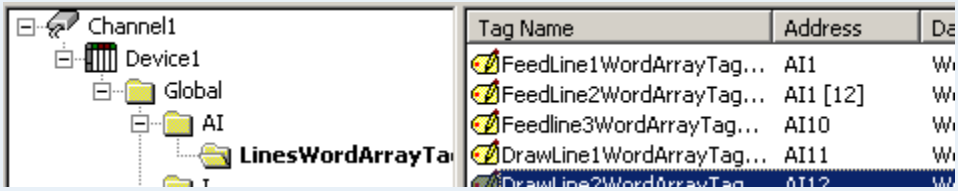
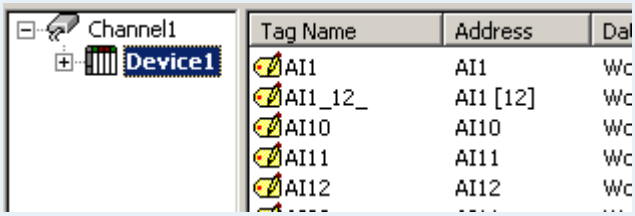


Add generated tags to the following group is blank.



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

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; i.e., tag names coming through the import file will not be retained. In the example shown below, note how the Tag Name and Address values are the same.  **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 (default) or condensed.

Expanded Hierarchy (default)

Note: To enable this functionality, make sure "Allow Automatically Generated Subgroups" in **Device Properties** is turned on.

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:

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

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 tag view in the OPC Server provides the familiar feel of 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.

With a complex project, the tag hierarchy could require a number of group levels. The limit on group levels created by automatic tag generation, not including the group specified in "Add generated tags to the following group", is 7 levels. If more than 7 levels are required, those tags will be placed in the 7th group, thus the hierarchy will plateau.

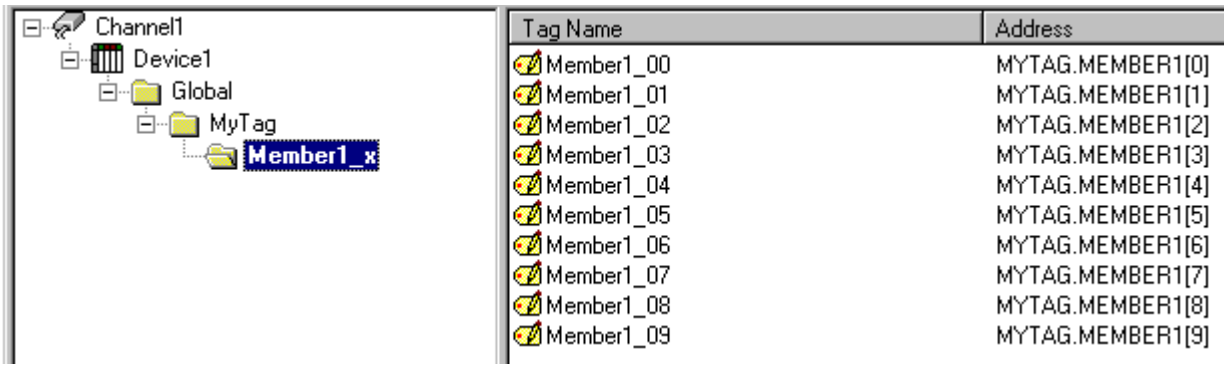
Array Tags
As previously mentioned, a group is created for each array. Within that group are the elements of the array. Group names will have the notation: <array name>_x_y_z where:

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 Hierarchy

Note: To enable this functionality, make sure "Allow Automatically Generated Subgroups" in **Device Properties** is turned on.

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:

- Program scope
- Structures and substructures

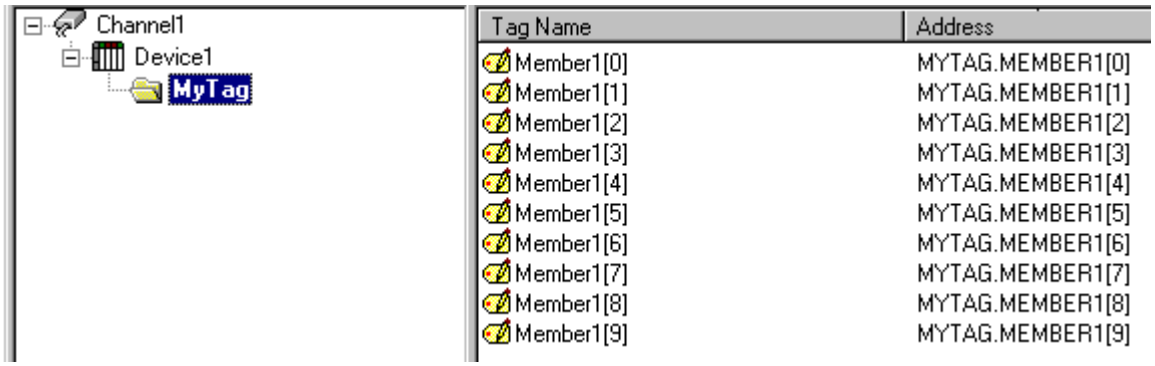
Groups are not created for arrays or .bit addresses.

With a complex project, it is easy to see that the tag hierarchy could require a number of group levels. The limit on group levels created via automatic tag generation and not including the group specified in "Add generated tags to the following group", is 7 levels. If more than 7 levels are required, those tags will be placed in the 7th group, thus the hierarchy will plateau and become unorganized.

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. It is recommended that Aliases be created for I/O module tags of interest in RSLogix5000. Aliases can be imported.

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

1. 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**.

4. Enter or browse for the location of the **L5K/L5X** previously created.

5. Select the **Options** tab and make any desired changes.

6. Select the **Filtering** tab and make any desired changes.

7. Select the **Database Creation** tab and utilize as instructed in **Database Creation Settings**.

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 your 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	Extended Error Codes
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	Extended Error Codes
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	

Logix5000-Specific (1756-L1) Error Codes

Error Code (hex)	Description	
00FF	General Error	Extended Error Codes

Note: Consult the Rockwell documentation for error codes not listed.

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: Consult the Rockwell documentation for error codes not listed.

0x001F Extended Error Codes

Error Code (hex)	Description
0203	Connection timed out

Note: Consult the Rockwell documentation for error codes not listed.

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: Consult the Rockwell documentation for error codes not listed.

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.
See also **Entering Tag Names & Addresses**.

2. Address is invalid according to the address format and underlying controller tag data type.
See also **Addressing Atomic Data Types**.

3. A program tag was specified incorrectly.
See also **Tag Addressing**.

4. An invalid address format was used.
See also **Address Formats**.

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

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

Error Type:
Warning

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

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

See Also:
Address Formats for valid bit and array element ranges.

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:
Re-enter the address in the client application to specify a smaller value for the array or a different starting point.

See Also:
Address Formats for valid array size ranges.

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 your 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. Check the Channel Properties | Network Interface | Network Adapter list in the communications server application for network adapters available on your system. If '<adapter>' is not in this list, steps should be taken to make it available to the system. This includes but is not limited to: 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)

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

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 and 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 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 we may add support for this type. In response to this error, the tag will be deactivated and 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 and 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 and 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 and 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 and 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 and 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

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 we may add support for this type. In response to this error, <count> elements of the

block will be deactivated and 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 and 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 and 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 and 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

Error Type:
Warning

Possible Cause:
A write request for the specified tag failed after so many retries (determined by Retry Attempts) 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 we may add support 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."

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 etc. 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 etc. 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 etc. 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

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

Error Type:
Warning

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

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

Unable to generate a tag database for device <device name>. Reason: 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: L5X 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 L5X file or is a corrupt L5X file.

Solution:
Select a valid L5X file or retry the tag export process in RSLogix to produce a new L5X file.

See Also:
Automatic Tag Database Generation Preparation

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

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: 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: Data type for Ref. Tag '<tag name>' unknown. Setting Alias Tag '<taq 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: 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: 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: 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

Technical Notes

RSLogix 5000 Project Edit Warning
1. Notice on downloading a project while Clients are connected
2. Notice on making online edits while Clients are connected

SoftLogix 5800 Connection Notes
1. Note on preventing communication errors by not having any Ethernet drivers in RSLinx on the SoftLogix PC
2. Instructions for connecting to a SoftLogix Soft PLC on the same PC as the OPC server

Optimized String Writes
Note for users of the String Logix Data Type.

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

No Other Ethernet Drivers in RSLinx

For proper operation, **no Ethernet-based drivers** (Ethernet Devices, Remote Devices Via Gateway, etc) 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 these guidelines:

1. Make sure that there are no Ethernet-based drivers currently running in RSLinx on that PC.
2. Verify that the Ethernet/IP Message Module is installed in the SoftLogix virtual chassis.
3. Check the Device ID value in the OPC server (Device Properties dialog, General tab). The Device ID should not be:

   127.0.0.1, 1, <PLC_CPU_slot>

   Instead, the Device ID should be:

   <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 (i.e. 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 a 1756-ENBT Ethernet module to obtain access to a DH+ or ControlNet network from the same backplane. Rack must contain an ENBT module and a DHRIO or CNB module.
Link Address	Unique Identifier for an interface module (i.e. Node ID, IP address, etc)
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 (i.e. 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 (i.e. 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 is dependent 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. See Also: **Logix Data Type**
	Logix Data Type defined by the user for use in the given controller. See Also: **Logix Data Type**
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.

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