ControlLogix Communication Driver

There are 2 independent ways to use this protocol. Using a TagProvider configuration, or as a Device-Channel.

TagProvider allows you to connect with data in devices directly, without create local tags, using the name definition on the remote device.

DeviceChannel allows to map tags in the project to external data addresses, giving more flexibility on name conventions and managing data blocks.

This document has the specific information about the device configuration on both methods. For a Generic Explanation on TagProviders, or about the Device Module, Channels, Nodes and Points, please refer to the reference guide.

Contents

Section 1 – Summary Information

Communication Driver Name: ControlLogix

Implementation DLL: T.ProtocolDriver.ControlLogix.dll

Protocol: ControlLogix (CIP over TCP/IP)

Interface: TCPIP

PLC types supported: ControlLogix 5000 family, FlexLogic and CompactLogix

Manufacturer: Allen-Bradley / Rockwell

PC Hardware requirements: Ethernet board

Section 2 – Channels Configuration

Protocol Options

Model: Set the PLC model. It can be:

- ***Others:*** For all models exception 1756-L8X.
- ***1756-L8X:*** For Allen-Bradley 1756-L8X model.

MaxStringItemsPerBlock: Define the maximum string item count to each block.

For example, if there are 12 string items configured and the MaxStringItemsPerBlock is 3, the result will be 4 blocks to read string data.

Section 3 – Nodes Configuration

Station Configuration

Stations syntax: <IP > ; <Port > ; <Slot>

Where :

<**IP**> = IP address of the slave device in the network

< **Port** > = TCP port where the slave device is listening (default is 44818)

<**Slot**> = Slot is the Slot number where the CPU is connected.

Example Nodes Configuration

Name	Node	PrimaryStation	SecundaryStation	Description
Node1	ControlLogix	192.168.1.101;44818;0		

Section 4 – Points Configuration

Address Column Configuration

The syntax for the ControlLogix communication points are:

- ***<Type> : <DeviceTagName>***

***Type*:** Type is data type of the Tag in PLC.

The valid type values are:

Type	Read	Write	Size	Range of Value
BOOL	✓	✓	1 bit	0 or 1
SINT	✓	✓	1 byte or 8 bits	-128 to 127
INT	✓	✓	2 bytes or 16 bits	-32768 to 32767
DINT	✓	✓	4 bytes or 32 bits	-2,147,483,648 to 2,147,483,647
REAL	✓	✓	4 bytes or 32 bits IEEE Floating point	-9.99x10^{37} to 9.99x10^{37}
STRING	✓	✓	n bytes	---

DeviceTagName*: Tag Name in PLC.

Note:** See below possible format for ***DeviceTagName.

Format	Syntax	Comments
Standard	<Device Tag Name>	
Array Element	<Device Array Tag name>[dim 1, dim2, dim 3]	Dimension Range = 1 to 3
User Defined Type (UDT)	<Decice Main Tag Name>.<Type Member>	
User Defined Type (UDT) Array Element	<Device Main Tag Name>.<Type Member>[dim 1, dim2, dim 3]	Dimension Range = 1 to 3

Accessing Bit from SINT or INT or DINT ControlLogix datatype

Method 1: Using the *Modifiers* column.
Use the Modifiers column in Device -> Points to specify the Bit to access.

Example of Device Point Configuration to access Bit 3 from INT

TagName	Node	Address	DataType	AccessType	Modifiers
Integer	Node1	INT:PLC_INTEGER	Native	ReadWrite	Bit = 3

Method 2: Using the Tag property.
In the Device the whole word into a tag and use the Tag property to access the specify Bit.

Example of Device Point Configuration to access whole word

TagName	Node	Address	DataType	AccessType
Integer	Node1	INT:PLC_INTEGER	Native	ReadWrite

Syntax to access Tag property in any place of project

Tag.*<TagName>*.Bit<*Bit Number*>

E.g.: Tag.Interger.Bit3

Example Points Configuration

TagName	Node	Address	DataType	AccessType
Digital	Node1	BOOL:PLC_BOOLEAN	Native	ReadWrite
Digital[2]	Node1	BOOL:BOOLEAN_ARRAY[2]	Native	ReadWrite
DigitalUDT	Node1	BOOL:MAINTAG.PLC_BOOLEAN	Native	ReadWrite
DigitalUDT[4]	Node1	BOOL:MAINTAG.BOOLEAN_ARRAY[4]	Native	ReadWrite
Word	Node1	SINT:PLC_SINTEGER	Native	ReadWrite
Word[7]	Node1	SINT:SINTEGER_ARRAY[7]	Native	ReadWrite
WordUDT	Node1	SINT:MAINTAG.PLC_SINTEGER	Native	ReadWrite
WordUDT[8]	Node1	SINT:MAINTAG.SINTEGER_ARRAY[8]	Native	ReadWrite

Integer	Node1	INT:PLC_INTEGER	Native	ReadWrite
Interger[3]	Node1	INT:INTEGER_ARRAY[3]	Native	ReadWrite
IntegerUDT	Node1	INT:MAINTAG.PLC_INTEGER	Native	ReadWrite
IntegerUDT[10]	Node1	INT:MAINTAG.INTEGER_ARRAY[10]	Native	ReadWrite
Double	Node1	DINT:PLC_DINTEGER	Native	ReadWrite
Double[14]	Node1	DINT:DINTEGER_ARRAY[14]	Native	ReadWrite
DoubleUDT	Node1	DINT:MAINTAG.PLC_DINTEGER	Native	ReadWrite
DoubleUDT[12]	Node1	DINT:MAINTAG.DINTEGER_ARRAY[12]	Native	ReadWrite
Real	Node1	REAL:PLC_REAL	Native	ReadWrite
RealArray[5]	Node1	REAL:REAL_ARRAY[5]	Native	ReadWrite
RealUDT	Node1	REAL:MAINTAG.PLC_REAL	Native	ReadWrite
RealUDT[34]	Node1	REAL:MAINTAG.REAL_ARRAY[34]	Native	ReadWrite
Text	Node1	STRING:PLC_STRING	Native	ReadWrite
TextArray[26]	Node1	STRING:STRING_ARRAY[26]	Native	ReadWrite
TextUDT	Node1	STRING:MAINTAG.PLC_STRING	Native	ReadWrite
TextUDT[21]	Node1	STRING:MAINTAG.STRING_ARRAY[21]	Native	ReadWrite

Section 5 – TagProvider

This Communication Protocol supports TagProvider feature. A tool that allows you to access your Communication Device Data Model without creating any Project Tags.

For more information, please refer to the TagProvider Application Note document.

5.1 How to Configure

To configure ControlLogix protocol as a TagProvider, navigate to **Edit Tags Providers** and create a newprovider for ControlLogix protocol.

In the **PrimaryStation** column, do the same configuration described in section 2 and 3.

Section 6 – Troubleshoot

The status of the driver execution can be observed through the diagnostic tools, which are:

- TraceWindow (with Settings, Device enabled)
- PropertyWatch
- ModuleInformation

Status value of 0 (zero) means communication success. Negative values indicate internal driver error and positive values means protocols errors according Allen-Bradley specification.

Error Codes

Error Code	Description	Possible Solution
0	Success	• None
-100	Error Sending Message	• Turn PLC on • Plug the PLC Ethernet cable • Check configured IP Address field in Device > Node • Ping PLC using prompt command
-101	Error Sending and Waiting Message	
-102 … -105	Error creating TCP/IP connection	
-106	Error Receiving Message	
-112	Timeout Start Message	• Turn PLC on • Plug the PLC Ethernet cable • Ping PLC using prompt command • Check configured IP Address field in Device > Node • Increase the driver timeout field in Device > Channel
-113	Timeout between Treated Chars	
-114	Timeout End Message	
-115	Timeout Connect	
-200	Protocol Error	• Check if the PLC model is compatible with driver documentation • Check the configured Address field in Device > Points
-201	Invalid Protocol	• Check if the PLC model is compatible with driver documentation • Contact technical support
-202	Invalid Station	• Check configured IP Address field in Device > Node • Restart the driver
-204	Invalid Message Sequence	• Check if the PLC model is compatible with driver documentation • Check the configured Address field in Device > Points
> 0	CIP Error	• See CIP error codes table

CIP Error Codes

The following error codes are in decimal.

Error Code	Description
1	Connection Failure.
2	Insufficient resources.
3	Value invalid.
4	IOI could not be deciphered or tag does not exist.
5	Unknown destination.
6	Data requested would not fit in response packet.
7	Loss of connection.
8	Unsupported service.
9	Error in data segment or invalid attribute value.
10	Attribute list error.
11	State already exists.
12	Object model conflict.
13	Object already exists.
14	Attribute not settable.
15	Permission denied.
16	Device state conflict.
17	Reply will not fit.
18	Fragment primitive.
19	Insufficient command data / parameters specified to execute service.
20	Attribute not supported.
21	Too much data specified.
26	Bridge request too large.
27	Bridge response too large.
28	Attribute list shortage.
29	Invalid attribute list.
30	Embedded service error.
31	Failure during connection.
34	Invalid reply received.
37	Key segment error.
38	Number of IOI words specified does not match IOI word count.
39	Unexpected attribute in list.

In this driver is very important to enable the TraceWindow messages, as invalid addresses can cause all the communication block with the PLC to fail, the TraceWindow tool (when Device is enabled on the settings) will display the first invalid address found on the block.

In order to have a quick view on the many communication blocks, open the ModuleInformation, navigate on the tree to find ControlLogix and them select the Read

Groups. Looking at the number and success and fail communication counters, you can easily identify if there is a block with error and then use the TraceWindow to locate the wrong address.

Revision History

Revision	Description	Date
A	Initial Revision	*April* 2011
B	Doc. Revision	*March* 2012
C	Implemented String type	*September* 2012
D	Added messages on invalid address	*March* 2013
E	Implemented Boolean array	*February 2015*
F	Doc. Revision	*March 2015*
G	Added the 1756-L8X model	*March 2017*
H	Added MaxStringItemsPerBlock option	*September 2019*
I	Added TagProvider information	*October 2021*