



## Bulletin 1203-CN1 ControlNet Communications Module

### I/O and Messaging using the ControlLogix System

APPLICATION NOTE # 3319

November 12, 1999

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#### **Purpose**

The purpose of this document is to provide guidance to users seeking to use the 1203-CN1 ControlNet communications module for I/O and messaging with a ControlLogix processor. This document is meant for use as a reference only. Users must ensure that installations meet applicable codes and are suitable for the existing conditions.

#### **What This Note Contains**

This document contains configuration information and sample portions of ladder programs that demonstrate the use of I/O and messaging between a ControlLogix processor and the 1203-CN1 module.

#### **Intended Audience**

This application note should be used by personnel familiar with the installation and operation of the 1203-CN1 module, and the installation, programming, I/O configuration, and operation of the ControlLogix processor.

#### **Where It Is Used**

The diagrams, parameter settings and auxiliary hardware used in this application note are designed to address specific issues in many different applications. Some changes by the user may be necessary to apply the concepts of this document to a specific application.

#### **Application Considerations**

These examples are kept simple for the sake of clarity. They may not perform all the required functions of a particular application. Consult the product manuals for more information.

As with any networked drive application, a hardwired stop circuit should be provided.



## Required Equipment and Software Revisions

The following equipment and software revisions are needed to set up communications between a ControlLogix processor and a 1203-CN1:

1. A ControlLogix processor (1756-L1), firmware version 4.35 or later.
2. A ControlLogix ControlNet bridge (1756-CNB or 1756-CNBR), firmware version 1.19 or later.
3. RSLinx software, version 2.10.137 or later.
4. RSNetWorx for ControlNet software, version 1.80.38 or later.
5. RSLogix 5000 software, version 2.25.00 or later.
6. A 1203-CN1 ControlNet communications module, any firmware version.
7. Any SCANport-compatible product.
8. ControlNet and SCANport cabling as required.

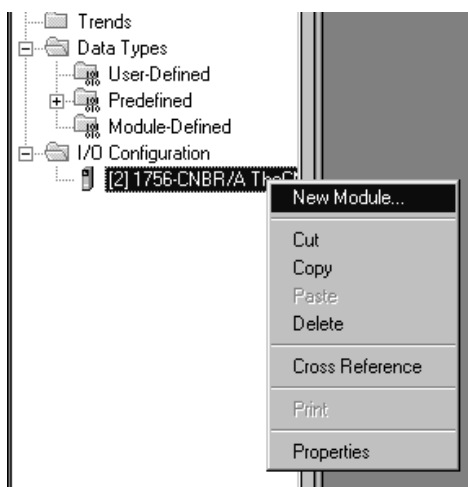
If the firmware in your ControlLogix equipment does not meet the above requirements, call the Control and Information Group technical support division to obtain a copy of the appropriate ControlFlash upgrade kit to perform the needed upgrade.

## Configuring an I/O Connection

After starting RSLogix 5000 and either starting a new project or opening an existing project, make sure that you are OFFLINE with the ControlLogix processor. I/O configuration is only available when offline.

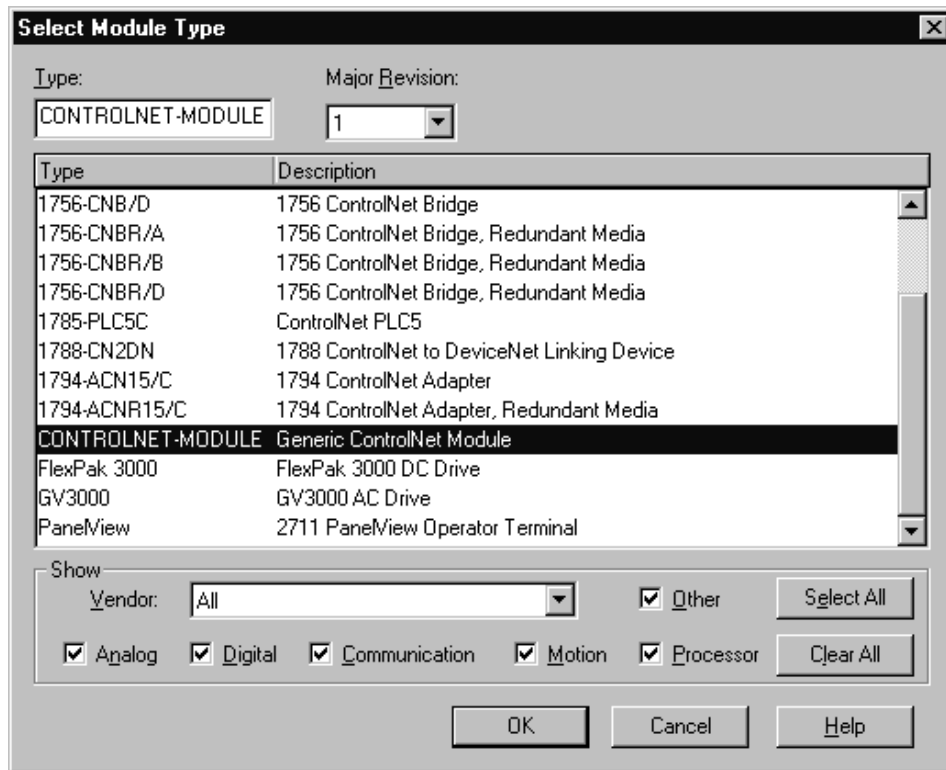
If you have not already defined the contents of your ControlLogix chassis under your project's "I/O Configuration" folder, you will need to define the ControlNet bridge module at a minimum. Use the right mouse button to click on the "I/O Configuration" folder, then choose "New Module" from the pop-up menu. From the dialog box that appears, choose the ControlNet bridge of the type (1756-CNB or 1756-CNBR) and series that you are using. In the next screen, you will need to name the ControlNet bridge and indicate its position in the ControlLogix chassis (slot 0 is the leftmost).

After defining the ControlNet bridge, use the right mouse button to click on the ControlNet bridge under "I/O configuration", then choose "New Module" from the pop-up menu:

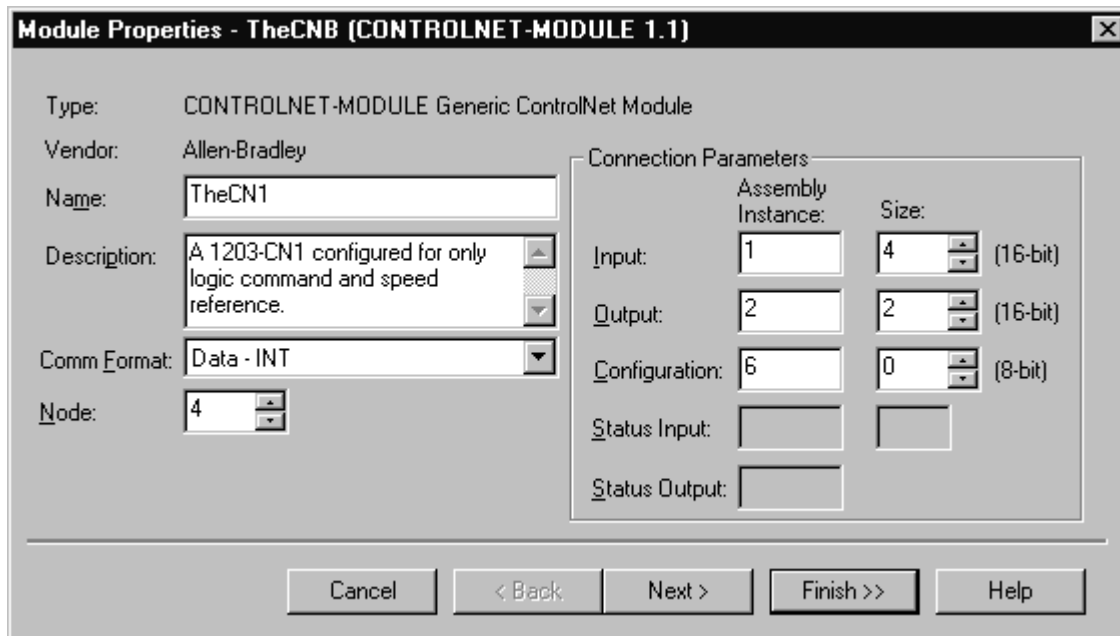




After doing this, you will see a dialog box that lists the various ControlNet devices known to RSLogix 5000. From the dialog box that appears, choose the "CONTROLNET-MODULE" entry:



Another dialog box will appear that asks for detailed information about the specific ControlNet module you are attempting to use (in this case, the 1203-CN1):





The fields in this dialog should be filled out as follows:

- **Name:** Give the 1203-CN1 a name that is unique within your project. You will use this name to direct I/O and explicit messages to the 1203-CN1.
- **Description:** You can enter a more detailed description of the 1203-CN1's purpose, location, etc., if you wish.
- **Comm Format:** Choose "Data - INT" for this setting. This allows you to set the input and output sizes in terms of 16-bit words.
- **Node:** Enter the ControlNet address of the 1203-CN1 you wish to use.
- **Input, Output, and Configuration Assembly Instance:** Use 1, 2, and 6, respectively, for these instance numbers. The 1203-CN1 does not currently require these instance numbers to be used, but they are recommended for compatibility with future revisions of the 1203-CN1.
- **Input Size:** The value to use for the input size is in 16-bit words, and is calculated as follows: Start with two words, then add two words if drive control (logic command and speed reference) is enabled on this 1203-CN1. Then, add two additional words for each data link enabled on this 1203-CN1. The final value should be 2, 4, 6, 8, 10, or 12 words.
- **Output Size:** The output size is always two words less than the input size calculated above. This value should be 0, 2, 4, 6, 8, or 10 words.

The table below shows the proper input and output sizes to select, based on the configuration of the 1203-CN1. The "Cmd/Stat Config" column refers to the setting of parameter number 4 in the 1203-CN1, which allows the user to select whether the 1203-CN1 passes logic command and speed reference data to the drive (and logic status and speed feedback data to the network). The "Number of Datalinks" column refers to the number of data links enabled by setting parameters 5 through 8 in the 1203-CN1.

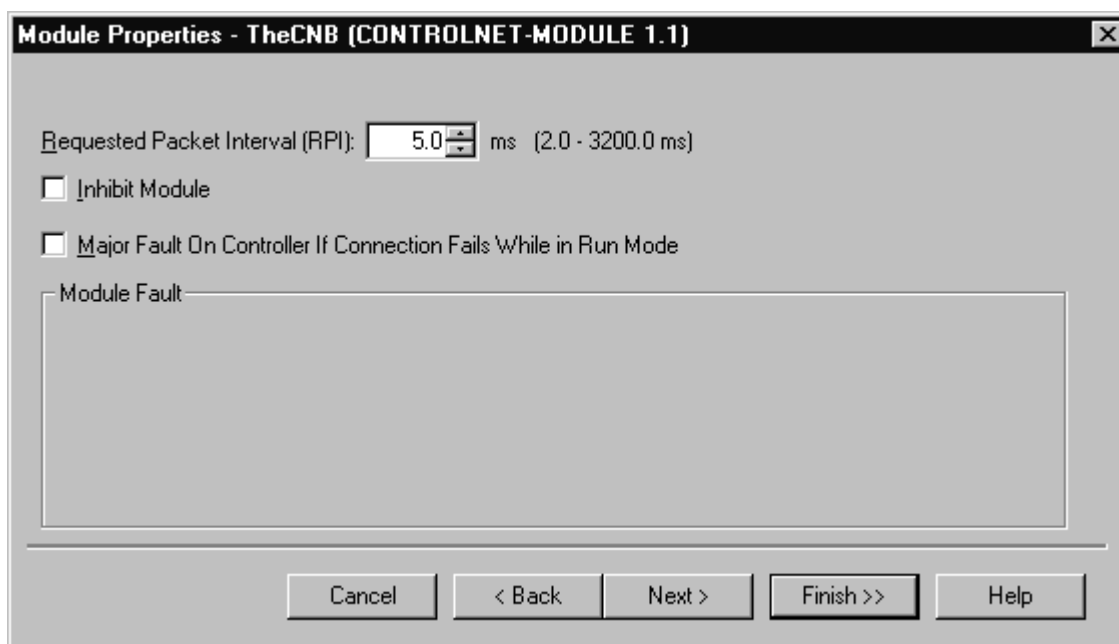
<u>Cmd/Stat Config</u>	<u>Number of Datalinks</u>	<u>Input Size</u>	<u>Output Size</u>
On	0	4	2
On	1	6	4
On	2	8	6
On	3	10	8
On	4	12	10
Off	0	Not supported – see below	
Off	1	4	2
Off	2	6	4
Off	3	8	6
Off	4	10	8



The generic ControlNet module support in RSLogix 5000 does not support a connection with an input or output size of zero. The combination of Cmd/Stat Config off and zero datalinks results in a connection output size of zero, so this configuration is not supported. However, this configuration means that the 1203-CN1 is useful only for messaging, and no connection to the 1203-CN1 is required to perform messaging.

- **Configuration Size:** Since the configuration assembly is not currently used on the 1203-CN1, enter 0 bytes for the size of the configuration assembly.

Click the "Next" button for the next dialog box in the configuration sequence:



For the requested packet interval, enter the number of milliseconds desired between each I/O message between the ControlLogix processor and the 1203-CN1. The 1203-CN1 can handle a packet interval as low as 5 milliseconds; therefore, make sure that this value is set to at least 5. Click the "Finish" button to complete the configuration of the I/O connection in RSLogix 5000.

At this point, download your configuration to the ControlLogix processor, then exit RSLogix 5000. To actually schedule the I/O, you will need to start RSNetWorx for ControlNet. Once RSNetWorx starts, go online to the ControlNet network containing the ControlLogix chassis and 1203-CN1 being configured. Turn on the "Enable Edits" check box, then save the network. This causes the I/O connection created in RSLogix 5000 to be scheduled in the ControlLogix processor.

After a few seconds, the I/O LED on the ControlLogix processor and the module LED on the 1203-CN1 should stop blinking and remain green. If they do not, it could indicate a number of I/O-related problems:

- If the 1203-CN1 module LED is solid green, the I/O connection has been made, and the flashing green I/O LED on the ControlLogix processor is indicating that another I/O connection did not start correctly.
- A flashing green or red module LED on the 1203-CN1 may be the result of a previous error condition on the network. Try power cycling the 1203-CN1 and determine if the module LED turns solid green.
- Occasionally, the I/O needs to be scheduled in RSNetWorx for ControlNet again. Try this operation again.



- If the above steps do not get the I/O connection opened, please contact technical support for the ControlLogix processor or 1203-CN1 for additional help.

After the I/O connection is open, exit RSNetWorx and restart RSLogix 5000. Go online to the ControlLogix processor, and bring up the "Controller Tags" entry. A screen similar to the following should appear:

Controller Tags - CN1Demo(controller)					
Scope:	CN1Demo(controller)	Show:	Show All	Sort:	Tag Name
Tag Name	Value	Force Mask	Style	Type	
- TheCN1:C	{...}	{...}			AB:CONTROLNE ...
+ TheCN1:C.Data	{...}	{...}	Hex		SINT[400]
- TheCN1:I	{...}	{...}			AB:CONTROLNE ...
- TheCN1:I.Data	{...}	{...}	Hex		INT[4]
+ TheCN1:I.Data[0]	16#0000		Hex		INT
+ TheCN1:I.Data[1]	16#0000		Hex		INT
+ TheCN1:I.Data[2]	16#0F0F		Hex		INT
+ TheCN1:I.Data[3]	16#7F11		Hex		INT
- TheCN1:O	{...}	{...}			AB:CONTROLNE ...
- TheCN1:O.Data	{...}	{...}	Hex		INT[2]
+ TheCN1:O.Data[0]	16#0002		Hex		INT
+ TheCN1:O.Data[1]	16#7F00		Hex		INT

The name of the tag will reflect the name you assigned the 1203-CN1 earlier. The "C" sub-group contains the contents of the configuration assembly, which is not currently used in the 1203-CN1. The "O" sub-group contains one entry for each word of output data you configured, and the "I" sub-group contains one entry for each word of input data you configured. The "O" sub-group corresponds directly to output data for a PLC-5 described on page 5-2 of the 1203-CN1 user manual (i.e., for most common configurations, word 0 is the logic command, word 1 is the speed reference, words 2 and 3 are the first pair of data links, etc.). The "I" sub-group is similar to the input data for a PLC-5, except that it is shifted by two words (i.e., word 2 is the logic status, word 3 is the speed feedback, etc.). Words 0 and 1 of the "I" sub-group represent network status data sent by the 1203-CN1 but not processed directly by the ControlLogix processor.

At this point, I/O between the ControlLogix processor and the 1203-CN1 should be configured and running, and the meaning of the various I/O words should be understood. If you need further assistance in configuring I/O, please contact technical support.

### **Explicit Messaging to the 1203-CN1**

Messaging between the ControlLogix processor and the 1203-CN1 can be done in one of two ways:

1. by creating a "CIP Generic" message to access the 1203-CN1's CIP (ControlNet) objects, or
2. by creating a PCCC message that accesses integer (N) data files inside the 1203-CN1, much like communicating between the ControlLogix processor and a legacy controller such as the PLC-5.

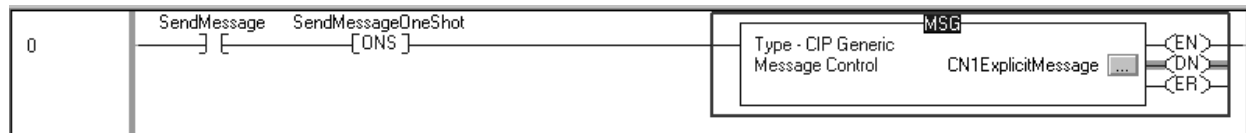
Each of these techniques is explained below.



## CIP Messaging

The 1203-CN1 accepts messaging over ControlNet to the CIP object set, sometimes referred to as native ControlNet objects. Appendix D of the 1203-CN1 user manual, publication no. 1203-5.13, describes the CIP objects available for messaging.

Messaging on a ControlLogix platform is similar to configuring messaging on a PLC-5, in that a "MSG" instruction conditioned by some other logic causes the message to be initiated:



The configuration of the "MSG" control block is slightly different than on a PLC-5, however. RSLogix 5000 provides a screen with two tabs for configuring a message. The example below performs a Get Attribute Single service (service 0E hex) to the Parameter Name String attribute (instance attribute 7) of instance 1 of the ControlNet parameter object (class 0F hex), thus retrieving the name of parameter 1 in the drive:

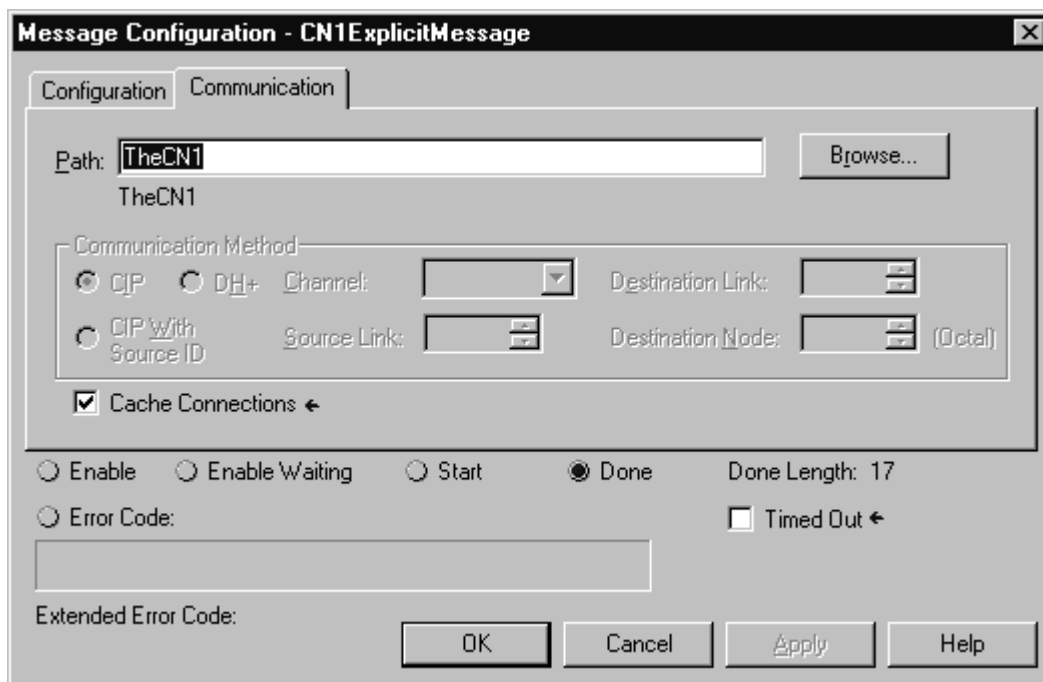
The "Configuration" tab of this dialog should be filled in as follows:

- **Message Type:** For an explicit CIP or ControlNet message, choose "CIP Generic".
- **Service Code:** This is the ControlNet service code for the request. Common service codes are 0E hex for Get Attribute Single and 10 hex for Set Attribute Single.
- **Object Type:** This is the class number of the object you wish to access.



- **Object ID:** This is the instance number of the object you wish to access. To access a class service or attribute, enter 0.
- **Object Attribute:** This is the attribute number of the object you wish to access.
- **Source:** Even if your message does not transmit data (beyond the service, class, instance, and attribute) to the 1203-CN1, a source tag needs to be created in the ControlLogix processor, and a source for message data needs to be designated here. The data in the source tag is only used if it is required by the 1203-CN1 (e.g., for a Set Attribute Single service).
- **Num. Of Elements:** Enter the number of bytes of data you wish to transfer (read or write).
- **Destination:** Even if your message does not retrieve data from the 1203-CN1, a destination tag needs to be created in the ControlLogix processor, and a destination for message data needs to be designated here. The data in the destination tag is only written if data is provided by the 1203-CN1 (e.g., for a Get Attribute Single service).

On the "Communication" tab, enter the name of the 1203-CN1 to which you wish to send this message:



### **PCCC Messaging**

In addition to CIP messaging, the 1203-CN1 also supports communications using PCCC. For purposes of PCCC messaging, the 1203-CN1 appears as a controller with various N files readable over ControlNet. This is traditionally how messaging between the 1203-CN1 and a PLC-5 processor is done. Appendix C of the 1203-CN1 user manual describes the meaning of various N files available for PCCC messaging.

Setting up a PCCC message is done in much the same way as a CIP message. This section describes the differences between CIP and PCCC messaging.

The "Configuration" tab for a PCCC message should be filled in as follows:



**Message Configuration - ThePCCMessage**

Configuration\* | Communication

Message Type: PLC5 Typed Read

Source Element: N10:4

Number Of Elements: 1

Destination Tag: hePCCMsgDestination [Create Tag...]

Enable    Enable Waiting    Start    Done   Done Length: 0

Error Code:    Timed Out ←

Extended Error Code:

OK   Cancel   Apply   Help

- **Message Type:** You can choose between PLC5 Typed Read and SLC500 Typed Read to read data from the 1203-CN1, or PLC5 Typed Write and SLC500 Typed Write to write data to the 1203-CN1. Either message type should work the same. Detailed differences between these message types are available in the "DF1 Protocol and Command Set Reference Manual", publication no. 1770-6.5.16. The other message type choices shown are not supported in the 1203-CN1.
- **Source or Destination Element:** Depending on whether your message is a read or write, you will be asked for either a source or destination element. This is the N file address of the data in the 1203-CN1 you wish to access.
- **Number of Elements:** This is the number of words of data you wish to read or write.
- **Destination or Source Tag:** Depending on whether your message is a read or write, you will be asked for either a destination or source tag. You will need to create a tag in the ControlLogix processor to hold the data retrieved from or written to the 1203-CN1 by this message.



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## Technical Support Resources

Should you have any additional questions, please contact the Rockwell Automation technical support division for the product related to your question:

<u>Division</u>	<u>Telephone</u>	<u>Email/Web</u>
Standard Drives <i>(1203-CN1, drive products)</i>	+1 262 512 8176	support@drives.ra.rockwell.com
Rockwell Software <i>(RSLinx, RSNetWorx for ControlNet, RSLogix 5000 software)</i>	+1 440 646 7800	<a href="http://www.software.rockwell.com/support/">http://www.software.rockwell.com/support/</a>
Control and Information Group <i>(ControlLogix system, ControlNet network)</i>	+1 440 646 6800	RACleAskTheExpert@ra.rockwell.com