Using Ladder Logic Instructions to Communicate with an Ethernet IP Nexus Unit

Communicating to an AMCI Ethernet IP Nexus unit is typically accomplished by using a scanner module in the PLC rack. However, it is also possible to communicate with these units directly using instructions in the ladder logic program.

Two instructions are required to transfer data between the PLC and the Nexus unit, one to read data from, and another to write data to, the Nexus Unit. The following two tables show the information common to all Nexus units.

This document shows how to communicate with AMCI Nexus units in MicroLogix 1100, ControlLogix, and SLC 500 systems.

Table 1: Reading Data
(Data Sent from the Nexus to the PLC)

Parameter	Value
Service Type	Get Single Attribute (ControlLogix) Read Assembly (SLC 500 & MicroLogix 1100)
Service Code	E (hex)
Class	4 (hex)
Instance	100 (decimal)
Attribute	3 (hex)
Length	See Table 3 below

Table 2: Writing Data
(Data Sent from the PLC to the Nexus)

Parameter	Value
Service Type	Set Single Attribute (ControlLogix) Write Assembly (SLC 500 & MicroLogix 1100)
Service Code	10 (hex)
Class	4 (hex)
Instance	150 (decimal)
Attribute	3 (hex)
Length	See Table 3 below

Note: The Service Type used in your PLC may be different.

Table 3 shows how many bytes of data the Message Instructions will have to transfer between the PLC and the various Nexus units.

Table 3: Length Parameters Table

Nexus	Read Length (Bytes)	Write Length (Bytes)
NX1F2E	32	32
NX1F4E	64	64
NX2A4E	42	20
NX2C4E	40	66
NX2C4E-08	272	66
NX2E4E	56	66
NX3A1E	40	80
NX3M1E	34	80
SD17098IE	200	20
SD31060IE	200	20

Even though the Read Length parameter must be set to 200 bytes, the SD17098IE and the SD31060IE drivers only transfer data in the first 20 bytes. The remaining 180 bytes will always be zero.

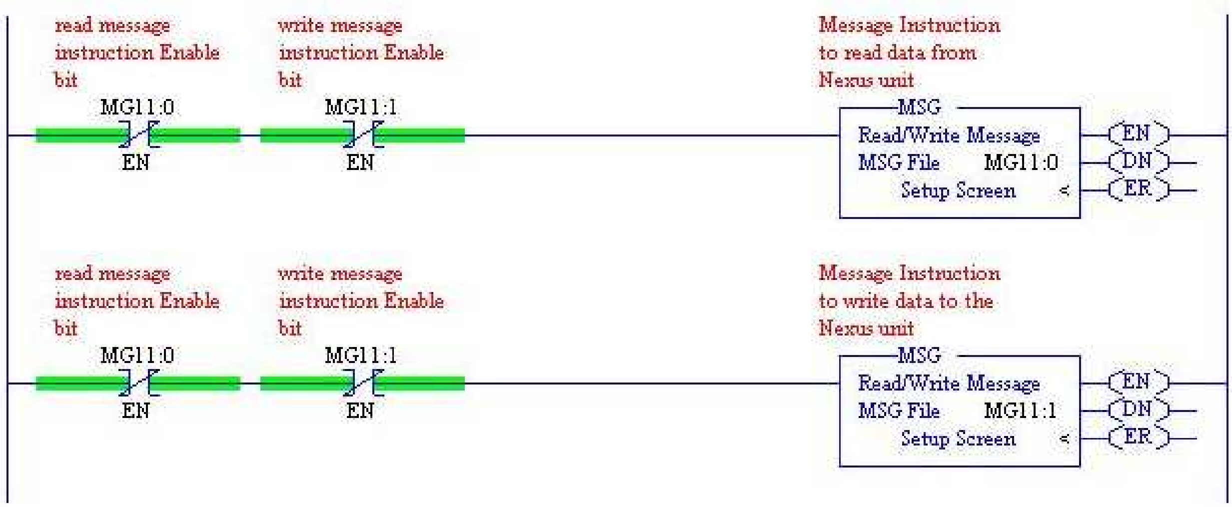
Using Message Instructions in a MicroLogix 1100 PLC

NOTE Only RSLogix 500 version 8.0 or higher can be used to configure a Message Instructions to communicate with an Ethernet IP device.

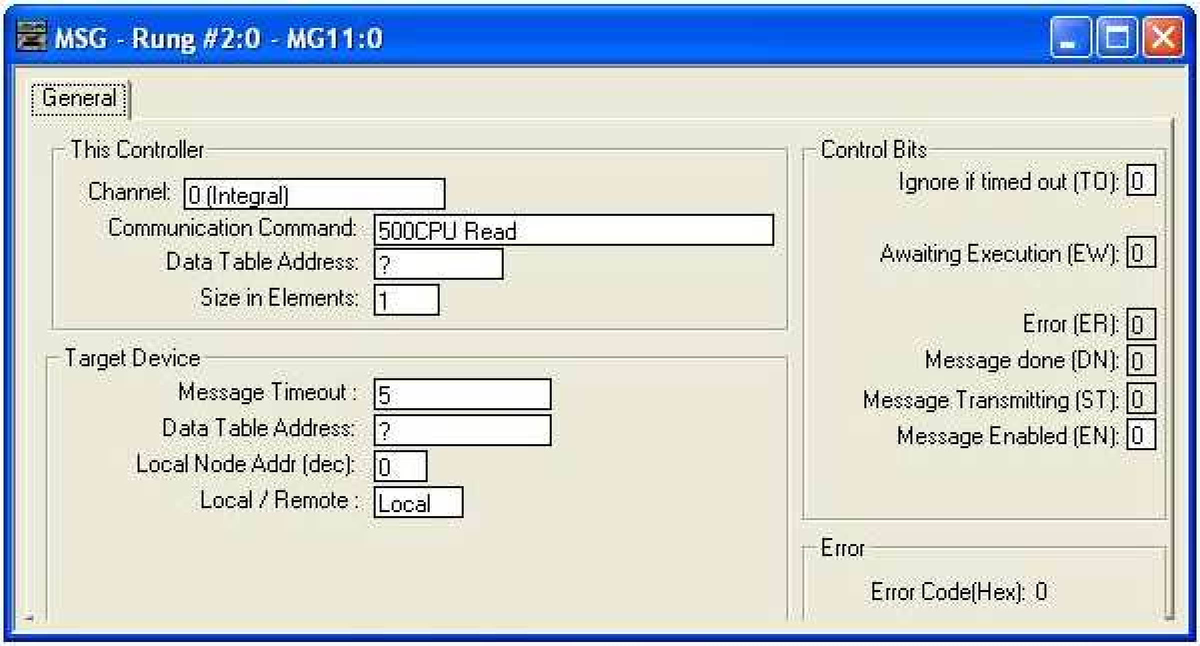
1. Create four new data files.

    - An Integer file to contain the data from the Nexus Unit. This file must have enough elements to contain all of the data read from the Nexus Unit.
    - An Integer file to contain the data sent to the Nexus Unit. This file must be large enough to contain all of the data sent to the Nexus unit.
    - A Message (MG) data file. This file must have at least two elements, one to control the Read Operation and one to control the Write Operation.
    - An Extended Routing Information (RIX) data file. This file is used to store information used by the Message Instructions. This file must have at least two elements, one for the Read Operation and one for the Write Operation.

2. Add the Message Instruction(s) to your Ladder Logic. The following rungs show how you can alternately read data from and write data to your Nexus unit.



3. Double Click on *Setup Screen* inside the Message Instruction. The following window will open



4. Double Click in the *Channel* field, click on the ▼, select *1 (Integral)*, and press Enter.
5. Double Click in the *Communication Command* field, click on the ▼, select *CIP Generic* and press Enter.
6. If the Message Instruction is being used to read data from the Nexus unit, enter the integer file where the data will be placed in the *Data Table Address (Received)* field and press enter.

   If the Message Instruction is being used to write data to the Nexus unit, enter the integer file where the source data will be located in the *Data Table Address (Send)* field and press Enter.

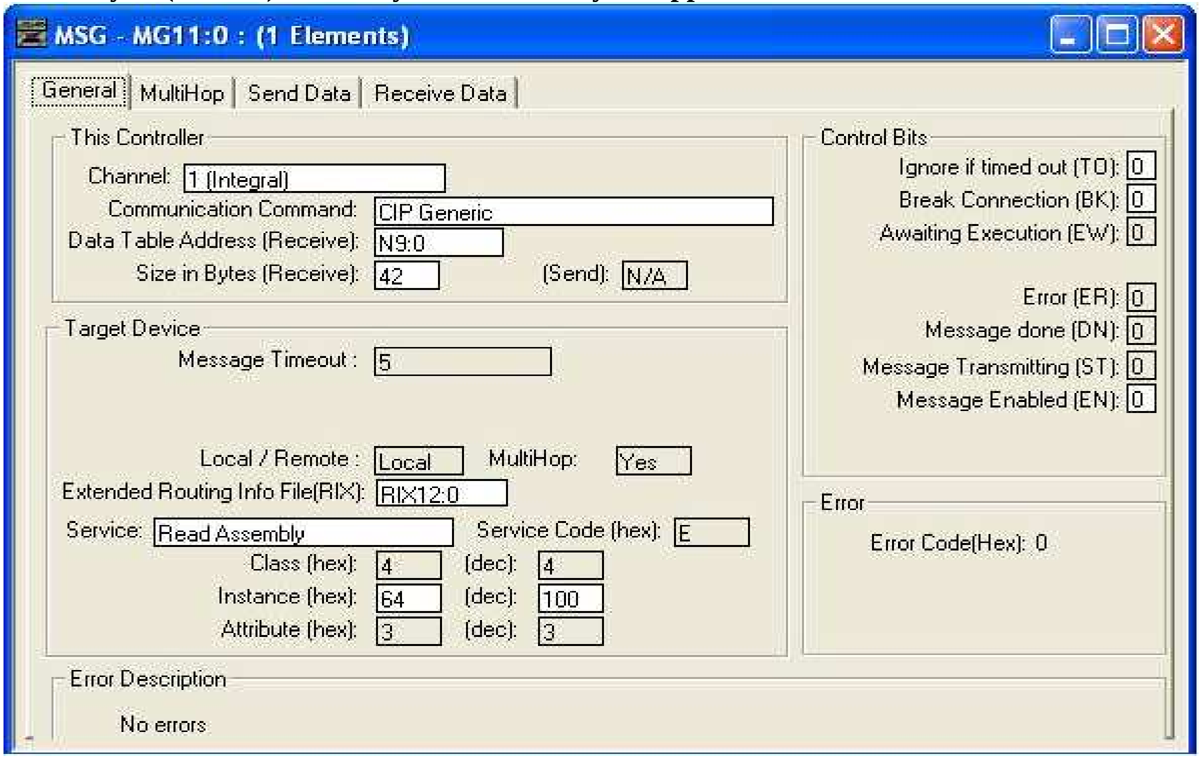
7. Use the data in Table 3 on page 1 to enter data either in the *Size In Bytes (Receive)* or *Size In Bytes (Send)* field.
8. Enter a RIX address in the *Extended Routing Info* field. Please note that each Message Instruction must have its own RIX address.
9. Double Click in the *Service* field and select *Read Assembly* for a Message Instruction that is being used to read data from the Nexus unit, or *Write Assemble* for a Message Instructions that is being used to send data to the Nexus unit, and press Enter.
10. For read operations, the *Service Code* field will change to E (hex). For write operations, the *Service Code* field will change to 10 (hex). For both read and write operations, the *Class* field will change to 4 (hex), and the *Attribute* field will change to 3 (hex).

11. For read operations, enter a value of 100 (64 hex) in the *Instance* field.

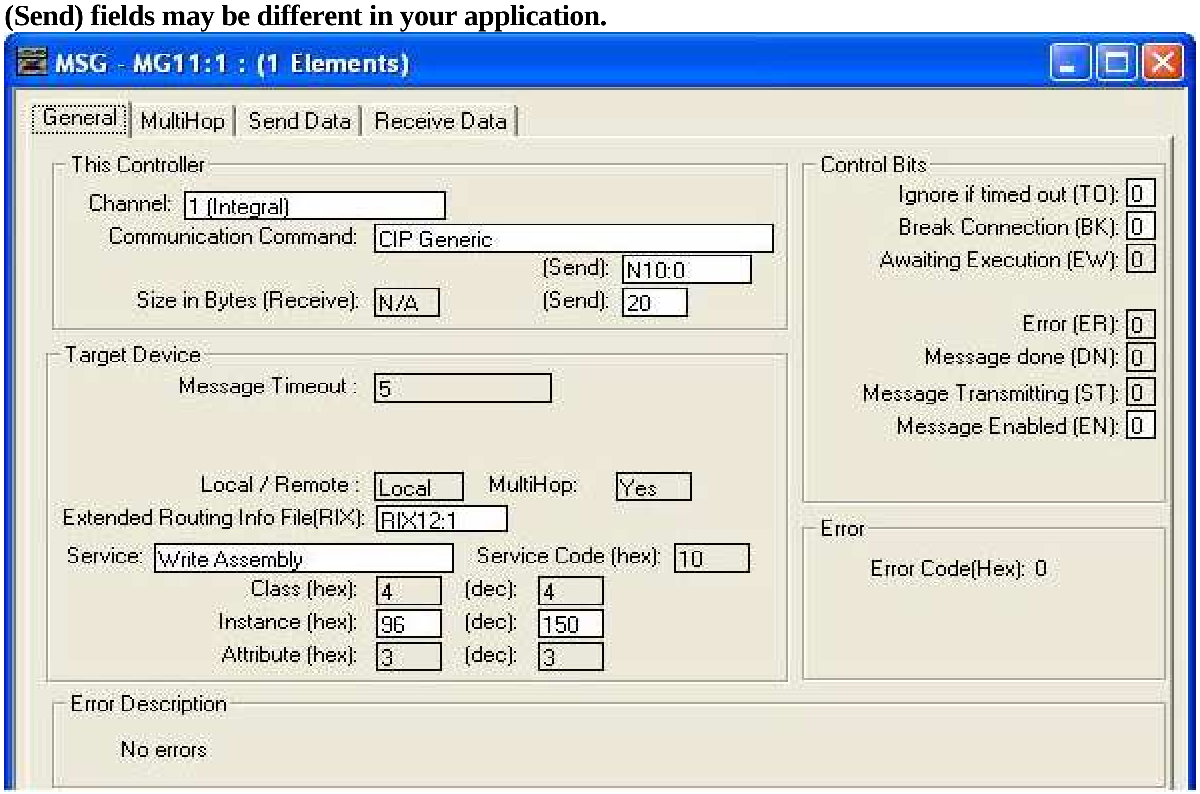
    For write operations, enter a value of 150 (96 hex) in the *Instance* field.

12. The images on the following page show a typical configuration for Message Instructions being used to both read data from and write data to a Nexus unit.

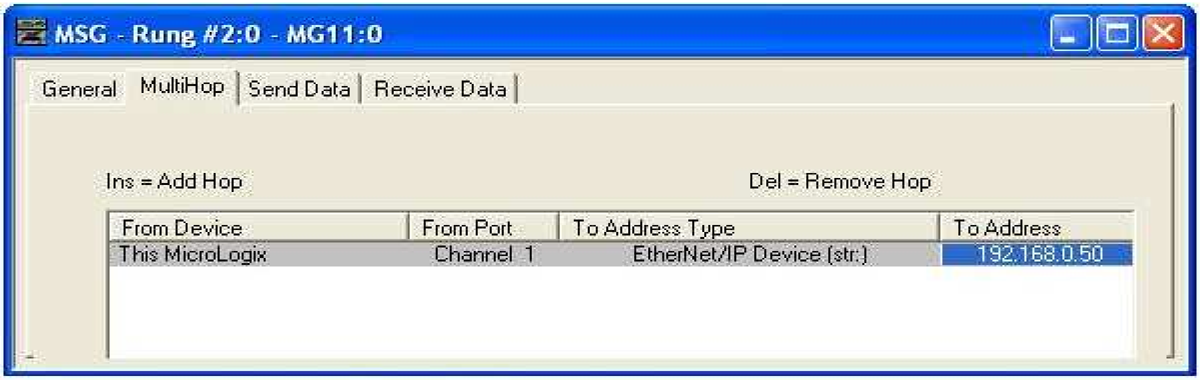
Message used to read data from a Nexus unit. Please note that the Data Table Address (Receive) and Size in Bytes (Receive) fields may be different in your application.



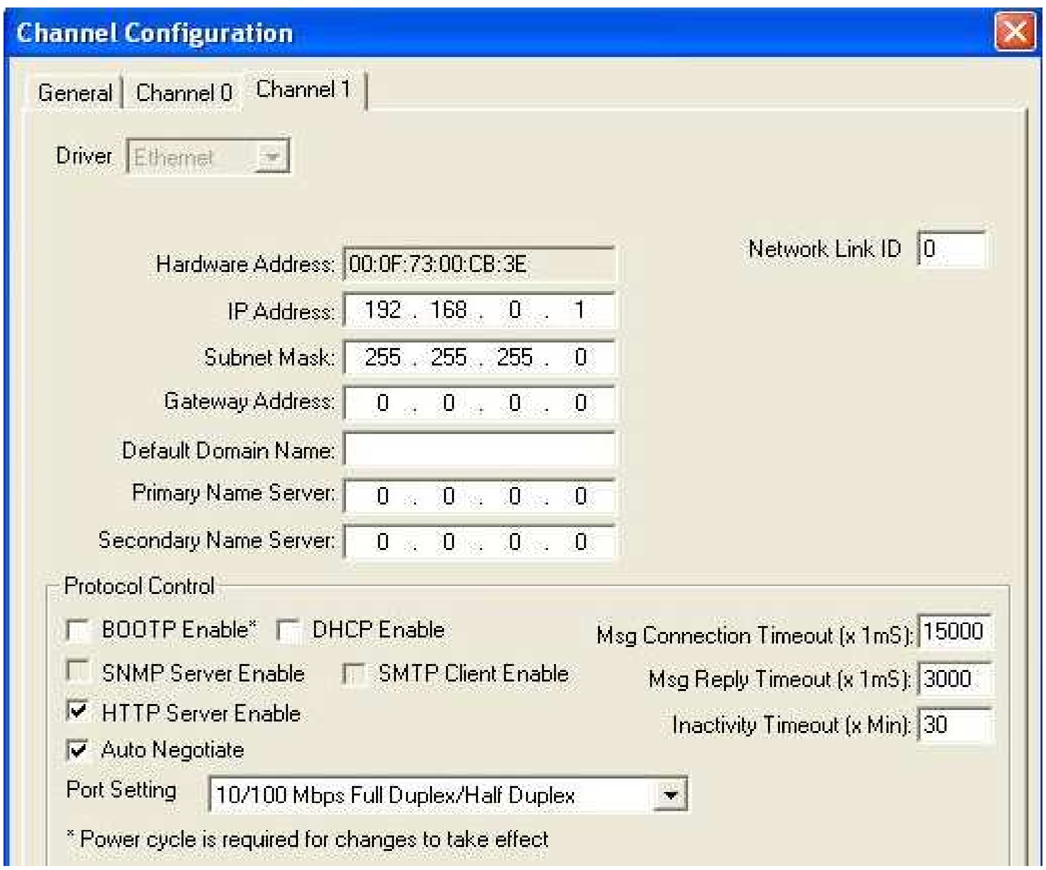
Message used to write data to a Nexus unit. Please note that the (Send) address and the Size in Bytes (Send) fields may be different in your application.



13. Click on the *MultiHop* tab, enter the IP address of the Nexus unit, and press Enter.



14. After you are finished adding both the read and write message instructions to your program, save and download the program to the PLC.
15. If you are unable to communicate with the Nexus unit, the problem may be that the Ethernet Port of your Micrologix 1100 has not been configured. To check this, double click on *Channel Configuration* in the project Tree and then select the *Channel 1* tab. The following window will open.



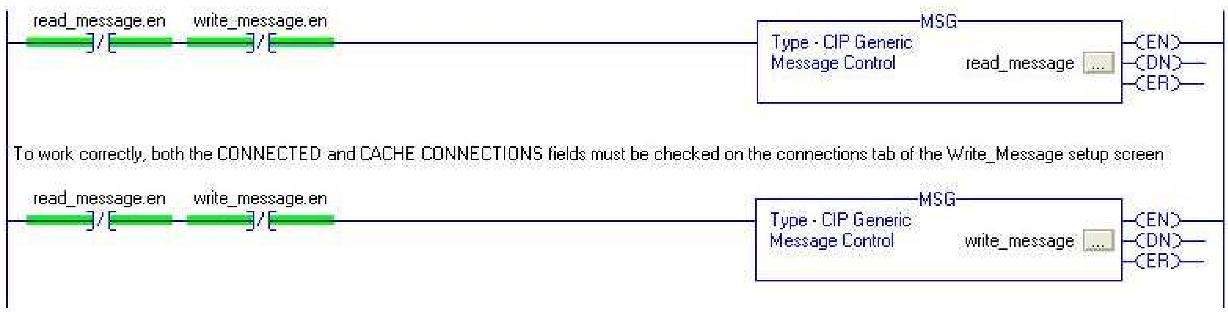
Enter the IP address and Subnet Mask of your system and click on *Apply*. The Ethernet Port should now be working.

Using Message Instructions in a ControlLogix PLC

Create four new tags in your ladder logic program.

1. A tag with the Message data type for reading data from the Nexus unit.
2. A tag with the Message data type for writing data to the Nexus unit.
3. A tag array with the INT data type that will be used to hold the data read from the Nexus unit.
4. A tag array with the INT data type that will hold the data sent to the Nexus unit.

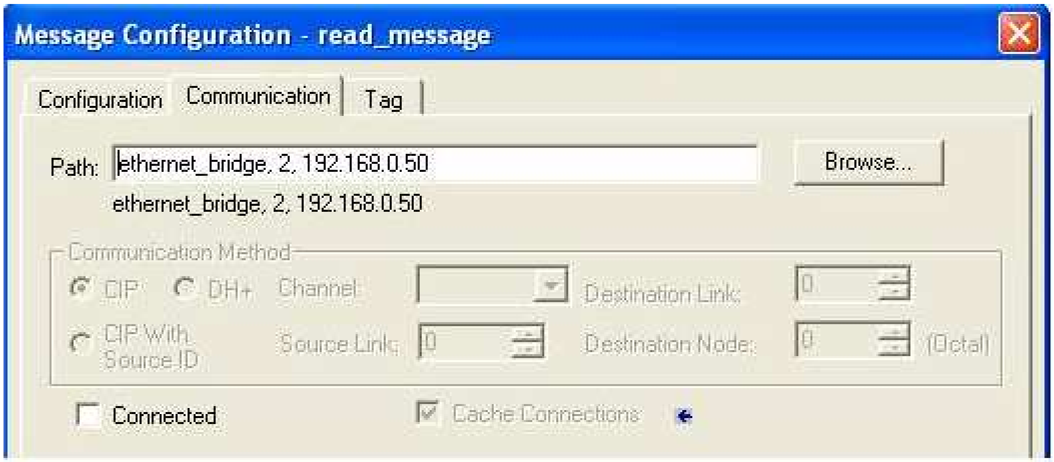
Add the Message Instructions to your ladder logic. The following image shows logic that will alternately read data from and write data to the AMCI Nexus unit.



Double click on the square box inside the Message Instruction used to read data from the Nexus Unit. The following Message Configuration window will open. Enter the parameters shown in Table 1 above. Please note that the *Message Type* field must be set to **CIP Generic** and the **Service Type** field must be set to **Get Attribute Single.**

Even though the *Source Length* field is not used by the Read Message screen, you must still create an INT tag array large enough, the first of which is shown in the *Destination* field, to contain all of the data transmitted from the Nexus Unit. The length values for all of the Nexus units manufactured by AMCI are shown in Table 3 above.

Click on the *Communication Tab*. The following window will open.



NOTE The path and IP address used in your application may be different.

Enter the following data in the *Path* field.

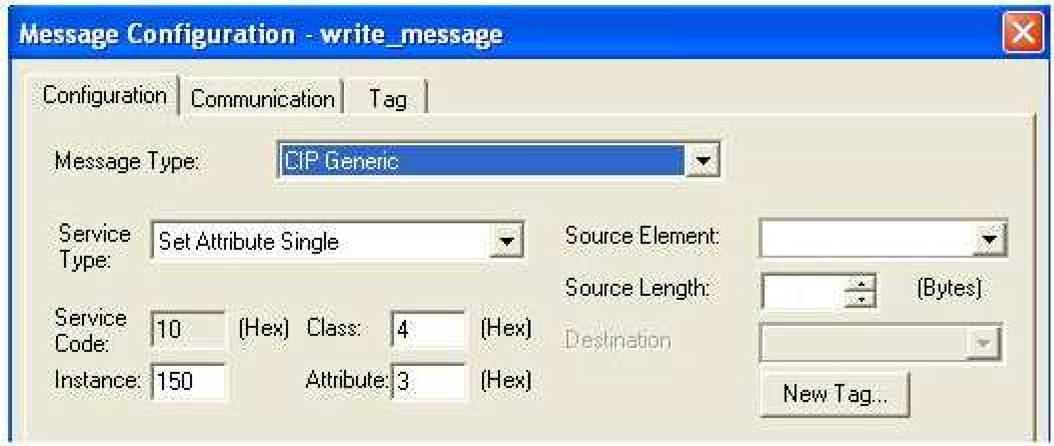
- 1, (to indicate the backplane)
- 3, (to indicate the slot where the Ethernet port is located)
- 2, (to indicate an external IP address)
- The IP address of Nexus Unit

For example, using an Ethernet Bridge module located in slot 3 to read the data from a Nexus unit with an IP address of 192.168.0.50 would be 1,3,2,192.168.0.50.

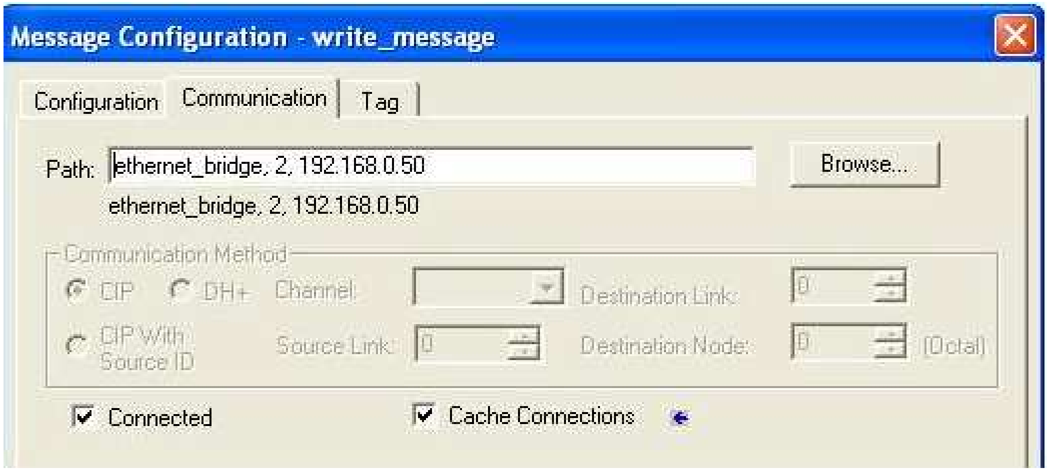
Click on *Apply* to accept the changes. The Read Message Configuration Window will close.

Double click on the square box inside the Message Instruction used to write data to the Nexus Unit. The following window will open. Enter the parameters shown in Table 1 above. Please note that the *Message Type* parameter must be set to **CIP Generic** and that the *Service Type* parameter must be set to **Set Attribute Single**.

You must create enough registers, the first of which is entered in the *Source Element* field, to hold the data that you are sending to the Nexus unit. The *Source Length* field must be set to the Write Length value that is used by your Nexus unit and is shown in Table 3 above.



Click on the *Communication Tab*. The following window will open.



NOTE

To work correctly, both the CONNECTED and CACHE CONNECTIONS fields should be checked in the Message Instruction used for Write operations

NOTE

The path and IP address used in your application may be different.

Enter the following data in the *Path* field.

- 1, (to indicate the backplane)
- 3, (to indicate the slot where the Ethernet port is located)
- 2, (to indicate an external IP address
- the IP address of Nexus Unit

For example, using an Ethernet Bridge module located in slot 3 to write data to a Nexus unit with an IP address of 192.168.0.50 would be 1,3,2,192.168.0.50.

Click on *Apply* to accept the changes. The Write Message Configuration Window will close.

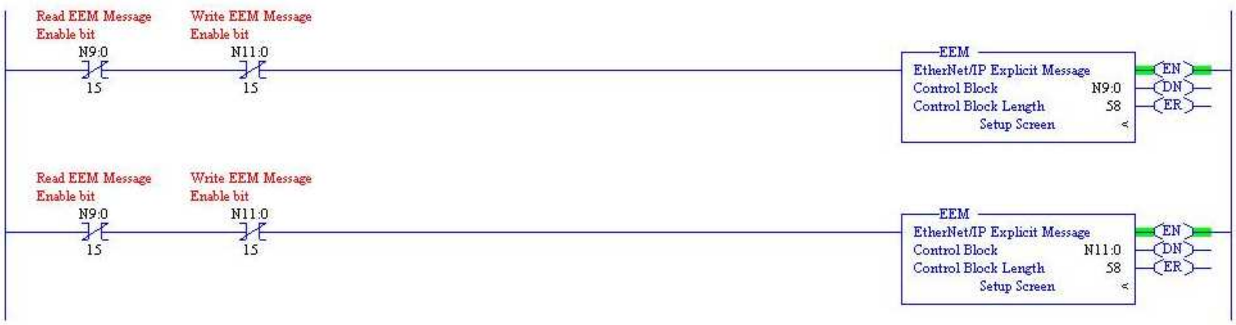
Using EEM Instructions in a SLC 500 PLC

NOTE EEM instructions are only available on RSLogix 500 version 7.10 or higher and can only be used on a 5/05 PLC with firmware version 10 or higher.

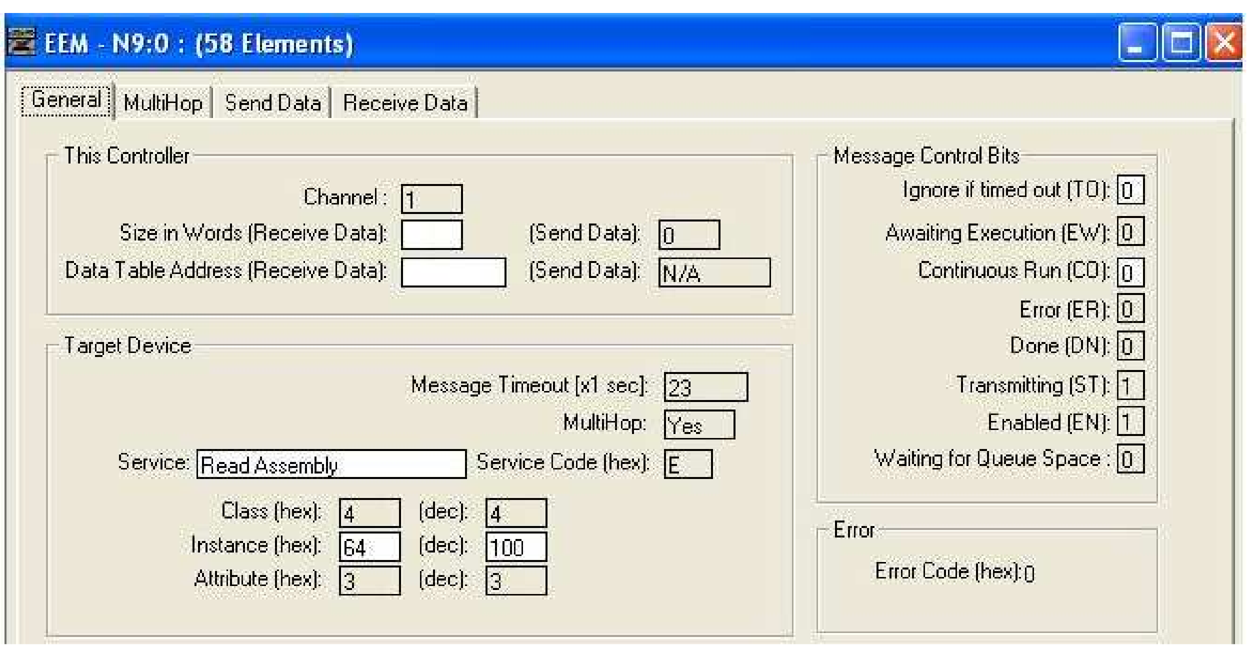
Create four new integer data files in your ladder logic program.

1. An Integer Data File 58 words long used as the control block to read data from the Nexus unit.
2. An Integer Data File 58 words long used as the control block to write data to the Nexus unit.
3. An Integer Data File with the exact number of words that will be read from the Nexus unit.
4. An Integer Data File with the exact number of words that will be written to the Nexus unit.

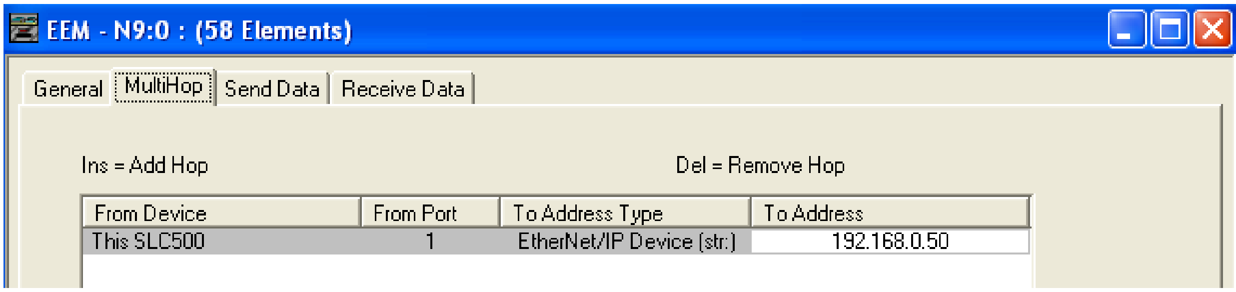
Add the EEM (Ethernet IP Explicit Message) Instructions to your ladder logic. The following image shows logic that will alternately read data from and write data to the AMCI Nexus unit.



Double click on *Setup Screen* inside the EEM Instruction used to read data from the Nexus Unit. The following EEM Setup Screen will open. Enter the parameters shown in Tables 1 and 3 above. Also, enter the data table address where the data read from the Nexus unit will be placed in the *Data Table Address (Receive Data)* field.



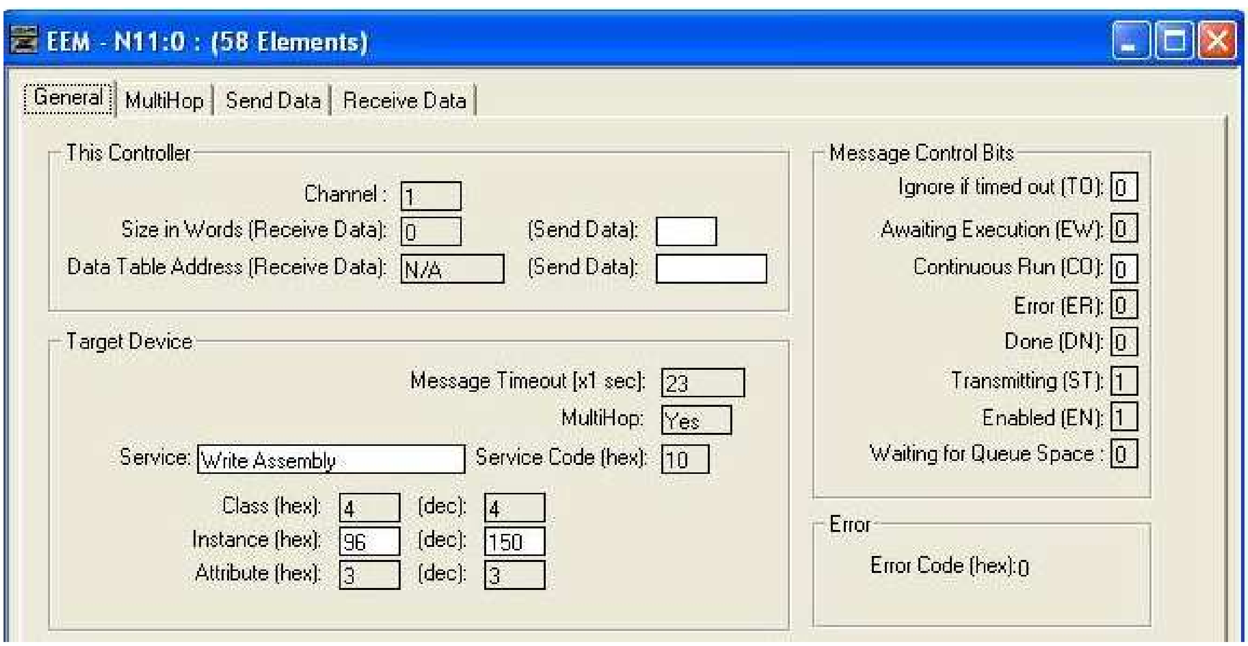
Click on the *MultiHop Tab* to enter the IP address of the Nexus unit. The following window will open.



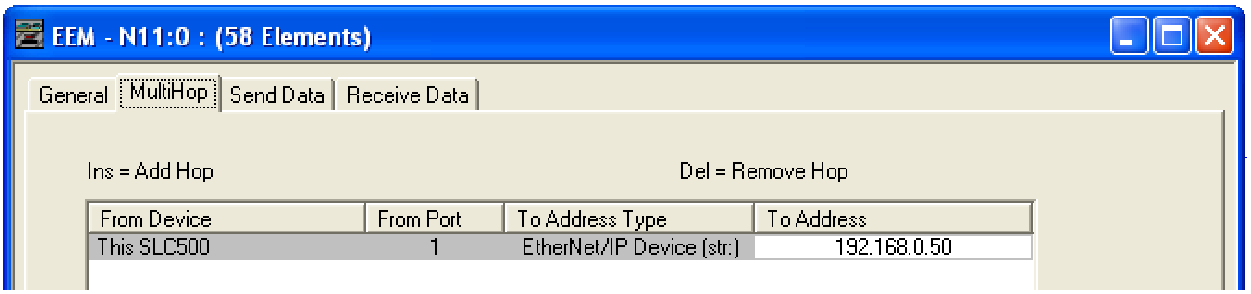
NOTE The path and IP address used in your application may be different.

Close the EEM reading instruction Setup Screen.

Double click on *Setup Screen* inside the EEM Instruction used to write data to the Nexus Unit. The following EEM Setup Screen will open. Enter the parameters shown in Tables 2 and 3 above. Also, enter the data table address where the data to be sent to the Nexus unit is located in the *Data Table Address (Send Data)* field.



Click on the *MultiHop Tab* to enter the IP address of the Nexus unit. The following window will open.



NOTE The path and IP address used in your application may be different.

Close the EEM writing instruction Setup Screen.

Version 0 was released on 8/28/07 and was the initial release of the document.
Version 1 was released on 4/28/08. Using Message Instructions to communicate with the MicroLogix 1100 was added to the document.   Also corrected that the SD17098IE and SD31060IE drivers require a read length of 200 bytes.
Version 2 was released on 1/8/09. The title was changed to "Using Ladder Logic Instructions to Communicate with an Ethernet IP Nexus Unit." This was done because a customer thought he could use Message Instructions in a SLC PLC and he actually has to use EEM instructions.

File: Nexus_Ethernet_message_communication.doc
Date: 1/8/09