

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.

(Data Sent from the Nexus to the PLC)		
Parameter	Value	
Somico Tuno	Get Single Attribute (ControlLogix)	
Service Type	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 1: Reading Data

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

(Duta Bent if on the The to the ((exus))			
Parameter	Value		
Service Type	Set Single Attribute (ControlLogix)		
Service Type	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.

Nexus	Read Length (Bytes)	Write Length (Bytes)	
NX1F2E	32	32	Even though the Read
NX1F4E	64	64	Length parameter must be
NX2A4E	42	20	set to 200 bytes, the
NX2C4E	40	66	SD17098IE and the
NX2C4E-08	272	66	SD31060IE drivers only
NX2E4E	56	66	transfer data in the first 20
NX3A1E	40	80	bytes. The remaining 180
NX3M1E	34	80	bytes will always be zero.
SD17098IE	200	20	
SD31060IE	200	20	

Table 3: Length Parameters Table

be

20 80



Using Message Instructions in a MicroLogix 1100 PLC



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

😹 MSG - Rung #2:0 - MG11:0	
General This Controller Channel: 0 (Integral) Communication Command: 500CPU Read Data Table Address: ? Size in Elements: 1 Target Device Message Timeout : Data Table Address: ? Data Table Address: ? Local Node Addr (dec): 0 Local / Remote : Local	Control Bits Ignore if timed out (TO): 0 Awaiting Execution (EW): 0 Error (ER): 0 Message done (DN): 0 Message Transmitting (ST): 0 Message Enabled (EN): 0
	Error Code(Hex): 0

- 4. Double Click in the *Channel* field, click on the $\mathbf{\nabla}$, 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 <u>must</u> 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.



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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.

🔀 MSG - MG11:0 : (1 Elements)	
General MultiHop Send Data Receive Data	
This Controller Channel: 1 (Integral) Communication Command: CIP Generic Data Table Address (Receive): N9:0 Size in Bytes (Receive): 42 (Send): N/A	Control Bits Ignore if timed out (TO): 0 Break Connection (BK): 0 Awaiting Execution (EW): 0
Target Device Message Timeout : 5 Local / Remote : Local MultiHop: Yes	Message done (DN): 0 Message Transmitting (ST): 0 Message Enabled (EN): 0
Extended Routing Info File(RIX): RIX12:0 Service: Read Assembly Service Code (hex): E Class (hex): 4 (dec): 4 Instance (hex): 64 (dec): 100 Attribute (hex): 3 (dec): 3	Error Error Code(Hex): 0
Error Description No errors	

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.

This Controller	Control Bits
Channel: 1 (Integral)	Ignore if timed out (TO):
Communication Command: CIP Generic	Break Connection (BK):
(Send): <u>N10:0</u>	Awaiting Execution (EW):
Size in Bytes (Receive): N/A (Send): 20	Error (ER):
Target Device	Message done (DN):
Message Timeout : 5	Message Transmitting (ST):
	Message Enabled (EN):
Land / Danaka	
Extended Bouting Info File(BIX): DIV12.1	
Service: In (via Assembly	Error
Class (hex): 4 (dec): 4	Error Code(Hex): 0
Instance (hex): 96 (dec): 150	
Attribute (hex): 3 (dec): 3	



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

ral MultiHop Send Data	Receive Data		
Ins = Add Hop	From Port	Del = Remove H	
This MicroLogix	Channel 1	EtherNet/IP Device (str:)	192,168.0.50

- 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.

hannel Configuration		
General Channel 0 Channel 1	1	
Driver Ethemet		
Hardware Address:	00:0F:73:00:CB:3E	Network Link ID
IP Address:	192 . 168 . 0 .	1
Subnet Mask:	255 . 255 . 255 .	D
Gateway Address:	0.0.0.	D
Default Domain Name:		_
Primary Name Server:	0.0.0.	D
Secondary Name Server:	0.0.0.	0
Protocol Control		
🔲 BOOTP Enable* 🔲 DH	CP Enable	Msg Connection Timeout (x 1mS): 15000
SNMP Server Enable	SMTP Client Enable	Msg Reply Timeout (x 1mS): 3000
HTTP Server Enable		Inactivity Timeout (x Min): 30
IV Auto Negotiate		
For Setting 10/100 Mbps	Full Duplex/Half Duplex	_
* Power cycle is required for c	hanges to take effect	

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.

read_message.en write_message.en	Type - CIP Generic Message Control read_message CON>
To work correctly, both the CONNECTED and CACHE CONNECTIONS read_message.en	fields must be checked on the connections tab of the Write_Message setup screen MSGMSGCEND
	Message Control write_message (CDN)(CR)(CR)

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 <u>must be set</u> to **CIP Generic** and the **Service Type** field <u>must be set</u> 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.

Message C	onfiguration - read_message	
Configurati	on Communication Tag	
Message	Type: CIP Generic	
Service Type:	Get Attribute Single	Source Element:
Service Code:	e (Hex) Class: 4 (Hex)	Destination
Instance:	100 Attribute: 3 (Hex)	New Tag



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

Path: lethernet_bridge, 2, 192.168.0.50 Browse ethernet_bridge, 2, 192.168.0.50 Communication Method Communication Method Image: Communication Link:	Communication Tag		
Communication Method	met_bridge, 2, 192.168.0.50		Browse
Communication Memod	1e(_bildge, 2, 132.166.0.30		
	C DH+ Channel	Destination Link:	0 =
CIP With Source Link 0 🚊 Destination Node: 0 🚍 (0	ith Source Link: 0 a ID	Destination Node:	0 🛨 (Octal



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

Enter the following data in the *Path* field.

- \succ 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.

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

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 <u>must be set</u> to **CIP Generic** and that the *Service Type* parameter <u>must be set</u> 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 <u>must</u> be set to the Write Length value that is used by your Nexus unit and is shown in Table 3 above.

Message C	onfiguration - write_message		
Configurati	on Communication Tag		
Message	Type: CIP Generic		
Service Type:	Set Attribute Single	Source Element	· ·
Service Code:	[10 (Hex) Class: 4 (H	lex) Destination	
Instance:	150 Attribute: 3 (F	lex)	New Tag

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

ionfig.	uration Commun	nication Tag	1				
Path:	ethernet_bridge, 2, 192.168.0.50				Browse		
	ethernet_bridge,	2, 192.168.0.	50				
-Can	nmunication Meth	od	_	ų.	Desta Part	0	-
c	CIP With	Source Link:	0		Destination Link Destination Node:	0	

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

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.

nis Controller	Message Control Bits
Channel: 1	Ignore if timed out (TO): []
Size in Words (Receive Data): (Send Data):	Awaiting Execution (EW): 0
ata Table Address (Receive Data): [Continuous Run (CO): 0
	Error (ER): 0
arget Device	Done (DN): 0
Message Timeout [x1 sec]: 23	Transmitting (ST): 1
MultiHop: Yes	Enabled (EN): 1
Service: Read Assembly Service Code (hex): E	Waiting for Queue Space : 0
Class (hex): 4 (dec): 4	
Instance (hex): 64 (dec): 100	Ellor

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

	EEN					
ſ	Gener	ral MultiHop Send Data R	eceive Data			
	Ins = Add Hop			Del = Re	emove Hop	
		From Device	From Port	To Address Type	To Address	
		This SLC500	1	EtherNet/IP Device (str.)	192.168.0.50	

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.

ral MultiHop Send Data Receive Data	
his Controller	Message Control Bits
Channel: 1	Ignore if timed out (TO): 0
Size in Words (Receive Data): 0 (Send Data):	Awaiting Execution (EW): 0
ata Table Address (Receive Data): N/A (Send Data):	Continuous Run (CO): 0
	Error (ER): 0
arget Device	Done (DN): ()
Message Timeout [x1 sec]: [23	Transmitting (ST): 1
MultiHop: Yes	Enabled (EN): 1
Service: Write Assembly Service Code (hex): 10	Waiting for Queue Space : 0
Class (bex) 4 (dec) 4	
Instance (hex); (96 (dec); (150	Error
Attribute (beult D (dee): D	Error Code (hex):

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

🗃 EEA					
Gene	ral MultiHop Send Data R	eceive Data			
Ins = Add Hop			Del = Re	emove Hop	
	From Device	From Port	To Address Type	To Address	
	This SLC500	1	EtherNet/IP Device (str:)	192.168.0.50	

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