

NXAE2

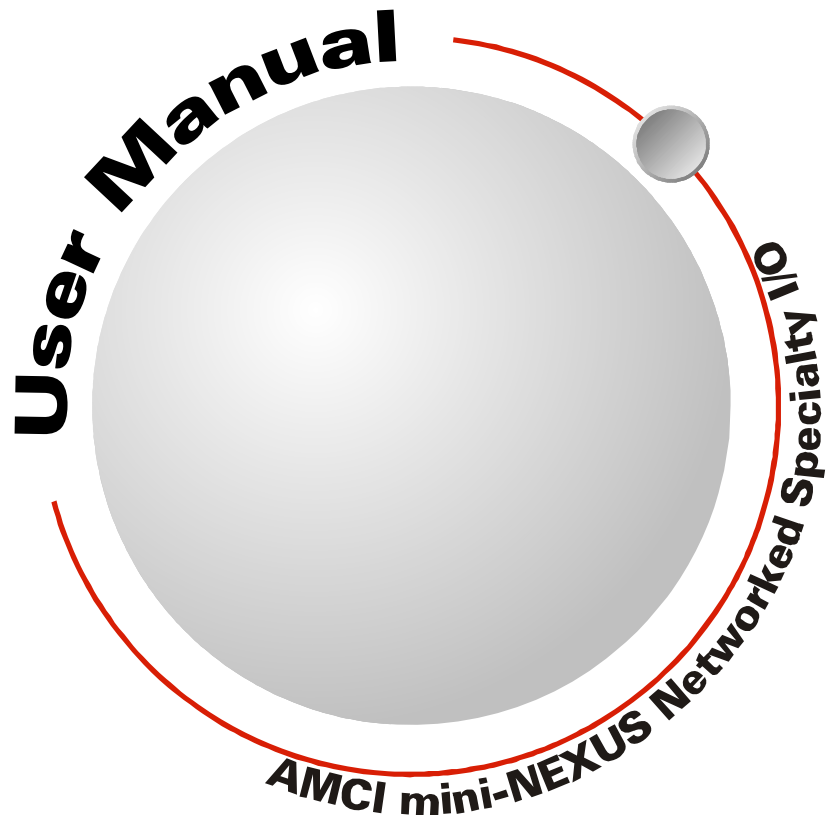
mini-NEXUS

Resolver Interface Module

with Integral 2-Port Ethernet Switch

Device Level Ring functionality for EtherNet/IP

Media Redundancy Protocol for PROFINET



EtherNet/IP™



GENERAL INFORMATION

Important User Information

The products and application data described in this manual are useful in a wide variety of different applications. Therefore, the user and others responsible for applying these products described herein are responsible for determining the acceptability for each application. While efforts have been made to provide accurate information within this manual, AMCI assumes no responsibility for the application or the completeness of the information contained herein.

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Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

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ABOUT THIS MANUAL

Read this chapter to learn how to navigate through this manual and familiarize yourself with the conventions used in it. The last section of this chapter highlights the manual's remaining chapters and their target audiences.

Audience

This manual explains the set-up, installation, and operation of AMCI's NXAE2 Resolver Interface Module. It is written for the engineer responsible for incorporating these modules into a design, as well as the engineer or technician responsible for their actual installation.

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Revision Record

This manual, 940-0N101, is the second release of this manual. It was released October 15th, 2020. It corrects typographical errors.

Revision History

940-0N101 October 15, 2020: Corrects typographical errors.

940-0N100 May 7, 2020: Initial release.

Navigating this Manual

This manual is designed to be used in both printed and on-line formats. Its on-line form is a PDF document, which requires Adobe Acrobat Reader version 7.0+ to open it. The manual is laid out with an even number of pages in each chapter. This makes it easier to print a chapter to a duplex (double sided) printer.

The PDF file is password protected to prevent changes to the document. You are allowed to select and copy sections for use in other documents and, if you own Adobe Acrobat version 7.0 or later, you are allowed to add notes and annotations.

Manual Conventions

Three icons are used to highlight important information in the manual:



NOTES highlight important concepts, decisions you must make, or the implications of those decisions.



CAUTIONS tell you when equipment may be damaged if the procedure is not followed properly.



WARNINGS tell you when people may be hurt or equipment may be damaged if the procedure is not followed properly.

Manual Conventions (continued)

The following table shows the text formatting conventions:

Format	Description
Normal Font	Font used throughout this manual.
<i>Emphasis Font</i>	Font used the first time a new term is introduced.
<i>Cross Reference</i>	When viewing the PDF version of the manual, clicking on the cross reference text jumps you to referenced section.
<i>HTML Link</i>	When viewing the PDF version of the manual, clicking on the link will connect you with the www.amci.com website.

Where To Go From Here

You will most likely read this manual for one of two reasons:

- If you are curious about the NXAE2 Resolver Interface Module from AMCI, this manual contains the information you need to determine if these product is the right one for your application. The first chapter, *Introduction to the NXAE2*, contains all of the information you will need to fully specify the right product for your application.
- If you need to install and use the NXAE2 Resolver Interface Module, then the rest of the manual is written for you. To simplify installation and configuration, the rest of the manual is broken down into *references* and *tasks*. Using this product requires you to complete multiple tasks, and the manual is broken down into sections that explain how to complete each one.

Chapter Title	Page #	Intended Audience
<i>Introduction to the NXAE2</i>	7	Anyone new to the NXAE2. This chapter gives a basic overview of the features available on the unit, typical applications, and specifications.
<i>Data Formats</i>	15	Anyone that needs detailed information on the data formats used by the NXAE2 to communicate with its host controller.
<i>Configuring Network Interfaces</i>	27	Basic information on configuring a PC or laptop to successfully communicate with an NXAE2 to set its IP address.
<i>Installing the NXAE2</i>	29	Anyone that must install an NXAE2 on a machine. Includes information on mounting, grounding, and wiring specific to the units.
<i>Set the IP Address and Protocol</i>	39	Anyone that needs to change the IP address or communications protocol used by the NXAE2.
<i>Implicit Communications with an EDS</i>	49	Anyone that wants to use EtherNet/IP Implicit Messaging on platforms that support EDS files.
<i>Implicit Communications Without an EDS</i>	55	Anyone that wants to use EtherNet/IP Implicit Messaging on platforms that do not support EDS files.
<i>EtherNet/IP Explicit Messaging</i>	61	Anyone using EtherNet/IP Explicit Messaging to communicate with the NXAE2.
<i>Modbus TCP Configuration</i>	67	Anyone using Modbus TCP to communicate with the NXAE2.
<i>PROFINET Network Configuration</i>	71	Anyone using PROFINET to communicate with the NXAE2.

INTRODUCTION TO THE NXAE2

This reference section contains the information you need to decide if the NXAE2 Resolver Interface Module is the right product for your application.

The NXAE2

The NXAE2 is a two channel resolver interface module that accepts 24 Vdc as its power source. What makes the NXAE2 unique is its advanced digital technology that allows the NXAE2 to interface with virtually any resolver transmitter, regardless of the manufacturer. This is accomplished by having the transformation ratio, reference voltage, and reference frequency completely programmable from the host controller.

The NXAE2 is a member of the growing line of products from AMCI that incorporate our *E2 Technology*. E2 Technology by AMCI is an innovative new multi-protocol approach to Ethernet distributed I/O.

E2 Technology products are simple and intuitive, allowing easy transition between Ethernet/IP, PROFINET, or Modbus/TCP protocols without the need to physically switch parts. An advanced web server integrated into all AMCI E2 Technology devices facilitates simple network configuration and troubleshooting via a web-browser. Furthermore, an impressive array of advanced features for each supported protocol has been incorporated into the devices to meet many unique application requirements.

The NXAE2 is a two channel resolver interface module that allows you to lower transducer wiring cost by placing the NXAE2 close to the transducers and running a single network cable back to the host controller. The NXAE2 also future-proofs your resolver feedback design. The host controller can be updated to any future platform that supports EtherNet/IP, PROFINET, or Modbus TCP and the NXAE2 will operate with the new system.

Each unit has two Ethernet ports which are internally connected through an onboard, two port, 10/100 Mbps ethernet switch. These ports allow you to wire your network in a “daisy-chain” fashion, which may lower network wiring costs and complexities.

The two ports also allow the units to function as members of a redundant Device Level Ring (DLR) network when using the EtherNet/IP protocol or as clients in a Media Redundancy Protocol (MRP) network when using PROFINET.

In DLR environments, the units act as Beacon-Based Ring Nodes. All units can process beacon packets at the default rate of every 400 microseconds. Beacon-based nodes can respond faster to network changes than nodes that only process Announce packets.

The NXAE2 (continued)

The NXAE2 can be programmed to accept three types of resolver based transducers:

- **Single Resolver Transducers** - This type of transducer has a single resolver in the transducer package. This type includes transducers that yield an absolute position over a single turn, such as our HT-20, HT-400, H25, and R11 product lines, and transducers that include an integral gear train between the input shaft and the resolver so they can yield an absolute position value over multiple turns. An example of this type of transducer is any member of the HT-20-(x) line from AMCI.
- **Redundant Resolver Transducers** - This type of transducer has two resolvers that are geared 1:1 with the input shaft. Examples of a redundant resolver transducer are the HTT-20-1 and HTT-400-1 from AMCI. These transducers are typically used in systems that require redundant controls for safety or high availability. To the NXAE2, these transducers appear as two single resolver, single turn, transducers.
- **Dual Resolver Transducers** - This type of transducer has two resolvers in the transducer package that are geared in such a way that the transducer yields a high resolution absolute position over multiple turns. As shown in figure R1.1 to the right, there are two types of dual resolver multi-turn transducers. One type uses a vernier gearing, where the two gears differ by one tooth. Examples of this type of transducer are the HTT-20-100, HTT-20-180, HTT-20-1000 and HTT-20-1800 transducers from AMCI. The second type uses a gear reduction between the fine and coarse gear so that the coarse gear completes one rotation for multiple turns of the fine resolver.

The NXAE2 accepts programming information and reports position, velocity, and error information over the network connection. This connection means that you do not have to be physically near the NXAE2 while configuring it. All configuration and setup data is sent from your host system over the network connection. This allows you to:

- Configure the NXAE2 from anywhere
- Store multiple setups on your machine
- Copy setup data from one machine to another
- Design custom HMI interfaces for configuration and setup that can simplify machine training, startup, and repair.

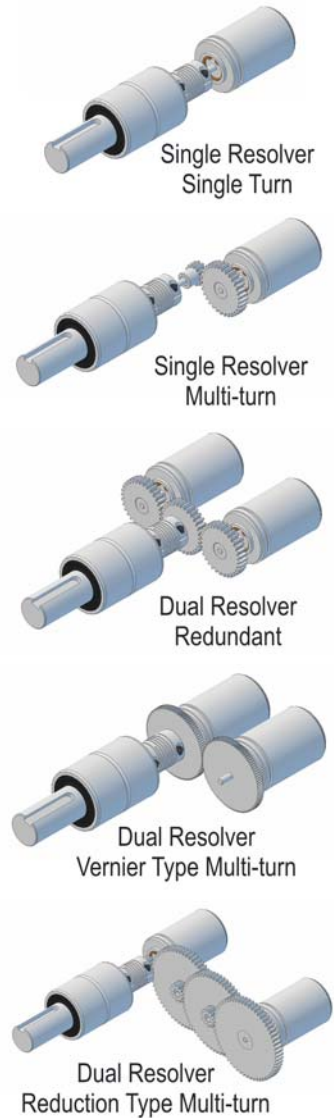


Figure R1.1 Resolver Transducer Types

Interpreting Resolver Specifications

When specifying a resolver for use with the NXAE2 module, the three most important specifications are:

- Reference Voltage - The specified operating voltage
- Reference Voltage Frequency - The specified operating reference voltage frequency
- Transformation Ratio (TR) - The ratio of output voltage to input voltage when the output voltage is at it's maximum value. This is typically specified at the resolver's 0° position, but it is valid at any of the resolver's 90° points.


Resolvers use different wire gauges and different turns ratios, which means that they operate at different voltages and frequencies. Voltages generally range from 6 to 12 Vac while frequencies range from 400 Hz to 5000 Hz. Transformation Ratios generally range from 0.45 to 1.4. The NXAE2 supports a much wider range for these setting to accommodate resolver-like devices such as variable reluctance transducers.

Interpreting Resolver Specifications (continued)

Published reference voltage specifications should be considered maximum values at the specified frequency. Using a higher voltage at the listed frequency may cause the iron cores in the resolver to saturate. This will significantly affect positional accuracy.

However, you can use a lower reference voltage setting without losing positional accuracy. This opens up the possibility of lowering the reference voltage frequency. Generally speaking, if you supply half of the specified reference voltage to the resolver, you can halve the reference frequency as well.

Lowering the reference voltage frequency increases the length of transducer cable you can place between the transducer and the NXAE2 by decreasing the effects of cable capacitance. This is why the default Reference Frequency setting for AMCI transducers is 2.5 KHz instead of 5.0 KHz specified for the R11X-J style resolvers. Using a Reference Voltage setting of 3.25 Vac instead of the specified 7.0 Vac keeps the resolver cores from saturating at the lower frequencies.

NOTE  The default values for 3.25 Vrms for the Reference Voltage and 2500 Hz for the Reference Frequency will work with most resolvers. You will only have to set the Transformation Ratio to get most resolvers working with the NXAE2.

NXAE2 Programmable Parameters

Common Parameters


These parameters are available on the NXAE2 regardless of the type of transducer used.

Reference Frequency

Programmable over a range of 400 to 10,000Hz with a resolution of 1Hz and an accuracy of 0.01%, this parameter allows you to match the frequency of the reference voltage to the operating frequency of your resolver. The factory default setting is 2500 Hz. If your application uses two resolvers, both operate at the same frequency.

Reference Voltage

Allows you to set the reference voltage from 0.800 to 12.000 Vrms. The parameter is programmed in millivolts, so the value's range is 800 to 12,000. The programmable resolution is 0.05 Vrms and the accuracy is 0.1%. The factory default setting is 3.25 Vrms. If your application uses two resolvers, both operate at the same voltage.

NOTE  The maximum return voltage that can be reliably decoded is 14 Vrms. Exceeding this voltage will not damage the module, but the module will report a transducer fault during parts of the cycle, or the reported position will not be accurate. When using a transducer that has a Transformation Ratio (TR) greater than 1.16, you will have to limit the Reference Voltage setting. A common TR is 1.4. With this TR, limit the Reference Voltage value to 10 Vrms.

Transducer Fault Latch (CH1 and CH2)

Gives you programmable control over whether or not transducer faults are self clearing or latched. Self clearing faults clear themselves as soon as the resolver signals return to valid values. Latched faults must be cleared by the host. The factory default setting is for self clearing faults.

Count Direction (CH1 and CH2)

Gives you programmable control over the direction of rotation needed to produce increasing counts. When you use AMCI transducers that are wired as shown in this manual, the factory default setting is for clockwise increasing counts when looking at the transducer's shaft.

NXAE2 Programmable Parameters (continued)

Single Turn Parameters

These parameter are available when the module is used with single resolver or redundant resolver transducers.

Transformation Ratio (CH1 and CH2)

Programmable over a range of 0.10 to 3.00 with a resolution of 0.01, this parameter allows you to match the gain of the input amplifiers to the transformation ratio of your resolver. The range of values is 10 to 300, with a factory default setting of 95, (0.95 TR).

Full Scale Count

This parameter allows you to set the number of counts reported by the NXAE2 for a full rotation of the resolver. This parameter has a range of 2 to 8,192, with a factory default of 1,024.

Preset Value

The transducer position can be set to any value within the range of 0 to (Full Scale Count – 1). This parameter sets the value the transducer position is set to when the host controller issues the Apply Preset command or when the associated DC input transitions from an inactive to active state. This parameter has a factory default value of zero.

Multi-turn parameters

These parameters are available when the module is used with dual resolver, multi-turn transducers.

Transducer Type

This parameter defines the type of dual resolver transducer attached to the NXAE2. This parameter has five values: 100, 180, 1000, 1800, and 128. The 100, 180, 1000, and 1800 values program the module to interface with AMCI vernier style transducers. The 128 value programs the module to use reduction style transducer such as those available from AVG/Autotech.

Number of Turns

This parameter defines the number of turns the transducer shaft must complete before the position value returns to zero. The acceptable values are dependant on the value of the Transducer Type parameter.

Transducer Type Parameter Setting	Number of Turns Acceptable Values
100	1, 2, 4, 5, 10, 20, 25, 50, 100
180	1, 2, 3, 4, 5, 6, 9, 10, 12, 15,18, 20, 30, 36, 45, 60, 90, 180
1000	10, 20, 40, 50, 100, 200, 250, 500, 1000
1800	10, 20, 30, 40, 50, 60, 90, 100, 120, 150,180, 200, 300, 360, 450, 600, 900, 1800
128	1, 2, 4, 8, 16, 32, 64, 128

Table R1.1 Number of Turns Parameter Settings

Full Scale Count

This parameter allows you to set the number of counts reported by the NXAE2 over the programmed Number of Turns. This parameter has a range of 2 to (4,096 * Number of Turns) for 100, 180, and 128 turn transducers and 2 to (409.6 * Number of Turns) for 1,000 and 1,800 turn transducers. As an example, assume an HTT-20-180 transducer and the programmed Number of Turns is 36. The range of the Full Scale Count Parameter is 2 to 147,456. (4,096*36)

NXAE2 Programmable Parameters (continued)

Multi-turn parameters (continued)

Preset Value

The transducer position can be set to any value within the range of 0 to (Full Scale Count – 1). This parameter sets the value the transducer position is set to when the host controller issues the Apply Preset command or when the associated DC input transitions from an inactive to active state. This parameter has a factory default value of zero.

DC Inputs

Each channel has a DC Input associated with it. Each DC Input accepts 10.5 to 27 Vdc (12 to 24 Vdc nominal). Each input is fully differential, and can be wired as a sinking or sourcing input.

The input is used to preset the position value of the associated channel. Whenever the input makes an inactive-to-active transition, the position will be preset to the programmed Preset Value. The input is considered active when it is conducting current.

The default Preset Value is zero.

Power Connector

Figure R1.2 shows the location of the Power Connector. The mate to this connector is included with the NXAE2. Spares are available from AMCI under the part number MS-4M. They are also available from Phoenix Contact under their part number 187 80 37.

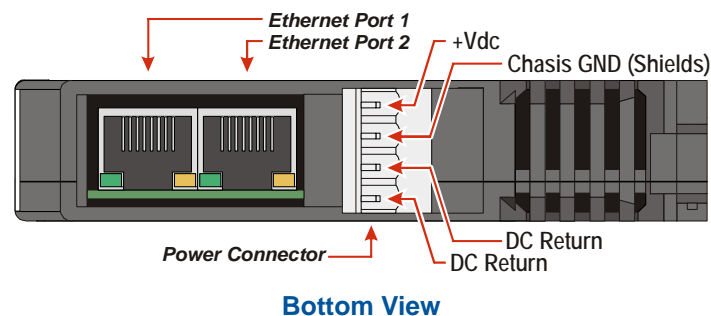


Figure R1.2 Power and Ethernet Connectors

Ethernet Connectors

Figure R1.2 also shows the location of the two Ethernet connections. These two RJ-45 ports are internally connected through a switch. Both ports are used in redundant ring networks. Either can be used in non-redundant networks. In non-redundant networks, the unused port can be used to daisy chain to the next device if this simplifies wiring in your application.

I/O Connector

As shown in figure R1.3, the I/O Connector is located on the top of the module. All resolver connections are made at this connector. Connections to the DC Inputs are also made on this connector. Power connections for the NXAE2 are made through the MS-4M connector on the bottom of the module.

The mate for this connector is included with the NXAE2. Spares are available from AMCI under the part number MS-2X11. They are also available from Phoenix Contact under their part number 173 88 98.

Pins 6 and 7 on the J1 and J2 connectors are internally connected together and are attached to the module’s signal ground. You will not see a signal on these pins when your reference point is any of the GND pins. The NXAE2 measures the signals on pins 5 and 8 of the J1 and J2 connectors to determine the resolver position.

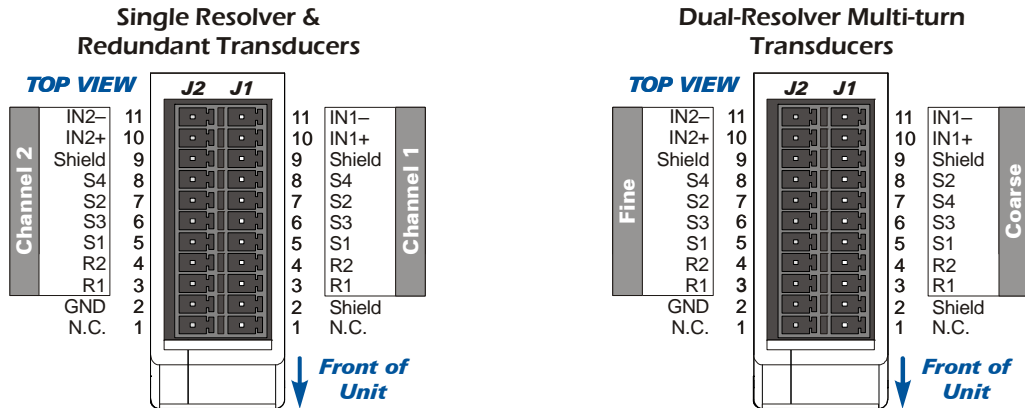


Figure R1.3 I/O Connector

Front Panel

The front panels of three NXAE2 modules are shown in figure R1.4. The front panel has the Status LED’s, which give you information on the state of the module and the resolvers.

CH1 & CH2 Status LEDs

Each resolver channel has a status LED on the front panel.

LED State	Description
Off	The channel has been disabled. Useful when only using one channel of the module.
Solid Red	Module Fault. This state cannot be disabled.
Blinking Red	Non-clearable transducer fault on the channel. This state can be disabled if the channel is not used.
Blinking Green	Latched, clearable transducer fault on the channel. This state can be disabled if the channel is not used.
Solid Green	The channel is not in fault and is reporting position data. This state can be disabled if the channel is not used.

Table R1.2 Transducer Status LED Patterns

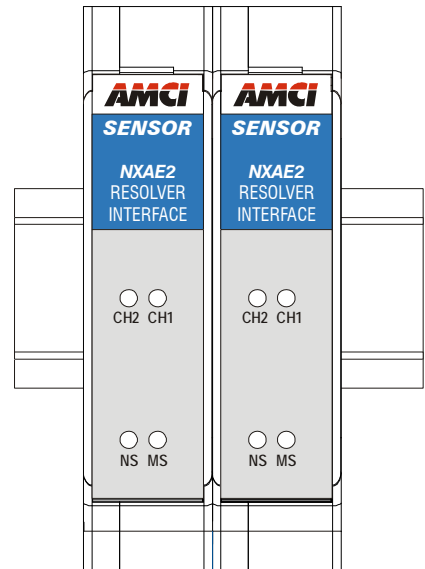


Figure R1.4 NXAE2 Front Panel

Front Panel (continued)**Module Status (MS) LED**

The Module Status LED is a bi-color red/green LED. The state of the LED depends on the state of the network adapter module.

LED State	EtherNet/IP Definition	Modbus TCP Definition	PROFINET Definition
Off	No Power	No Power	No power
Alternating Red/Green	Initializing: Power up Self-Test		
	Communications failure. There is a communications error between the main processor and the ethernet co-processor within the unit. You must cycle power to the NXAE2 to attempt to clear this fault.		
Flashing Green	Initializing: Waiting for valid physical connection to the network.		
Steady Green	Module and Network are operational.		Device Name or IP Address are set.
Flashing Red	Initializing: IP Address conflict		Initializing: Device Name or IP Address are not set.
	If the Network Status LED is also flashing, the IP Address or Network Protocol has been changed. Cycle power to the unit to continue. If the Network Status LED is in any other state, a write to flash memory has failed. Cycle power to the unit to clear this fault.		

Table R1.3 Module Status LED States

Power Up Behavior

- **Blinking Green:** The unit will blink the Module Status LED green during initialization.

Network Status (NS) LED

The Network Status LED is a bi-color red/green LED. The state of the LED depends on the protocol the NXAE2 is configured to for.

LED State	EtherNet/IP Definition	Modbus TCP Definition	PROFINET Definition
Off	No Power	No power or no TCP connections	No power, duplicate IP address, mismatch in Device Name, or no connection to the IO Controller.
Alternating Red/Green	Power up Self-Test	Power up Self-Test	Power up Self-Test
Blinking Green	Ethernet connection, but no CIP connections	Indicates number of connections with 2 second delay between group. The NXAE2 supports up to five concurrent connections.	On-line, Stop state. A connection with the IO Controller is established and it is in its STOP state.
Steady Green	Valid Ethernet network and CIP connections	Not Implemented	On-line, Run state. A connection with the IO Controller is established and it is in its RUN state.
Blinking Red	If the MS LED is steady green: Network Connection Timeout	Not Implemented	Not Implemented
	If the MS LED is blinking red: IP Address or Network Protocol changed: Cycle power		
Steady Red	Duplicate IP address on network.		Not Implemented.

Table R1.4 Network Status LED States

Specifications

Sensor Type

Resolver Transmitters and similar sensors with sine/cosine stator outputs such as variable reluctance transducers.

Number of Input Channels

Two. The NXAE2 can interface with two independent single resolver transducers or one dual resolver transducer.

Number of I/O Words (16 bits each)

10 input words and 10 output words

Physical Dimensions

Width: 0.9 inches max.
 Depth: 4.5 inches max.
 Height: 3.9 inches
 5.0 inches min. with mating connectors

Weight

0.38 lbs. (0.17 kg.) with mating connectors

Current Draw

200 mA without sensors
 400 mA with reference voltage shorted to GND.

Measurement Method

Ratiometric. Compensates for, and eliminates, most sources of error, including phase shift, voltage drift, electrical noise, and temperature changes.

Reference Voltage

Programmable from 0.800 to 12.000 Vac with 1 millivolt resolution. Default of 3.25 Vac
 The maximum permissible return voltage is 14.0 Vrms. When the Transformation Ratio is greater than 1.16, the Reference Voltage must be limited.

Reference Frequency

Programmable from 400 to 10,000 Hz with 1 Hz resolution. Default of 2,500 Hz

Sensor Transformation Ratio

Programmable from 0.10 to 3.00 with a resolution of 0.01. Default of 0.95

Position Resolution

13 bit (8,192) maximum per turn for single resolver transducers.
 12 bit (4,096) maximum per turn for dual resolver multi-turn transducers.

Velocity Update Time

Programmable to 32 or 125 milliseconds

DC Inputs

Electrical Characteristics:
 IN1 and IN2: Both end uncommitted. Can be wired to accept sourcing or sinking sensors.
 Accept 10.5 to 27Vdc without the need for an external current limiting resistor.

Network Interface

10/100baseT. Two switched ports.
 Supports EtherNet/IP, PROFINET, and Modbus TCP. EtherNet/IP-DLR and PROFINET-MRP extensions also supported.

Environmental Specifications

Input Power 24 Vdc \pm 10%, surge to 30Vdc without damage to module.
 Ambient Operating Temperature
 -4° to 122°F (-20° to 50°C)
 Storage Temperature
 -40° to 185°F (-40° to 85°C)
 Humidity 0 to 95%, non-condensing

Status LED

See *Front Panel* starting on page 12.

Connectors

Mating connectors are included with the NXAE2 and are available separately under the following AMCI part numbers.

Connector	AMCI Part #	Wire	Strip Length	Min. Tightening Torque
I/O	MS-2X11	28 - 16 AWG	0.275 inches	Spring Cage Connector
Power	MS-4M	28 - 12 AWG	0.394 inches	4.43lb-in (0.5 Nm)

REFERENCE 2

DATA FORMATS

This reference chapter details the input and output data formats used to communicate with the NXAE2 in single turn and dual resolver, multi-turn applications.

Single Turn Data Formats

These data formats are used when programming the module for use with single resolver, single turn transducers. These formats are also used with single resolver, multi-turn transducers as well as redundant resolver transducers.

Output Data Format

Figure R2.1 below shows the format of the output data when programming the module to operate with one or two single resolver transducers.

Word (0)	Command Word (See Description Below)
Word (1)	Setup Word (See Description Below)
Word (2)	Channel 1: Full Scale Count Range: 2 to 8,192
Word (3)	Channel 1: Preset Value Range: 0 to (Full Scale Count – 1)
Word (4)	Channel 1: Transformation Ratio Range: 10 to 300 (TR= 0.1 to 3.0)
Word (5)	Channel 2: Full Scale Count Range: 2 to 8,192
Word (6)	Channel 2: Preset Value Range: 0 to (Full Scale Count – 1)
Word (7)	Channel 2: Transformation Ratio Range: 10 to 300 (TR= 0.1 to 3.0)
Word (8)	Reference Voltage Range: 800 to 12,000 (0.8 to 12.0 Vrms)
Word (9)	Reference Frequency Range: 400 to 10,000 Hz

Figure R2.1 Single Turn Output Data Format

Single Turn Data Formats (continued)

Command Word 0

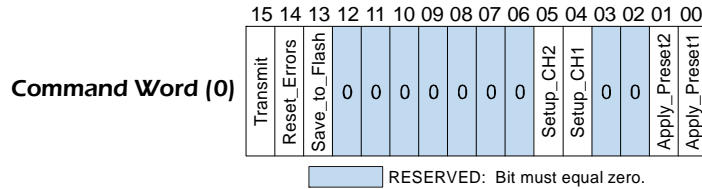


Figure R2.2 Single Turn Command Word Format

- Bit 15: Transmit Bit – Used to control the flow of programming data to the NXAE2. The NXAE2 will not accept new programming data until this bit makes a 0→1 transition. Once this bit is set, it should remain set until the module responds by setting the Acknowledge bit in the Network Input Data. Programming error bits in the input data are valid as long as the Acknowledge bit is set. Resetting the Transmit bit to “0” will reset the Acknowledge bit.
- Bit 14: Reset_Errors – When set to “1”, the module will reset all programming error bits and clear any latched transducer faults that can be cleared.
- Bit 13: Save_to_Flash – When set to “1”, the module saved all parameter values and calculated position offsets to non-volatile flash memory. These values are recalled and used after a power cycle.



The EEPROM used to store parameter values and the position offsets has a minimum write limit of 10,000 writes. If your application requires you to constantly preset the position values and store these values in non-volatile memory, consider offsetting the position in your ladder logic program.

- Bit 05: Setup_CH2 – When set to “1”, the module uses bits 8 through 11 in Setup Word 1, and the values in words 5 through 9 to program channel 2. When this bit is reset to “0”, these bits and words are ignored and the values for channel 2 are not changed. Note that the Reference Voltage and Frequency are programmed if either of the Setup_CH2 or Setup_CH1 bits are set to “1”.
- Bit 04: Setup_CH1 – When set to “1”, the module uses bits 0 through 3 in Setup Word 1, and the values in words 2, 3, 4, 8 and 9 to program channel 1. When this bit is reset to “0”, these bits and words are ignored and the values for channel 1 are not changed. Note that the Reference Voltage and Frequency are programmed if either of the Setup_CH2 or Setup_CH1 bits are set to “1”.
- Bit 01: Apply_Preset2 – When set to “1”, the module sets the CH2 position to the value of the CH2 Preset Value parameter. The CH2 Preset Value has a factory default value of zero. The CH2 Preset Value can be programmed by setting the Setup_CH2 bit (bit 05 of this word) and putting the desired CH2 Preset Value in Word 6. Please note that applying the preset value, and programming the CH2 Preset Value parameter, are two independent processes. They cannot be accomplished together in the same transmit cycle. However, it is possible to apply the preset value and save the calculated offset in flash in one transmit cycle. The offset is saved to flash memory when the Save_to_Flash bit, (bit 13) is set.
- Bit 00: Apply_Preset1 – When set to “1”, the module sets the CH1 position to the value of the CH1 Preset Value parameter. The CH1 Preset Value has a factory default value of zero. The CH1 Preset Value can be programmed by setting the Setup_CH1 bit (bit 04 of this word) and putting the desired CH1 Preset Value in Word 3. Please note that applying the preset value, and programming the CH1 Preset Value parameter, are two independent processes. They cannot be accomplished together in the same transmit cycle. However, it is possible to apply the preset value and save the calculated offset in flash in one transmit cycle. The offset is saved to flash memory when the Save_to_Flash bit, (bit 13) is set.

Single Turn Data Formats (continued)

Setup Word 1

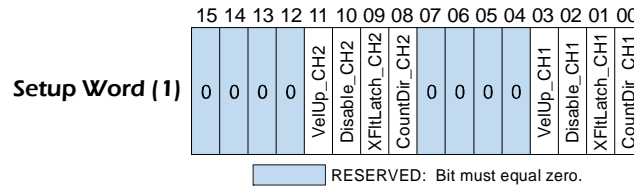


Figure R2.3 Single Turn Setup Word Format

- Bit 11: VelUp_CH2 – This bit is only acted upon when the Setup_CH2 bit, (Word 0: Bit 05), is set to “1”. When set to “1”, the velocity update time for channel 2 is set to 32 milliseconds. When set to “0”, the velocity update time is set to 125 milliseconds. Note that this only affects the update time of the velocity data.
- Bit 10: Disable_CH2 – This bit is only acted upon when the Setup_CH2 bit, (Word 0: Bit 05), is set to “1”. When set to “1”, the module disables channel 2. The channel’s LED on the front panel is disabled and zeros are reported for the channel 2 position and velocity data.
- Bit 09: XFltLatch_CH2 – This bit is only acted upon when the Setup_CH2 bit, (Word 0: Bit 05), is set to “1”. When set to “0”, the transducer fault latch is disabled. Transducer faults will clear themselves as soon as valid signals are detected on the channel 2 inputs. When set to “1”, the transducer fault latch is enabled. Transducer faults are latched, and can be cleared by issuing a programming block with the Reset_Errors bit (Word 0: Bit 14), set to “1”.
- Bit 08: CountDir_CH2 – This bit is only acted upon when the Setup_CH2 bit, (Word 0: Bit 05), is set to “1”. When the transducer is wired to the module as shown in this manual, set this bit to “0” for CW increasing counts when looking at the transducer’s shaft. Set this bit to “1” for CCW increasing counts. Note that count direction can also be switched by reversing the connection of the S2-S4 pair on the transducer input connector.
- Bit 03: VelUp_CH1 – This bit is only acted upon when the Setup_CH1 bit, (Word 0: Bit 04), is set to “1”. When set to “1”, the velocity update time for channel 1 is set to 32 milliseconds. When set to “0”, the velocity update time is set to 125 milliseconds. Note that this only affects the update time of the velocity data.
- Bit 02: Disable_CH1 – This bit is only acted upon when the Setup_CH1 bit, (Word 0: Bit 04), is set to “1”. When set to “1”, the module disables channel 1. The channel’s LED on the front panel is disabled and zeros are reported for the channel 1 position and velocity data.
- Bit 01: XFltLatch_CH1 – This bit is only acted upon when the Setup_CH1 bit, (Word 0: Bit 04), is set to “1”. When set to “0”, the transducer fault latch is disabled. Transducer faults will clear themselves as soon as valid signals are detected on the channel 1 inputs. When set to “1”, the transducer fault latch is enabled. Transducer faults are latched, and can be cleared by issuing a programming block with the Reset_Errors bit (Word 0: Bit 14), set to “1”.
- Bit 00: CountDir_CH1 – This bit is only acted upon when the Setup_CH1 bit, (Word 0: Bit 04), is set to “1”. When the transducer is wired to the module as shown in this manual, set this bit to “0” for CW increasing counts when looking at the transducer’s shaft. Set this bit to “1” for CCW increasing counts. Note that count direction can also be switched by reversing the connection of the S2-S4 pair on the transducer input connector.

Single Turn Data Formats (continued)

Input Data Format

Figure R2.4 below shows the format of the input data when the module is programmed to operate with one or two single resolver transducers.

Word (0)	Module Status (See Description Below)
Word (1)	Channel 1 Status (See Description Below)
Word (2)	Channel 1: Position Value Range: 0 to (Full Scale Count -1)
Word (3)	Channel 1: Velocity (RPM) Range: 0 to speed rating of transducer
Word (4)	Reserved for future use Range: 0
Word (5)	Channel 2 Status (See Description Below)
Word (6)	Channel 2: Position Value Range: 0 to (Full Scale Count -1)
Word (7)	Channel 2: Velocity (RPM) Range: 0 to speed rating of transducer
Word (8)	Reserved for future use Range: 0
Word (9)	Reserved for future use Range: 0

Figure R2.4 Single Turn Input Data Format

Module Status (Word 0)

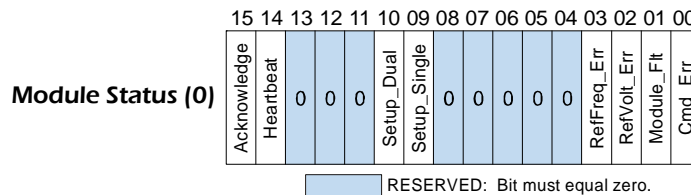


Figure R2.5 Single Turn Module Status Format

- Bit 15: **Acknowledge** – Used to control the flow of programming data to the NXAE2. The NXAE2 sets this bit in response to the Transmit bit being set by the host. Programming error bits in the two status words are only valid while the Acknowledge bit is set. Once this bit is set, it will remain set until your host controller resets the Transmit Bit.
- Bit 14: **Heartbeat_Bit** – This bit will change state approximately every 500 milliseconds. Monitor this bit to verify that the unit and network connection are operating correctly.
- Bit 10: **Setup_Dual** – Set to “1” when the module is programmed to work with dual resolver, multi-turn transducers. Set to “0” when the module is programmed to work with single resolver or redundant transducers.
- Bit 09: **Setup_Single** – Set to “1” when the module is programmed to work with single resolver or redundant transducers. Set to “0” when the module is programmed to work with dual resolver, multi-turn transducers.
- Bit 03: **RefFreq_Err** – Set to “1” when the Reference Frequency parameter is outside its valid range of 400 to 10,000 Hz. The Reference Frequency is programmed with word 9.
- Bit 02: **RefVolt_Err** – Set to “1” when the Reference Voltage parameter is outside its valid range of 800 to 12,000, (0.8 to 12.0 Vrms) The Reference Voltage is programmed with word 8.

Single Turn Data Formats (continued)

Module Status (Word 0) (continued)

- Bit 01: Module_Flt – Set to “1” when the module is experiencing a hardware fault. Cycle power to the module to attempt to clear this error.
- Bit 00: Cmd_Err – Set to “1” under the following conditions:
 - Setting any reserved bits in Command Word 0 or Command Word 1
 - Setting the Apply Preset bit when the Transducer Fault bit for the channel is set
 - Applying the preset and programming setup data in the same programming cycle.

Channel Status (Words 1 & 5)

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
CH1 Status (1)	0	0	0	0	CH1_Input	0	CH1_V@0	CH1_Disabled	0	CH1_TR_Err	0	0	CH1_PresetErr	CH1_FSCErr	CH1_SetupErr	CH1_XducerFit
CH2 Status (5)	0	0	0	0	CH2_Input	0	CH2_V@0	CH2_Disabled	0	CH2_TR_Err	0	0	CH2_PresetErr	CH2_FSCErr	CH2_SetupErr	CH2_XducerFit

RESERVED:
Bit must equal zero.

Figure R2.6 Single Turn Channel Status Format

- Bit 11: Channel(1/2)_Input – This bit is set to “1” when the associated DC input is active. The input is active when it is conducting current. This bit is reset to “0” when the input is inactive. An inactive-to-active transition on the physical input will preset the channel’s position to the channel’s programmed Preset Value. Note that the calculated offset is not stored in flash memory. The offset can be stored by initiating a programming cycle with the Save_to_Flash bit set. See *Command Word 0*, found on page 16, for additional information on the Save_to_Flash bit.
- Bit 09: Channel(1/2)_VelocityAtZero – This bit is set to “1” when the velocity reading of the channel is zero. This bit is reset to “0” if the transducer is rotating or there is a transducer fault. Note that the resolution of the tachometer is 1 RPM. Therefore, this bit will be on when the actual speed is below 0.5 RPM.
- Bit 08: Channel(1/2)_Disabled – This bit is set to “1” when the channel has been disabled. When disabled, the Status LED for the channel on the front panel is off. This bit equals “0” when the channel is enabled.
- Bit 04: Channel(1/2)_TR_Error – This bit is set to “1” when you attempt to program the channel’s Transformation Ratio parameter outside its valid range of 10 to 300 (0.10 to 3.00).
- Bit 03: Channel(1/2)_Preset_Error – This bit is set to “1” when you attempt to program the channel’s Preset Value parameter outside its valid range of 0 to (Full Scale Count – 1).
- Bit 02: Channel(1/2)_FSC_Error – This bit is set to “1” when you attempt to program the channel’s Full Scale Count parameter outside its valid range of 2 to 8,192 counts per turn.
- Bit 01: Channel(1/2)_Setup_Error – This bit is set to “1” when any of the reserved bits in Setup Word 1 are set to “1”. These bits are bits 04 through 07 and 12 through 15.
- Bit 00: Channel(1/2)_Transducer_Fault – This bit is set to “1” when the channel is in its transducer fault state. If the channel’s front panel status LED is blinking green, the fault can be cleared by issuing a programming block with the Reset_Error bit (Output Word 0, bit 14) set to “1”. If the status LED is blinking red, then there is an error in the resolver signals. This can be a wiring issue, or the programmed values for the Reference Voltage, Reference Frequency, or the channel’s Transformation Ratio may not be correct.



If there is an invalid parameter when switching from Multiturn setup to Single turn setup, the NXAE2 will remain in multiturn mode while setting the appropriate single channel status bit in word 1 or 5.

Multi-Turn Data Formats

These data formats are used when programming the module for use with dual resolver, multi-turn transducers.

Output Data Format

Figure R2.7 below shows the format of the output data when programming the module to operate with a dual resolver multi-turn transducer.

Word (0)	Command Word (See Description Below)
Word (1)	Setup Word (See Description Below)
Word (2)	Transducer Type Range: 100, 180, 1000, 1800, 128
Word (3)	Number of Turns Range: (See parameter description below.)
Word (4)	Full Scale Count (32 bit value) Range: (See parameter description below.)
Word (5)	
Word (6)	Preset Value (32 bit value) Range: 0 to (Full Scale Count – 1)
Word (7)	
Word (8)	Reference Voltage Range: 800 to 12,000 (0.8 to 12.0 Vrms)
Word (9)	Reference Frequency Range: 400 to 10,000 Hz

Figure R2.7 Multi-turn Output Data Format

Command Word (Word 0)

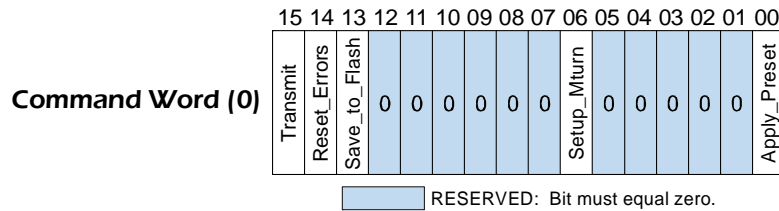


Figure R2.8 Multi-turn Command Word Format

- Bit 15: Transmit Bit – Used to control the flow of programming data to the NXAE2. The NXAE2 will not accept new programming data until this bit makes a 0→1 transition. Once this bit is set, it should remain set until the module responds by setting the Acknowledge bit in the Network Input Data. Programming error bits in the input data are valid as long as the Acknowledge bit is set. Resetting the Transmit bit to “0” will reset the Acknowledge bit.
- Bit 14: Reset_Errors – When set to “1”, the module will reset all programming error bits and clear any latched transducer faults that can be cleared.
- Bit 13: Save_to_Flash – When set to “1”, the module saved all parameter values and calculated position offsets to non-volatile flash memory. These values are recalled and used after a power cycle.



The EEPROM used to store parameter values and the position offsets has a minimum write limit of 10,000 writes. If your application requires you to constantly preset the position values and store these values in non-volatile memory, consider offsetting the position in your ladder logic program.

- Bit 06: Setup_Mturn – When set to “1”, the module uses the remaining words in the block to program the module for use with dual resolver, multi-turn transducers. When this bit is reset to “0”, these words are ignored and the parameter values are not changed.

Multi-Turn Data Formats (continued)

Command Word (Word 0) (continued)

Bit 00: Apply_Preset – When set to “1”, the module sets the position to the value of the Preset Value parameter. The Preset Value has a factory default value of zero. The Preset Value can be programmed by setting the Setup_Mturn bit (bit 06 of this word) and putting the desired Preset Value in Words 6 and 7. Please note that applying the preset value, and programming the Preset Value parameter, are two independent processes. They cannot be accomplished together in the same transmit cycle. However, it is possible to apply the preset value and save the calculated offset in flash in one transmit cycle. The offset is saved to flash memory when the Save_to_Flash bit, (bit 13) is set.

Setup Word (Word 1)

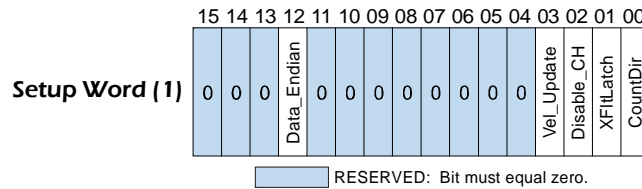


Figure R2.9 Multi-turn Setup Word Format

- Bit 12: Data_Endian – This bit is only acted upon when the Setup_Mturn bit, (Word 0: Bit 06), is set to “1”. Reset to “0” to program and report the 32-bit values in little endian format. Set to “1” to program and report the 32-bit values in big endian format. EtherNet/IP applications should reset this bit to “0”. Modbus and PROFINET applications should start with this bit set to “1”.
- Bit 03: Vel_Update – This bit is only acted upon when the Setup_Mturn bit, (Word 0: Bit 06), is set to “1”. When set to “1”, the velocity update time for the multi-turn channel is set to 32 milliseconds. When set to “0”, the velocity update time is set to 125 milliseconds. Note that this only affects the update time of the velocity data.
- Bit 02: Disable_CH – This bit is only acted upon when the Setup_Mturn bit, (Word 0: Bit 06), is set to “1”. When set to “1”, the module disables the channels. The channels LED’s on the front panel are disabled and zeros are reported for the position and velocity data.
- Bit 01: XFiltLatch – This bit is only acted upon when the Setup_Mturn bit, (Word 0: Bit 06), is set to “1”. When set to “0”, the transducer fault latch is disabled. Transducer faults will clear themselves as soon as valid signals are detected on the resolver inputs. When set to “1”, the transducer fault latch is enabled. Transducer faults are latched, and can be cleared by issuing a programming block with the Reset_Errors bit (Word 0: Bit 14), set to “1”.
- Bit 00: CountDir – This bit is only acted upon when the Setup_Mturn bit, (Word 0: Bit 06), is set to “1”. When the transducer is wired to the module as shown in this manual, set this bit to “0” for CW increasing counts when looking at the transducer’s shaft. Set this bit to “1” for CCW increasing counts. Note that count direction can also be switched by reversing the connection of the CS2-CS4 pair and the FS2-FS4 pair on the transducer input connector.

Multi-Turn Data Formats (continued)

Transducer Type (Word 2)

This parameter sets the type of transducer attached to the module. This parameter is needed so that the module can convert the two resolver positions into a single multi-turn value. The range of this parameter is the discrete values of 100, 180, 1000, 1800, and 128. When set to 100, 180, 1000, or 1800, an AMCI transducer is assumed. When set to 128, an AVG/Autotech transducer is assumed. The table below shows the TR value is used based on transducer type, along with the suggested settings for the Reference Voltage and Reference Frequency settings.

Transducer Type	Fixed TR	Suggested Ref. Voltage Setting	Suggested Ref. Frequency Setting
100	0.95	3.25 Vrms	2500 Hz
180	0.95	3.25 Vrms	2500 Hz
1,000	0.95	3.25 Vrms	2500 Hz
1,800	0.95	3.25 Vrms	2500 Hz
128	1.40	3.25 Vrms	2500 Hz

Table R2.1 Dual Resolver, Multi-turn Transducer Suggested Settings

Number of Turns (Word 3)

This parameter sets the number of turns that the transducer must complete before the position value returns to zero. The range of values for this parameter depends on the setting of the Transducer Type parameter.

Transducer Type	Available Number of Turns
100	1, 2, 4, 5, 10, 20, 25, 50, 100
180	1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, 180
1,000	10, 20, 40, 50, 100, 200, 250, 500, 1000
1,800	10, 20, 30, 40, 50, 60, 90, 100, 120, 150, 180, 200, 300, 360, 450, 600, 900, 1800
128	1, 2, 4, 8, 16, 32, 64, 128

Table R2.2 Available Number of Turns Parameter Values

Full Scale Count (Words 4&5)

This parameter sets the number of counts over the programmed number of turns. This value is programmed as a 32 bit double precision integer. The range of values for this parameter depends on the setting of the Transducer Type parameter.

Transducer Type	Full Scale Count
100	2 to (Number of Turns * 4,096) Maximum value of 409,600
180	2 to (Number of Turns * 4,096) Maximum value of 737,280
1,000	2 to (Number of Turns * 409.6) Maximum value of 409,600
1,800	2 to (Number of Turns * 409.6) Maximum value of 737,280
128	2 to (Number of Turns * 4,096) Maximum value of 524,288

Table R2.3 Available Full Scale Count Parameter Values

Multi-Turn Data Formats (continued)

Input Data Format

Figure R2.10 below shows the format of the input data when the module is programmed to operate with a dual resolver multi-turn transducer.

Word (0)	Module Status (See Description Below)
Word (1)	Channel Status (See Description Below)
Word (2)	Position Value (32 bit value) Range: 0 to (Full Scale Count -1)
Word (3)	
Word (4)	Velocity (RPM) Range: 0 to speed rating of transducer
Word (5)	Reserved for future use Range: 0
Word (6)	Reserved for future use Range: 0
Word (7)	Reserved for future use Range: 0
Word (8)	Reserved for future use Range: 0
Word (9)	Reserved for future use Range: 0

Figure R2.10 Multi-Turn Input Data Format

Module Status (Word 0)



Figure R2.11 Multi-turn Module Status Word Format

- Bit 15: Acknowledge – Used to control the flow of programming data to the NXAE2. The NXAE2 sets this bit in response to the Transmit bit being set by the host. Programming error bits in the Channel Status word is only valid while the Acknowledge bit is set. Once this bit is set, it will remain set until your host controller resets the Transmit Bit.
- Bit 14: Heartbeat_Bit – This bit will change state approximately every 500 milliseconds. Monitor this bit to verify that the unit and network connection are operating correctly.
- Bit 10: Setup_Dual – Set to “1” when the module is programmed to work with dual resolver, multi-turn transducers. Set to “0” if the module is programmed to work with single resolver or redundant transducers.
- Bit 09: Setup_Single – Set to “1” when the module is programmed to work with single resolver or redundant transducers. Set to “0” if the module is programmed to work with dual resolver, multi-turn transducers.
- Bit 03: RefFreq_Err – Set to “1” when the Reference Frequency parameter is outside its valid range of 400 to 10,000 Hz. The Reference Frequency is programmed with word 9.
- Bit 02: RefVolt_Err – Set to “1” when the Reference Voltage parameter is outside its valid range of 800 to 12,000, (0.8 to 12.0 Vrms) The Reference Voltage is programmed with word 8.
- Bit 01: Module_Flt – Set to “1” when the module is experiencing a hardware fault. Cycle power to the module to attempt to clear this error.

Multi-Turn Data Formats (continued)

Module Status (Word 0) (continued)

Bit 00: Cmd_Err – Set to “1” under the following conditions:

- Setting any reserved bits in the Command Word or the Setup Word
- Setting the Apply Preset bit when the Transducer Fault bit for the channel is set
- Applying the preset and programming setup data in the same programming cycle.

Channel Status (Word 1)

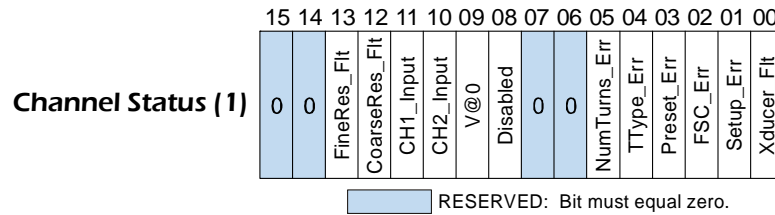


Figure R2.12 Multi-turn Channel Status Word Format

- Bit 13: Fine_Resolver_Fault – This bit is set to “1” when the fine resolver is in a transducer fault state. If the CH2 front panel status LED is blinking green, the fault can be cleared by issuing a programming block with the Reset_Error bit (Output Word 0, bit 14) set to “1”. If the status LED is blinking red, then there is an error in the resolver signals. This can be a wiring issue, or the programmed values for the Reference Voltage, Reference Frequency, or the channel’s Transformation Ratio may not be correct for the sensor.
- Bit 12: Coarse_Resolver_Fault – This bit is set to “1” when the coarse resolver is in a transducer fault state. If the CH1 front panel status LED is blinking green, the fault can be cleared by issuing a programming block with the Reset_Error bit (Output Word 0, bit 14) set to “1”. If the status LED is blinking red, then there is an error in the resolver signals. This can be a wiring issue, or the programmed values for the Reference Voltage, Reference Frequency, or the channel’s Transformation Ratio may not be correct for the sensor.
- Bit 11: CH1_Input – This bit is set to “1” when the Channel 1 DC input is active. The input is active when it is conducting current. This bit is reset to “0” when the input is inactive. An inactive-to-active transition on the physical input will preset the channel’s position to the channel’s programmed Preset Value. Note that the calculated offset is not stored in flash memory. The offset can be stored by initiating a programming cycle with the Save_to_Flash bit set. See *Command Word (Word 0)*, found on page 20, for additional information on the Save_to_Flash bit.
- Bit 10: CH2_Input – This bit is set to “1” when the Channel 2 DC input is active. The input is active when it is conducting current. This bit is reset to “0” when the input is inactive.
- Bit 09: VelocityAtZero – This bit is set to “1” when the velocity reading of the channel is zero. This bit is reset to “0” if the transducer is rotating or there is a transducer fault. Note that the resolution of the tachometer is 1 RPM. Therefore, the tachometer will read zero, and this bit will be on, when the actual speed is below 0.5 RPM.
- Bit 08: Disabled – This bit is set to “1” when the channel has been programmatically disabled. When disabled, the Status LED’s on the front panel are off. This bit equals “0” when the channel is enabled.
- Bit 05: Number_of_Turns_Error – This bit is set to “1” when you attempt to program the channel’s Number of Turns parameter outside of the value sets defined in table R2.2, *Available Number of Turns Parameter Values*, found on page 22.
- Bit 04: TType_Error – This bit is set to “1” when you attempt to program the channel’s Transducer Type parameter outside of the value set of {100, 180, 1000, 1800, 128}.

Multi-Turn Data Formats (continued)**Channel Status (Word 1) (continued)**

- Bit 03: Preset_Error – This bit is set to “1” when you attempt to program the channel’s Preset Value parameter outside its valid range of 0 to (Full Scale Count – 1).
- Bit 02: FSC_Error – This bit is set to “1” when you attempt to program the channel’s Full Scale Count parameter outside its valid range. The range is based on the programmed Number of Turns parameter. The range is 2 to (Number of Turns * 4,096) for 100, 180, and 128 turn transducers. The range is 2 to (Number of Turns * 409.6) for 1,000 and 1,800 turn transducers.
- Bit 01: Setup_Error – This bit is set to “1” when any of the reserved bits are set to “1” or an invalid combination of bits exists.
- Bit 00: Transducer_Fault – This bit is set to “1” when either or both of the resolvers in the transducer are in a faulted state. See the description of bits 14 and 13 above.

NOTE 

If there is an invalid parameter when switching from Single turn setup to Multi-turn setup, the NXAE2 will remain in single turn mode while setting the appropriate single channel status bit in word 1 or 5.

Notes

CONFIGURING NETWORK INTERFACES

This section lists suggestions for configuring the network interfaces on your computer or laptop before attaching to the NXAE2.

Firewall Settings

Firewalls are hardware devices or software that prevent unwanted network connections from occurring. Firewall software has been present on Windows based computers since XP, and it may prevent your computer from communicating with the NXAE2. The internal webserver uses port 80, which is the default http port, and should work without changing any firewall settings. Configuring your firewall to allow communication with the NXAE2 is beyond the scope of this manual.


Disable All Unused Network Interfaces

Routing and default gateway setting on your computer might prevent connection to the NXAE2. When using the Net Configurator utility, broadcast packets that are used to find the NXAE2 often go out the wrong port. The easiest way to avoid this problem is to temporarily disable all network interfaces that are not attached to the NXAE2.

This includes all wireless interfaces as well as all Bluetooth interfaces.

Configure Your Network Interface

Before you can communicate with the NXAE2, your network interface must be on the same subnet as the encoder.

NOTE  The rest of this procedure assumes you are using the 192.168.0.xxx subnet. If you are not, you will have to adjust the given network addresses accordingly.

The easiest way to check the current settings for your NIC is with the 'ipconfig' command.

- For Windows 7, click on the [Start] button, and type "cmd" in the "Search programs and files" text box. Press [Enter] on the keyboard.
- For Windows 8 and 10, press the [Win+X] keys and select "Command Prompt" from the resulting popup. There is no need to run the command prompt as the administrator, so do not select "Command Prompt (Admin)".

Configure Your Network Interface (continued)

A DOS like terminal will open. Type in ‘ipconfig’, press [Enter] on the keyboard and the computer will return the present Address, Subnet Mask, and Default Gateway for all of your network interfaces. If your present address is 192.168.0.xxx, where ‘xxx’ does not equal 50, and your subnet mask is 255.255.255.0, then you are ready to configure your NXAE2 module. Figure R3.1 shows the output of an ipconfig command that shows the “Local Area Connection 2” interface on the 192.168.0.xxx subnet.

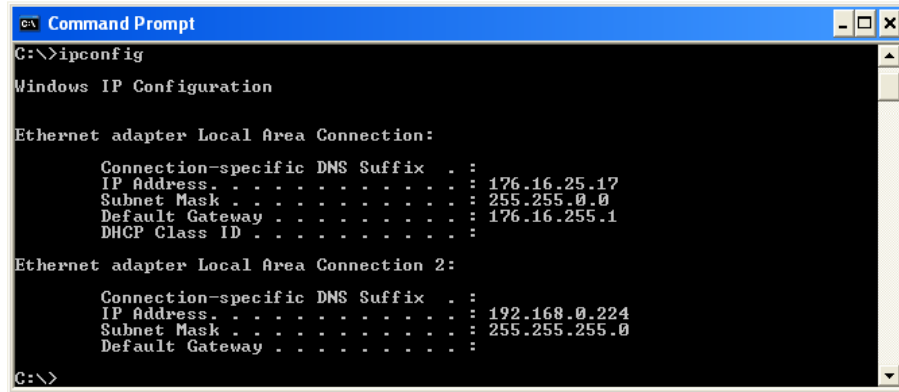


Figure R3.1 ipconfig Command

If your present address is not in the 192.168.0.xxx range, type in ‘ncpa.cpl’ at the command prompt and hit [Enter] on the keyboard.

- For Windows 7, this open the *Network Connections* window. Double click on the appropriate interface. In the window that opens, select “Internet Protocol Version 4 (TCP/IP v4)” from the list and then click on the [Properties] button.
- For Windows 8 and 10, this open the *Network Connections* window. Double click on the appropriate interface. In the window that opens, select “Internet Protocol Version 4 (TCP/IP v4)” from the list and then click on the [Properties] button.

Set the address and subnet mask to appropriate values. (192.168.0.1 and 255.255.255.0 will work for an NXAE2 that has factory default settings.) The default gateway and DNS server settings can be ignored.

Test Your Network Interface

Going back to the terminal you opened in the last step, type in ‘ping aaa.bbb.ccc.ddd’ where ‘aaa.bbb.ccc.ddd’ in the IP address of the NXAE2. The computer will ping the unit and the message “Reply from aaa.bbb.ccc.ddd: bytes=32 time<10ms TTL=128” should appear four times.

If the message “Request timed out.” or “Destination host unreachable” appears, then one of four things has occurred:

- You set a new IP address, but have not yet cycled power to the NXAE2
- You did not enter the correct address in the ping command.
- The IP address of the NXAE2 is not set correctly.
- The NXAE2 and the computer are not on the same subnet.

TASK 1

INSTALLING THE NXAE2

This chapter covers the physical installation of the NXAE2.

1.1 Safe Handling Guidelines

1.1.1 Prevent Electrostatic Damage



CAUTION

Electrostatic discharge can damage the NXAE2 if you touch connector pins. Follow these guidelines when handling the module.

- 1) Touch a grounded object to discharge static potential before handling the module.
- 2) Work in a static-safe environment whenever possible.
- 3) Wear an approved wrist-strap grounding device.
- 4) Do not touch the pins of the rear, I/O, or Ethernet connectors.
- 5) Do not disassemble the module
- 6) Store the module in its anti-static bag and shipping box when it is not in use.

1.1.2 Prevent Debris From Entering the Module



WARNING

During DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, tapping liquids, etc.) is prevented from falling into the module. Debris may cause damage to the module or unintended machine operation with possible personal injury. The DIN rail for the modules should be securely installed and grounded before the modules are mounted on it.

1.1.3 Remove Power Before Servicing



WARNING

Remove power before removing or installing the NXAE2 module.

1.2 Mounting

1.2.1 DIN Rail Installation

NXAE2 modules can be mounted on following DIN Rail

- EN 05 022 - 35 x 7.5 (35 x 7.5 mm)
- EN 05 022 - 35 x 15 (35 x 15 mm)

The DIN Rail must be securely mounted to a panel and solidly grounded before the modules are installed. Grounding is usually accomplished through the mounting hardware, by first removing any paint or other material from all surfaces that may interfere with proper grounding. Another option is to install a heavy gauge wire from the DIN rail to your system's ground bus.

When installing the 7.5mm deep DIN rail there is a 0.40 inch clearance for bolt heads between the rail and the NXAE2 module. When installing a module on 15mm deep rail, the clearance is 0.70 inches.

1.2 Mounting (continued)

1.2.2 Dimensions

Figure T1.1 shows the dimensions of the NXAE2 module. The NXAE2 module is a low power module that does not require any additional spacing when mounting the unit.

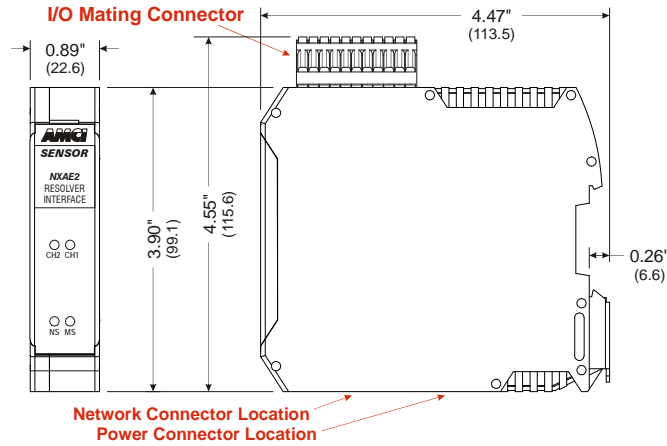


Figure T1.1 NXAE2 Outline

NOTE You will need to ground the resolver cable shields at the module. There are three pins on the I/O Mating Connector to ground the shields, but you have the option to ground them on the DIN rail.

1.2.3 Mounting the NXAE2 Module

Mounting the NXAE2 on a DIN rail is a very simple process thanks to the design of the enclosure.

- 1) Partially engage the connector into the enclosure.
- 2) Engage the top clip in the enclosure with the top of the DIN rail and rotate the module down until the metal bracket snaps on to the DIN Rail.

Once all of your modules are installed, it is strongly suggested to use the end caps from Phoenix Contact with the part number of 271 37 80 to secure the modules on the DIN Rail. These end caps prevent the module from sliding along the DIN rail if it is subjected to shock or vibration during machine operation.

1.3 Power Wiring

The NXAE2 accepts 24 Vdc as its input power. Maximum current draw is 400 mA when the reference voltage is shorted to ground. Minimum wire gauge for the connector is 24 AWG. As shown in the figure below, the power connector is located on the bottom of the module. The mating connector is included with the NXAE2. Spares are available from AMCI under the part number MS-4N. They are also available from Phoenix Contact under their part number 187 80 37.

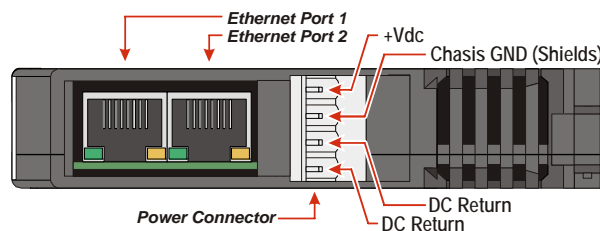


Figure T1.2 Power Connector Location

Power connections should be tight, as loose connections may lead to arcing which will heat the connector. Phoenix Contact specifies a tightening torque of 4.4 to 5.4 lb-in (0.5 to 0.6 Nm).

The power supply is connected to the pins marked “+Vdc In” and “DC Return”. The “Chassis GND” pin is used to attach the NXAE2 to earth ground.

1.4 Network Connections

As shown in figure T1.2 above, the NXAE2 modules have two Ethernet ports with a built-in Ethernet switch connecting the two. In non-redundant applications, either port can be used to attach the module to the network. The remaining port can be used to extend the network to another device if this would reduce wiring costs.

1.4.1 EtherNet/IP DLR Applications

In Device Level Ring applications, the NXAE2 modules function as Beacon-Based Ring Nodes. In these applications, both ports are used when wiring the ring, daisy chaining from one unit in the ring to the next.

1.4.2 PROFINET MRP Applications

In Media Redundancy Protocol applications, the NXAE2 modules function as a Media Redundancy Client (MRC). In these applications, both ports are used when wiring the ring, daisy chaining from one unit in the ring to the next.

1.5 I/O Connector Pinout

The I/O Connector is located on the top of the module. The mate for this connector is included with the NXAE2. Spares are available from AMCI under the part number MS-2X11 and are also available from Phoenix Contact under their part number 173 88 98. Figure T1.3 shows the pin out for the I/O connector.

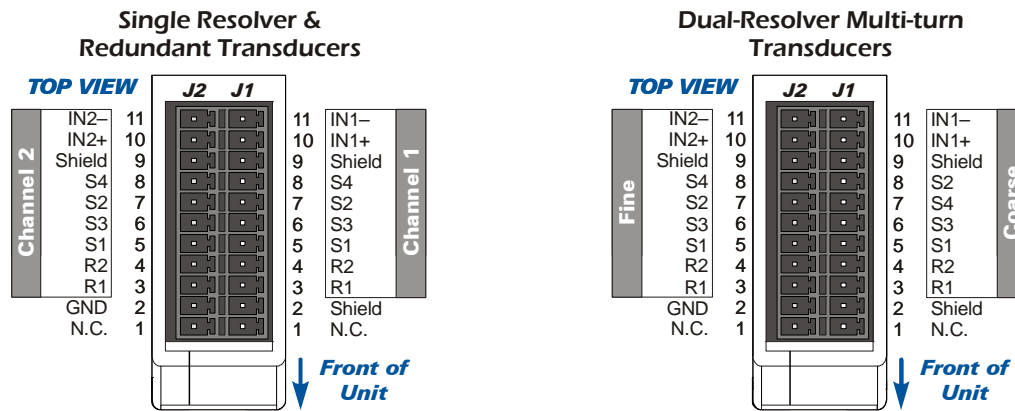


Figure T1.3 I/O Connector

NOTE

- 1) When using the NXAE2 with a dual resolver multi-turn transducer, the coarse resolver must be wired to channel 1 and the fine resolver must be wired to channel 2.
- 2) Pins 6 and 7 of the J1 and J2 connectors are internally connected together and attached to the module's signal ground. You will not see a signal on these pins when your reference point is any GND pin. The NXAE2 measures the signals on pins 5 and 8 of the J1 and J2 connectors to determine the resolver position.

1.6 AMCI Transducers

1.6.1 Transducer Outline Drawings

Because it is programmable, the NXAE2 is compatible with every single and dual resolver transducers manufactured by AMCI as well as our R11 and R15 resolver transmitters. Outline drawings and specification sheets are available on our website, www.amci.com/resolvers.asp.

1.6 AMCI Transducers (continued)

1.6.2 Mounting

All AMCI resolver transducers are designed for industrial environments and therefore require little attention. The resolver is electrically isolated from the body of the transducer to eliminate the potential for ground loops and ground shifts in the system. The main guideline to follow when mounting the transducers is to limit bearing loads when coupling the transducer to your machine. This includes using flexible couplers when directly coupling shafts to eliminate shaft misalignments.

The following bearing load ratings are known as “L₁₀ ratings” in the bearing trade associations. L₁₀ is a statistical rating meaning that 90% of the bearings will survive the specified number of revolutions. AMCI specifies our rated number of revolutions as 2X10⁹, or 2 billion, which is a number commonly used in the industry. By specifying the maximum load and statical life, AMCI gives you data you need to choose the right transducer for your application.

Note that these load ratings are maximums, and you should always strive to keep shaft loading to a minimum. The inverse relationship between shaft loading and bearing life is not linear, it's exponential.

$$\left[\frac{1}{x}\right]^3 \text{ where } x = \frac{\text{new shaft load}}{\text{old shaft load}} \Rightarrow \left[\frac{\text{old shaft load}}{\text{new shaft load}}\right]^3$$

This means that decreasing the shaft loading by half will, statically, increase the bearing life by a factor of eight. For example, decreasing a shaft load from 100 lbs. to 50 lbs. yields: $[100/50]^3 = 8$ times increase in statistical bearing life.

At the loads specified below, bearing life is a minimum of 2x10⁹ revolutions. Note that the R11 series and HT-6 transducers always require a flexible coupler to your machine because of their shaft size.

Shaft Dia.	Maximum Radial Load	Maximum Axial Load
R11 Series		
0.120"	2.0 lbs. (8.9N)	1.0 lb. (4.4N)
0.188"	6.0 lbs. (26.7N)	3.0 lbs. (13.3N)
HT-6		
0.188"	6.0 lbs. (26.7N)	3.0 lbs. (13.3N)
H25 Series		
0.250"	40 lbs. (178N)	20 lbs. (89N)
10 mm	40 lbs. (178N)	20 lbs. (89N)
0.375"	40 lbs. (178N)	20 lbs. (89N)
0.625"	100 lbs. (445N)	50 lbs. (222N)
HT Series		
0.375"	100 lbs. (445N)	50 lbs. (222N)
0.625"	100 lbs. (445N)	50 lbs. (222N)
HTT Series		
0.375"	100 lbs. (445N)	50 lbs. (222N)
0.625"	100 lbs. (445N)	50 lbs. (222N)

Table T1.1 Shaft Load Specifications

1.7 Foreign Transducers

The wide range of programmable parameters in the NXAE2 makes it compatible with resolver transmitters and other sine/cosine output sensors such as variable reluctance transducers. You will have to obtain specifications for these units from their manufacturer, including mounting, wiring, and electrical characteristics.

NOTE Regardless of the type of cable suggested by the transducer manufacturer, AMCI strongly recommends Belden 9873, 9730, and 9731 or exact equivalents as cables for your transducer. With tens of thousands of installations worldwide, AMCI is confident in the quality of these cables. If you wish to use a different cable, contact AMCI to verify your cable type.

1.8 Transducer Wiring

NOTE In the United States, the National Electrical Code cable type used for the transducer cable is CM (Communications, General Purpose cable). Therefore the installation of the cable falls under Article 800 of the National Electrical Code unless your local code or company policy is more restrictive.

1.8.1 Single Resolver Transducers

The following diagram shows how to wire a standard AMCI single resolver transducer to channel 1 of the NXAE2. Wiring to channel 2 is identical except for the shield connection. Shield connections can only be made on

- the J1-2, J1-9, or J2-9 pins of the MS-2X11
- the Earth Ground pin of the power connector
- the same point that the NXAE2 is attached to your ground bus.

CAUTION “GND” in the following diagrams reference *signal ground*, not *chassis ground*. Connecting shield wires to these pins may result in electrical noise being injected into the transducer circuit that may cause faulting readings with the potential for improper machine operation.

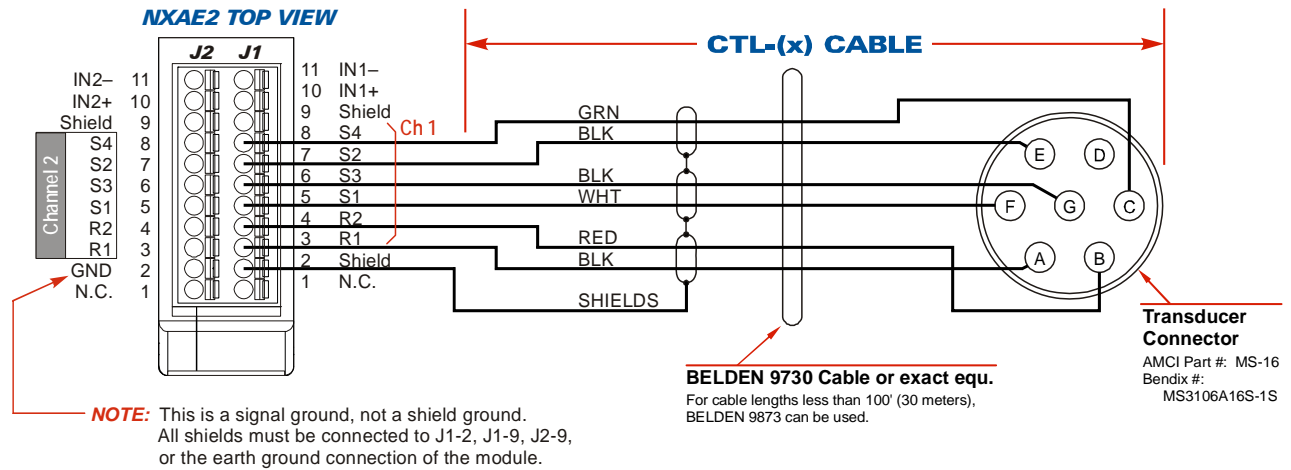


Figure T1.4 AMCI CTL Cable Wiring

Figure T1.4 shows connections to AMCI transducers that use our standard MS-16 connector. For units that do not use the MS-16 connector, refer to the transducer’s specification sheet for connection information. Specifications sheets can be found on our website at:

- <https://www.amci.com/industrial-automation-support/user-manuals/>

When connecting a transducer from another manufacturer, use the R1-R2, S1-S4, designations to determine how to correctly attach the transducer to the NXAE2.

1.8 Transducer Wiring (continued)

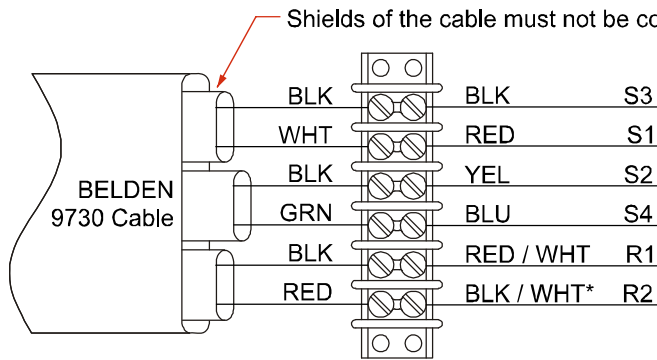
1.8.1 Single Resolver Transducers (continued)

NOTE 

- 1) There are two ways to reverse the count direction when using single resolver transducers. One method is to set the Count Direction parameter when programming the NXAE2. The other method is to reverse the connections on one of the stator pairs. AMCI standard method is to reverse the S2-S4 pair, which is the green/black pair of the CTL cables.
- 2) When using a foreign single resolver transducer, note how the signals are paired in the AMCI CTL cable and use this pairing when generating your wiring diagrams.
- 3) The cable shields must be isolated from earth ground at the transducer to prevent ground loops and ground shifts. If using a junction box, treat the cable shields as a signal carrying conductor at the junction. Do not tie the shields to earth ground at the junction box.
- 4) The cable shields must be isolated from earth ground at the transducer to prevent ground loops and ground shifts. When using a foreign transducer, do not attach the shields to a transducer pin, even if this follows the standard of your transducer's manufacturer.

1.8.2 Size 11 and Size 15 Resolvers

Figure T1.5 shows the connections required to attach a resolver with industry standard wire colors to a Belden 9730 cable. If these connections are followed, you can refer to figure T1.4 on page 33 for connections from the Belden cable to the NXAE2.



Shields of the cable must not be connected to chassis ground except at the module. Strip the shields back to inside the cable.

*A yellow wire with a white tracer is sometimes used instead of a black wire with a white tracer. All AMCI resolvers use a black/white wire.

Figure T1.5 Resolver to Cable Connections

1.8 Transducer Wiring (continued)

1.8.3 AMCI Dual Resolver Multi-turn Transducers

The following diagram shows how to wire a standard AMCI dual resolver transducer to the NXAE2. Shield connections can only be made on

- the J1-2, J1-9, or J2-9 pins of the MS-2X11
- the Earth Ground pin of the power connector
- the same point that the NXAE2 is attached to your ground bus.



“GND” in the following diagrams reference *signal ground*, not *chassis ground*. Connecting shield wires to these pins may result in electrical noise being injected into the transducer circuit that may cause faulting readings with the potential for improper machine operation.

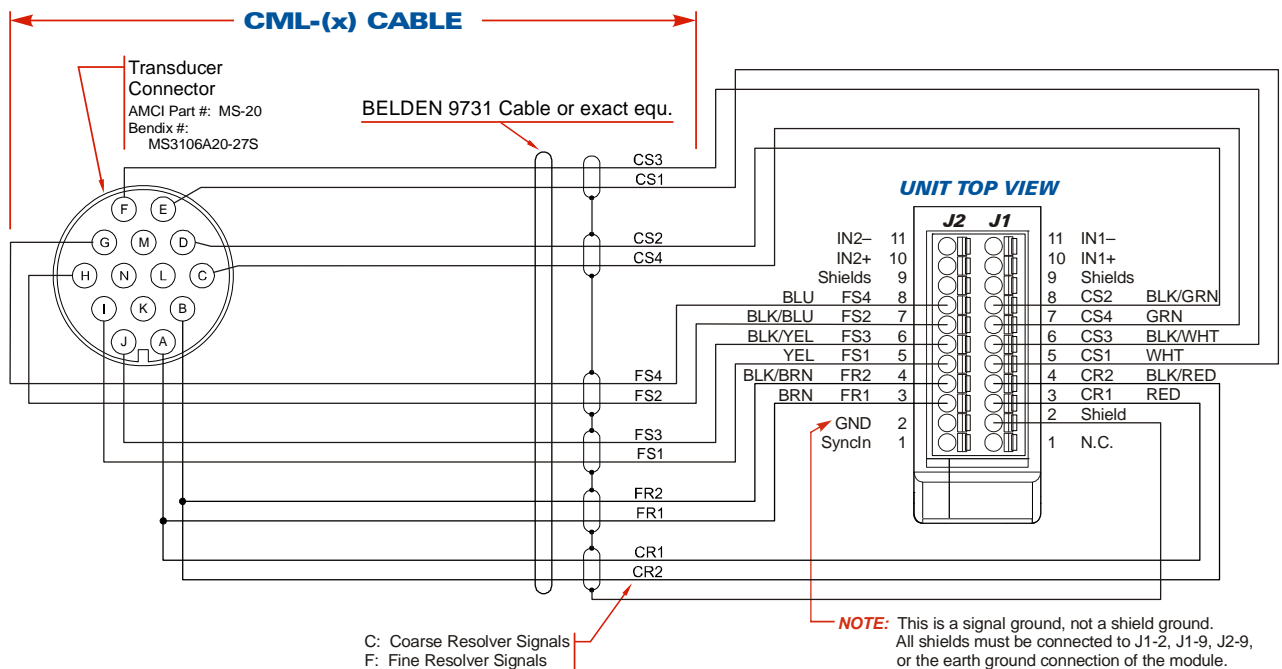


Figure T1.6 AMCI CML Cable Wiring



- 1) There are two ways to reverse the count direction when using a dual resolver transducer. One method is to set the Count Direction parameter when programming the NXAE2. The other method is to reverse connections on two of the stator pairs. These two pairs are the CS2-CS4 pair, which is the green/black pair, and the FS2-FS4 pair, which is the blue/black pair. The green CS4 wire goes into the CS2 terminal of the NXAE2 while the black CS2 wire goes into the CS4 terminal. The blue FS4 wire goes into the FS2 terminal of the NXAE2 while the black FS2 wire goes into the FS4 terminal.
- 2) When using a foreign dual resolver multi-turn transducer, note how the signals are paired in the AMCI CML cable and use this pairing when generating your wiring diagrams.
- 3) The cable shields must be isolated from earth ground at the transducer to prevent ground loops and ground shifts. If using a junction box, treat the cable shields as a signal carrying conductor at the junction. Do not tie the shields to earth ground at the junction box.
- 4) The cable shields must be isolated from earth ground at the transducer to prevent ground loops and ground shifts. When using a foreign transducer, do not attach the shields to a transducer pin, even if this follows the standard of your transducer’s manufacturer.

1.8 Transducer Wiring (continued)

1.8.4 Foreign Dual Resolver Transducers

Trial and error may be involved when connecting a foreign dual resolver transducer to an NXAE2 module for the first time. This is because the resolvers must appear to be rotating in the same direction before the NXAE2 can decode the multi-turn position correctly. The direction of rotation of the coarse resolver depends on the number of gear train stages between this resolver and the input shaft. Because of this, part of the commissioning procedure when using a foreign dual resolver transducer is to verify the direction of rotation of both resolvers and changing wire connections as needed. It is possible to temporarily program the NXAE2 as a two channel single turn module. This allows you to see the position of the two resolvers independently so you can verify rotation direction.

In order to ease the installation of Autotech RL210 transducers, the following table can be used to wire one of these transducers to an NXAE2.

Function	RL210 Connections		NXAE2 Pin
	Terminal	MS Connector	
Coarse/Fine R1	1	A	J1-3
Coarse/Fine R2	2	B	J1-4
Coarse S1	3	C	J1-5
Coarse S3	5	E	J1-6
Coarse S2	4	D	J1-7
Coarse S4	6	F	J1-8
Fine S1	7	H	J2-5
Fine S3	9	L	J2-6
Fine S2	8	K	J2-7
Fine S4	10	M	J2-8
Shields	Do not connect at transducer to avoid ground loops and shifts		J1-2

Table T1.1 RL210 Connections to NXAE2

1.8.5 Avoiding Ground Loops and Ground Shifts

A ground loop or ground shift can occur when the shields of a cable are attached to earth ground in two places. A ground loop occurs when the shield can act as a second return path for power currents. A ground shift occurs when the two places the shield is grounded at are at two different voltage potentials. (The likelihood of a ground shift increases as the cable length increases.) In either case, the shield acts as a low impedance path between the two points which results in a constant current flowing through the shield. To avoid these problems, the cable shields must not be grounded in two places.

- If the shields of the transducer cable are isolated from the body of the transducer, which is the AMCI standard practice, connect the shields of the transducer cable to the shields of the extension cable and ground the shields at the NXAE2. Treat the shields of the transducer cable as a signal carrying conductors at all junctions and do not connect them to earth ground at any other point. This is the proper method to wire all transducers attached to the NXAE2.
- If the shields of the transducer cable are connected to the body of the transducer through an integral cable but the body of the transducer is isolated from chassis ground by its mounting, connect the shields of the transducer cable to the shields of the extension cable and ground the shields at the NXAE2. Treat the shields of the transducer cable as a signal carrying conductors and do not connect them to earth ground at any other point.

1.8 Transducer Wiring (continued)

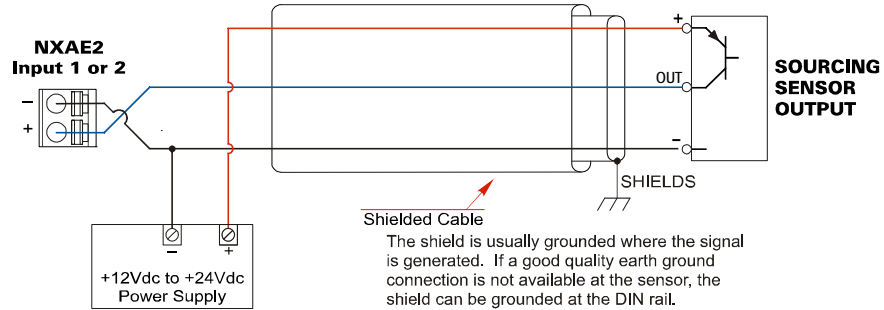
1.8.5 Avoiding Ground Loops and Ground Shifts (continued)

- If the shields of the transducer cable are connected to the body of the transducer through an integral cable and the body of the transducer is connected to earth ground by its mounting, **Do Not** connect the shields of the transducer cable to the shields of the extension cable. The shields of the transducer cable are grounded by the transducer body. Connect the shields of the extension cable to earth ground at the NXAE2. The splice between the transducer and extension cables must be made in a grounded junction box. You are strongly advised to strip back the cable shields only as far as necessary to make the splice and keep the wires as short as possible to minimize the possibility of injecting noise into the cable at the splice.

1.9 DC Input Wiring

Inputs 1 and 2 are differential inputs that can be wired to accept sourcing or sinking sensors. They accept 10.5 to 27 Vdc without the need for an external current limiting resistor. Figure T1.7 below shows how to wire discrete DC sourcing and sinking sensors to inputs 1 and 2 of the NXAE2.

NXAE2 Connection to Sourcing Sensor Output



NXAE2 Connection to Sinking Sensor Output

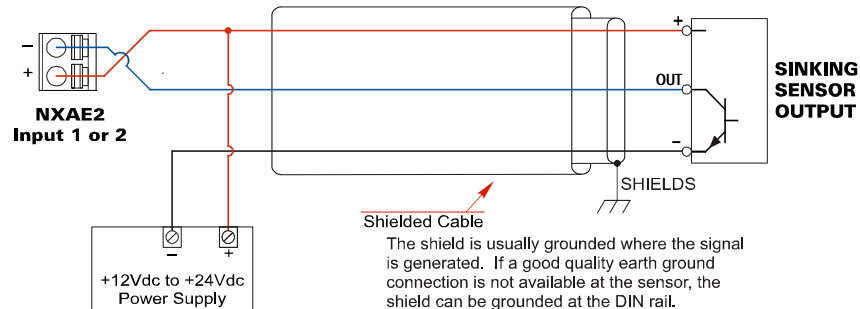


Figure T1.7 Input Wiring

1.9.1 Cable Shields

Because they are low power signals, cabling from the sensor to the NXAE2 should be done using a twisted pair cable with an overall shield. The shield should be grounded at the end when the signal is generated, which is the sensor end. If this is not practical, the shield should be grounded to the same ground bus as the NXAE2.

Notes

TASK 2

SET THE IP ADDRESS AND PROTOCOL

This section is intended for the engineer or technician responsible for setting the IP address of an AMCI NXAE2.

2.1 Determine the Best Method for Setting the IP Address

There are three methods for setting the IP address on an NXAE2. Table T2.1 below outlines the available methods and when you can use them.

Method	Restrictions	Section
<i>Use Factory Default Settings</i>	1) The machine must use 192.168.0.xxx subnet. 2) The 192.168.0.50 address must be available.	2.2a
<i>Use the Embedded Web Server</i>	No restrictions on use. This is the preferred method. The internal webserver can be used to set the NXAE2 to any IPv4 address. The IP address and protocol will be stored in nonvolatile memory and used on subsequent power-ups.	2.2b
<i>Use the AMCI NET Configurator Utility</i>	No restrictions on use. The software can be used to set the NXAE2 to any IPv4 address. The IP address and protocol choice will be stored in nonvolatile memory and used on subsequent power-ups. The software utility can also be used to program the NXAE2 and monitor data from it.	2.2c

Table T2.1 Methods for Setting the IP Address



There is a MAC address label on each NXAE2 which has a writable surface. There is room on the label for writing the programmed IP address of the unit. It is a best practice to use this label to document the IP address of the unit in case it is ever repurposed.



In order to conform to the ODVA specification for EtherNet/IP, the NXAE2 also supports the DHCP protocol. You will need an EtherNet/IP DHCP server, such as the one available from Rockwell Automation, in order to use this protocol. It is supported, but AMCI encourages you to use the embedded web server if your company policy prevents you from installing third-party software, such as the AMCI NET Configurator.

2.2a Use Factory Default Settings

The factory default address for the NXAE2 is 192.168.0.50 with a subnet mask of 255.255.255.0. The easiest way to verify this address is with the ping command as described in the section *Configure Your Network Interface* which starts on page 27.

If the module does not respond to this address then it may take some effort to determine the correct address. There is a label on the unit that lists the MAC address of the device. There is space on the label for noting the IP address of the device if it is changed. If the address was not documented, a program called Wireshark (<https://www.wireshark.org/>) can be used to determine the address of the unit.

Task Complete

2.2b Use the Embedded Web Server

PREREQUISITE: You must know the present IP address of the NXAE2. The factory default address is 192.168.0.50.

PREREQUISITE: Task 1.3: *Power Wiring*, found on page 30. You must be able to power the NXAE2.

PREREQUISITE: Task 1.4 *Network Connections*, found on page 31. You must attach your NXAE2 to your computer.

PREREQUISITE: Reference 3: *Configuring Network Interfaces*, which starts on page 27. The network interfaces on your computer must be on the same subnet before you can communicate with an NXAE2.

2.2b.1 Disconnect the NXAE2 from the host controller and cycle power to the NXAE2.

This ensures that the unit does not have any open connections to the host controller.

2.2b.2 Start your web browser and connect to the NXAE2

The internal HTML pages should work with any browser. Once your web browser is running, enter the present IP address of the NXAE2 into the address bar. The default address is 192.168.0.50. The unit will respond with the following page. Note that the Firmware Version number may be different.

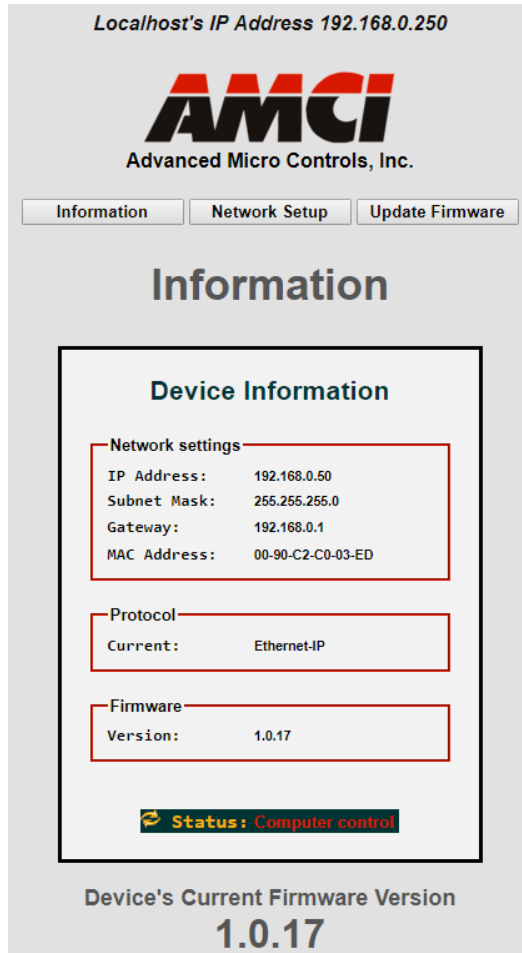


Figure T2.1 NXAE2 Information Webpage

2.2b Use the Embedded Web Server (continued)

2.2b.3 Network Setup Page

- 1) Click on the [Network Setup] button to switch to the Network Setup page shown below. This page shows the current IP address settings, as well as the configured protocol.

Localhost's IP Address 192.168.0.250

AMCI
Advanced Micro Controls, Inc.

Information Network Setup Update Firmware

Network Setup

Device Configuration

Network settings

IP Address:

Subnet Mask:

Gateway:

Protocol

Ethernet/IP

Modbus-TCP

PROFINET (Protocol default address of 0.0.0.0 is set)

Write Configuration

1.0.17

Current Firmware Version

Figure T2.2 NXAE2 Network Setup Web Page

- 2) Enter your desired values into the IP Address, Subnet Mask, and Default Gateway fields.



The Default Gateway setting is not optional! It must be set to a valid address on the chosen subnet. Because the Default Gateway is often not used in device level networks, if you do not have a required value for it, AMCI suggests setting the Default Gateway to the IP address of your host controller.

- 3) If need be, click on the proper radio button to select the required protocol.
- 4) Click on the [Write Configuration] button to write the new configuration to the unit. If there are any errors with the data, the unit will display a warning message instead of accepting the new values.

2.2b Use the Embedded Web Server (continued)

2.2b.3 Network Setup Page (continued)

5) If the values are accepted, the following pages will be displayed while the data is being written to the unit.

NOTE ⚠️ Wait for the pop up window to appear before cycling power to the NXAE2. Cycling power before this window appears may corrupt the non-volatile memory of the NXAE2. The NXAE2 will also flash the Network Status LED red to indicate that power must be cycled.

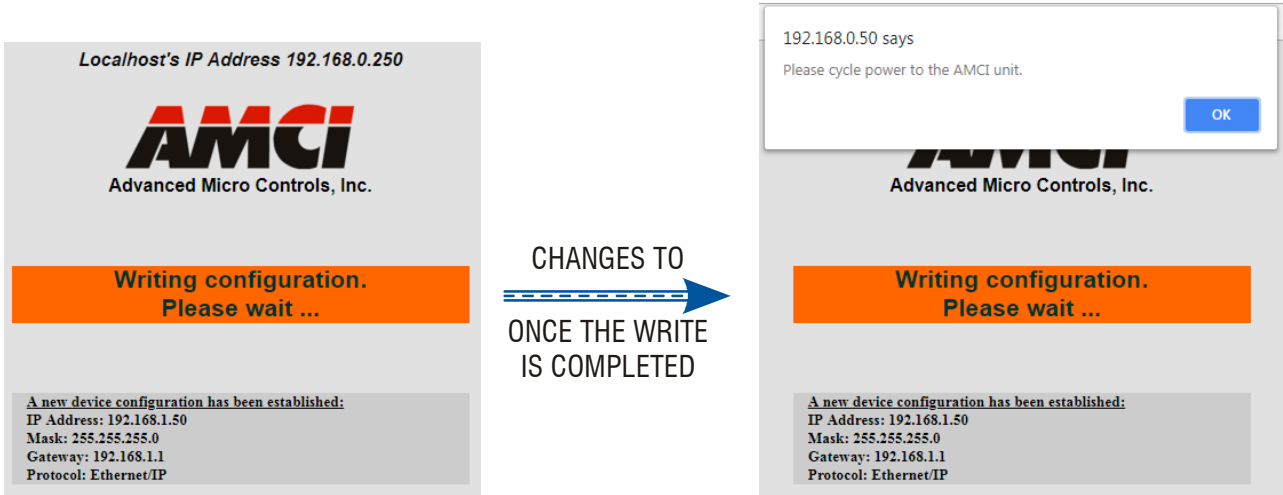


Figure T2.3 Write Configuration to Flash Memory Pages

6) Once instructed to, cycle power to the unit. You can now enter the new IP address into the address bar of your web browser to reconnect with the NXAE2.

Task Complete

2.2c Use the AMCI NET Configurator Utility

PREREQUISITE: You must know the present IP address of the NXAE2. The factory default address is 192.168.0.50.

PREREQUISITE: Task 1.3: *Power Wiring*, found on page 30. You must be able to power the NXAE2.

PREREQUISITE: Task 1.4 *Network Connections*, found on page 31. You must attach your NXAE2 to your computer.

PREREQUISITE: Reference 3: *Configuring Network Interfaces*, which starts on page 27. The network interfaces on your computer must be on the same subnet before you can communicate with an NXAE2.

2.2c.1 Download the AMCI Net Configurator Utility

The AMCI Net Configurator utility is available on our website, www.amci.com. The latest version available should be used. It can be found in the *Support* section under *Software*. The program exists as a ZIP file, and at the time of this writing, the link was “AMCI NET Configurator Utility for all networked products...”.

2.2c.2 Install the AMCI Net Configurator Utility

Once downloaded, simply extract the program from the ZIP file and run the program to install the AMCI Net Configurator utility on your computer. The software installs as most products do, giving you the option to change the file locations before installing the utility. Once the install is complete, a link to the utility is available on the Start Menu.

The install process only copies the utility to the designated location and creates links to the Start Menu. No changes are made to your registry settings.

2.2c Use the AMCI Net Configurator Utility (continued)

2.2c.3 Verify that Your Host Controller is Disconnected from the NXAE2

In order to program the NXAE2, the AMCI Net Configurator utility must act as a bus master. Therefore, physically disconnect your host controller from the NXAE2 before starting the Net Configurator utility. Conflicting commands from the Net Configurator utility and the host controller will prevent the NXAE2 for communicating properly with either bus master.

2.2c.4 Apply or Cycle Power to the NXAE2

Cycling power to the NXAE2 will reset any connections it may have with the host controller.

2.2c.5 Start the AMCI Net Configurator Utility

Double click on the utility’s icon. A welcome screen similar to the one in figure T2.4 below will appear.

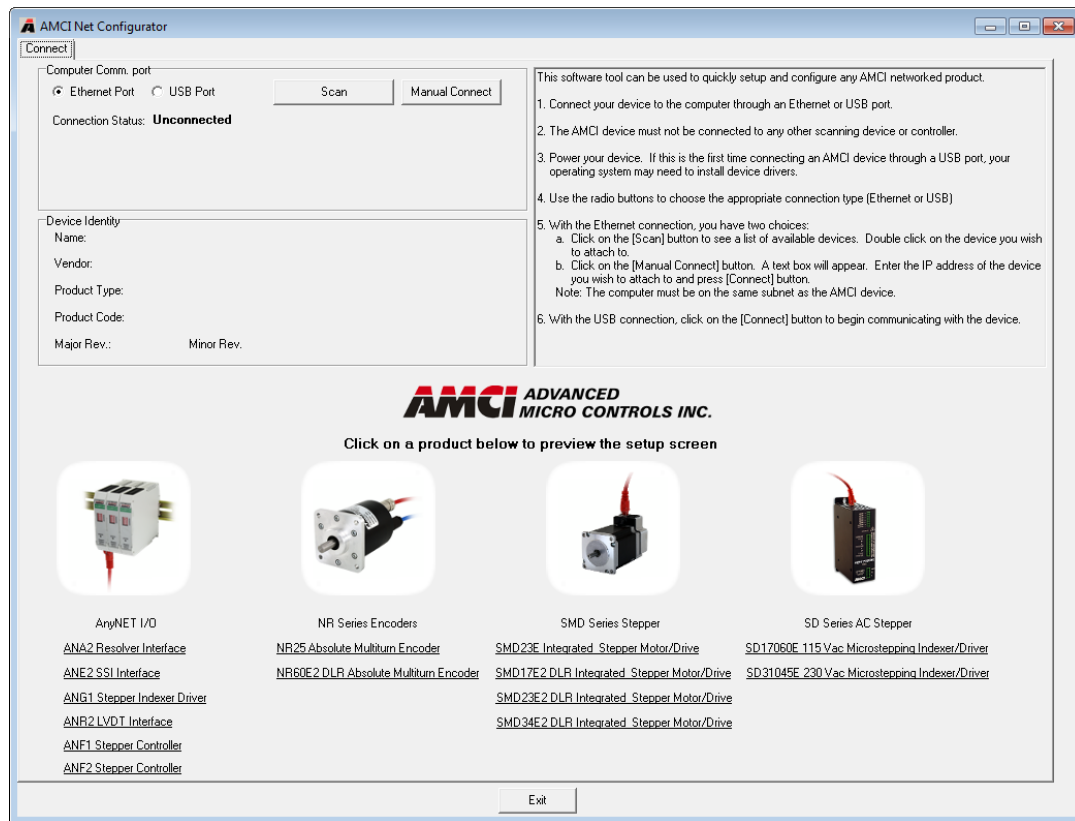


Figure T2.4 Net Configurator Welcome Screen

2.2c Use the AMCI Net Configurator Utility (continued)

2.2c.6 Press the [SCAN] button and Connect to the NXAE2

Pressing the [Scan] button will open the window shown in figure T2.5. The NXAE2 will appear in the scan list only if the unit and your network interface are on the same subnet. Optionally, you can press the [Manual Connect] button and enter the IP address of the NXAE2.

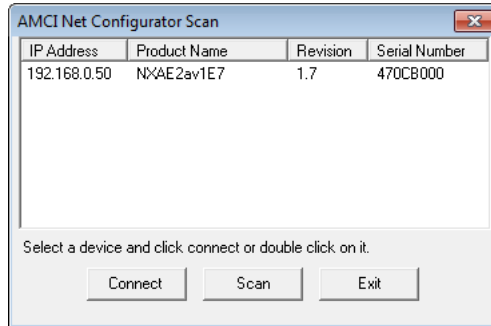


Figure T2.5 Scan for NXAE2

If scanning for the NXAE2, click on the IP Address of the module and click on the [Connect] button. The Net Configurator utility will connect to the unit.

2.2c.7 Click on the "Allow IP..." Checkbox to Access the IP Settings

Figure T2.6 below shows the screen that results when you are connected to the NXAE2. In order to change the IP Address of the unit, you must first click on the checkbox next to the text "Allow IP configuration changes. You will need to restart the device." Once the checkbox is selected, the [Set IP Address] button will be enabled.

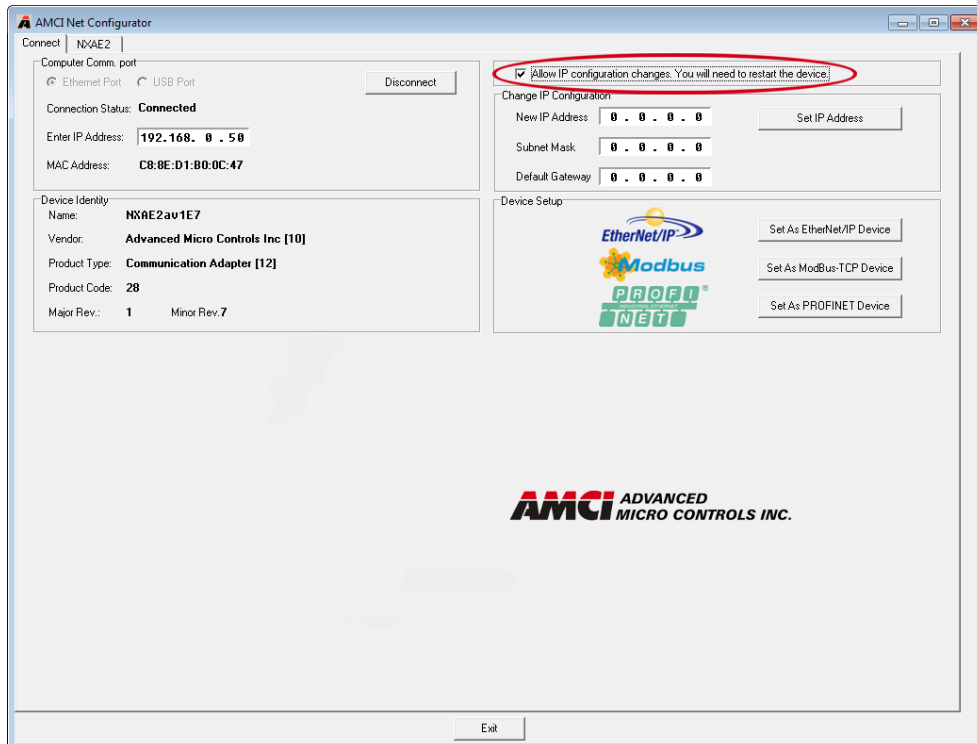



Figure T2.6 Enable IP Address Changes

2.2c Use the AMCI Net Configurator Utility (continued)

2.2c.8 Set the IP Address, Subnet Mask, and Default Gateway

Enter your desired values into the IP Address, Subnet Mask, and Default Gateway fields.

NOTE  The Default Gateway setting is not optional! In order to comply with the ODVA specification, it must be set to a valid address on the chosen subnet. Because the Default Gateway is often not used in device level networks, if you do not have a required value for it, AMCI suggests setting the Default Gateway to the IP address of your host controller.

2.2c.9 Set the Communications Protocol

The factory default protocol for the NXAE2 is EtherNet/IP. In order to use the Modbus TCP or PROFINET protocols, simply click on the appropriate button.

2.2c.10 Write the New IP Address to the NXAE2

Click on the [Set IP Address] button. If there is an error in the settings, the utility will tell you what is wrong. Once they are all correct, the utility will write the new IP address settings to the unit. These settings are automatically saved to nonvolatile memory.

2.2c.11 Remove Power from the NXAE2

The new IP address will not be used until power to the NXAE2 has been cycled.

Task Complete

Notes

PROTOCOL SPECIFIC INFORMATION

Manual Sections

The remainder of this manual is divided into three sections, one for each supported protocol. Each section has the protocol name in the page header.

Starting Pages

EtherNet/IP protocol: Page 49

Modbus TCP protocol: Page 67

PROFINET protocol: Page 71

Notes

IMPLICIT COMMUNICATIONS WITH AN EDS

Many EtherNet/IP platforms support the use of EDS files to simplify the addition and configuration of devices. This chapter covers the installation and use of the EDS file for systems that are programmed with Rockwell Automation Studio 5000 version 20 and above. Other systems will follow a similar pattern. Consult your controller's documentation if you need additional information.

Note: Use of an EDS file is completely optional. The NXAE2 can always be added to a system as a generic module. If you are using RSLogix 5000 version 19 and below, or RSLogix 500, adding the unit as a generic device is the only option available.

Using the EDS file simplifies configuration by sizing the configuration values appropriately.

3.1 Obtain the EDS file

All AMCI EDS files are located on our website at the following address:

➤ <http://www.amci.com/industrial-automation-support/configuration-files/>

Products are listed in alphabetical order. Simply download the ZIP file and extract it to its own directory. The ZIP file contains the EDS text file and a custom icon file for the device.

3.2 Install the EDS file

3.2.1 Start the EDS Hardware Installation Tool

1) Once Studio 5000 is running, in the menu bar select Tools → EDS Hardware Installation Tool. This will open the EDS Wizard.

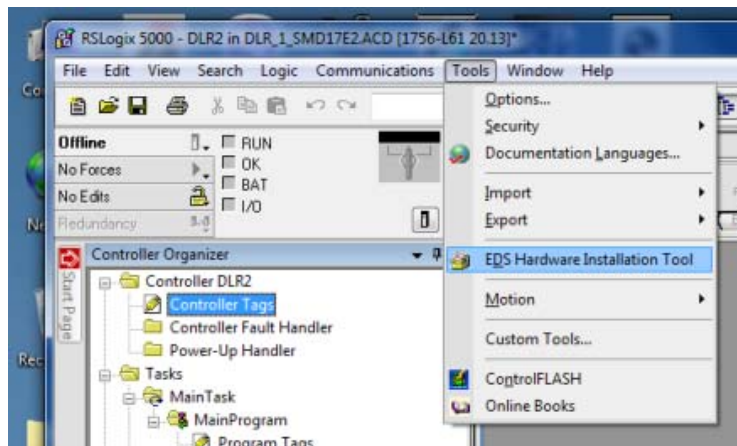


Figure T3.1 Opening the EDS Wizard

2) Click on [Next >] to advance to the Options screen.

3.2 Install the EDS file (continued)

3.2.2 Install the EDS File

1) On the Options screen, select the Register an EDS file(s) radio button and press [Next >].

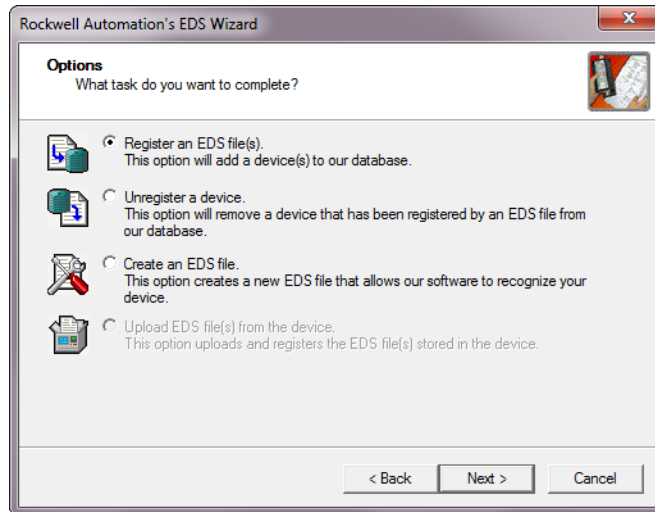


Figure T3.2 EDS Options Screen

2) The registration screen will open. Select the Register a single file radio button.

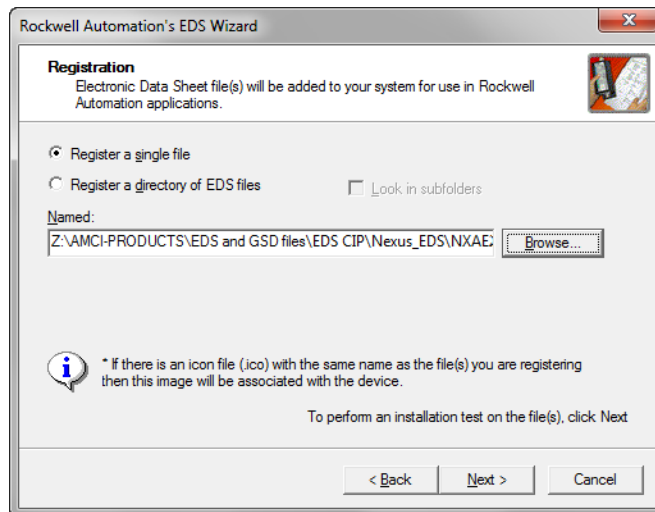


Figure T3.3 EDS Registration Screen

3) Click on the [Browse...] button and browse to the folder that contains the extracted EDS file you downloaded from the AMCI website. Select the EDS file and click on the [Open] button to return to the registration screen. Click on the [Next >] button to advance to the EDS file test screen.

3.2 Install the EDS file (continued)

3.2.2 Install the EDS File (continued)

- 4) Once at the EDS File Installation Test Results screen, expand the tree as needed to view the results of the installation test for the EDS file. You should see a green check mark next to the file name indicating that the EDS file is correct.

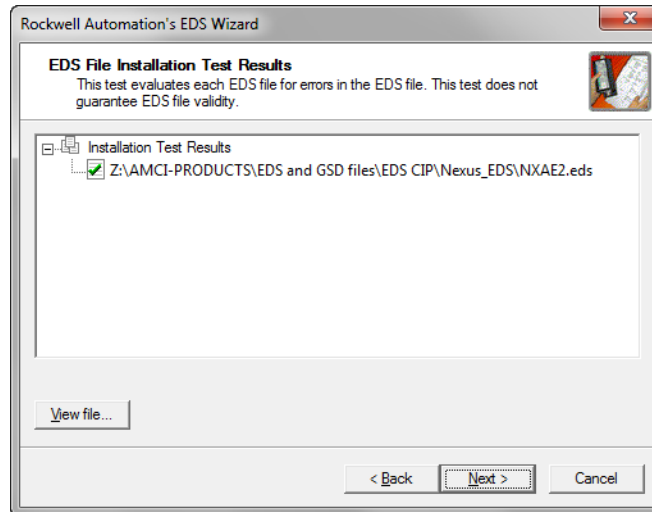


Figure T3.4 EDS Test Screen

- 5) Press on the [Next >] button to advance to the Change Graphic Image screen. This screen gives you the ability to change the icon associated with the device.

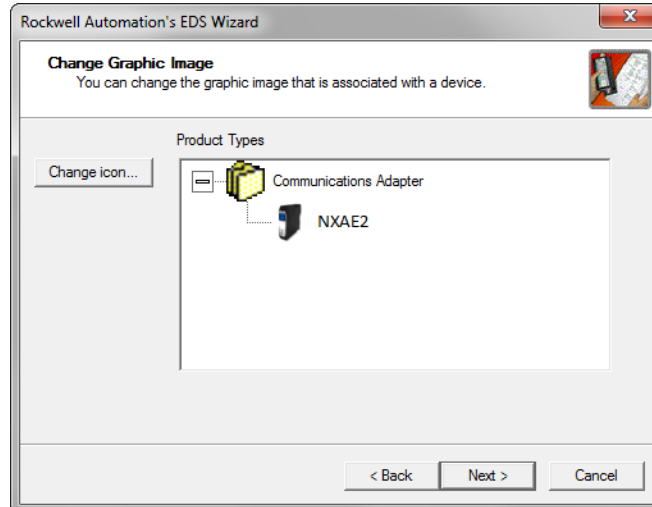


Figure T3.5 Change ECS Icon Screen

- 6) Click on the [Change icon...] button. In the window that opens, click on [Browse...] and browse to the folder that contains the extracted EDS and icon files you downloaded from the AMCI website.
- 7) Select the icon file (*.ico) associated with the device. Click on the [Open] button and then on [OK] to return to the Change Graphic Image screen.
- 8) Click on the [Next...] button to advance to the completion screen. The Completion screen tells you that you have successfully completed the wizard.
- 9) Click on the [Finish] button to exit the EDS wizard.

3.3 Host System Configuration

Studio 5000 is used to configure both the ControlLogix and CompactLogix platforms. When using these platforms, you have the option of using a separate Ethernet Bridge module or an Ethernet port built into the processor.

If the Ethernet port is built into processor, the only step you have to take before adding an AMCI NXAE2 is to create a new project with the correct processor or modify an existing project. Once this is done, the Ethernet port will automatically appear in the Project Tree. If you are using an Ethernet bridge module, you will have to add it to the I/O Configuration tree before adding the unit to your project.

Refer to your Rockwell Automation documentation if you need instructions for configuring the ethernet port.

3.4 Add the NXAE2 to Your Project

You can add an NXAE2 to the project once the Ethernet port (built-in or bridge module) is configured. As shown in figure T3.6 below, the Ethernet port will be listed under the I/O Configuration tree.

- 1) Right click on the Ethernet port and then click on “New Module...” in the pop-up menu.

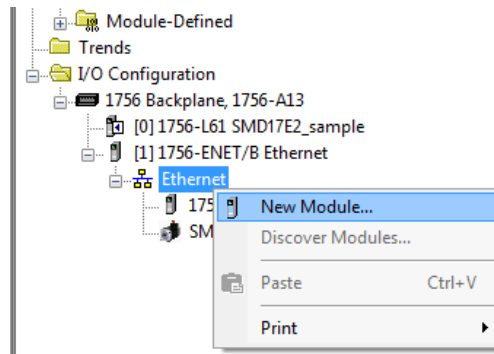


Figure T3.6 Adding an AMCI Ethernet Unit

- 2) In the resulting Select Module Type screen, select “Advanced Micro Controls Inc. (AMCI)” in the Vendor Filters. This will limit the results to catalog numbers from AMCI.
- 3) Select “NXAE2” in the resulting list.
- 4) Click on the [Create] button to create the module.
- 5) Click on [Close] if necessary to close the Select Module Type screen.

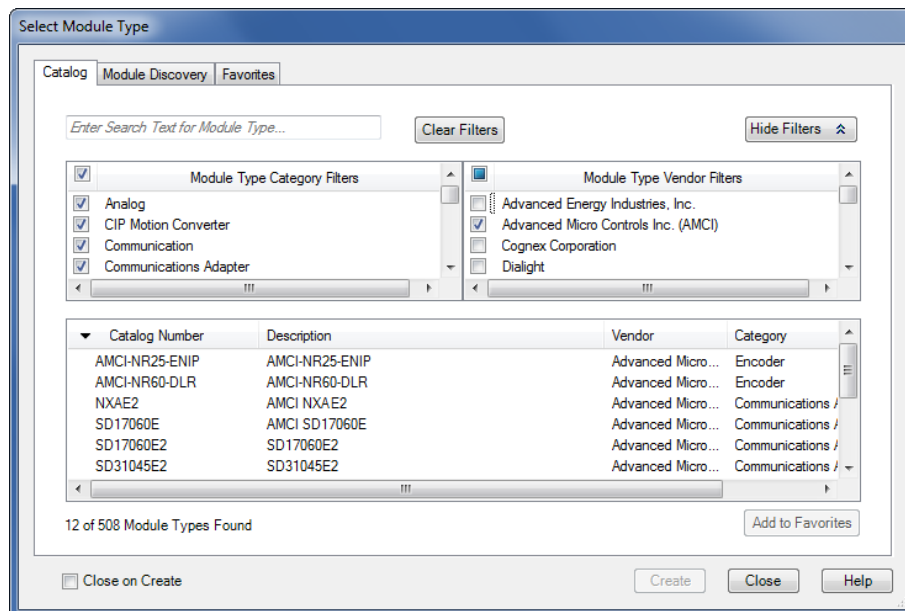



Figure T3.7 Selecting the NXAE2

3.5 NXAE2 Properties

If you are continuing from step 3.4, the resulting New Module screen is used to configure the network connection between the NXAE2 and your controller. If you need to open the screen to perform this task at a later time, right click on the unit in the project tree and then select “Properties” from the drop-down menu

NOTE  Tabs that are not listed in the steps below are filled with reasonable defaults by the EDS file.

3.5.1 General Tab

The Name, Description, and IP address of the device must be specified here. The [Change...] button allows you to change the Module Definition if needed.

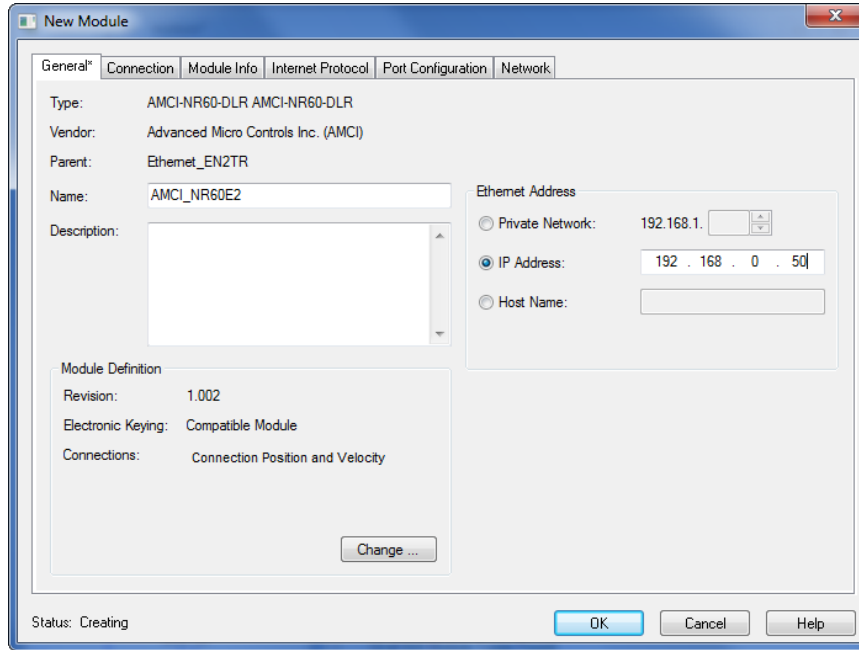


Figure T3.8 NR60E2 Properties Screen - EDS

3.5.2 Connection Tab

The default RPI time is eight milliseconds. This value can be changed in this tab.

3.6 Buffering the Input Data

Input data is updated asynchronously to the program scan. The input data should be buffered with Synchronous Copy File instructions to guarantee stable data during the program scan.

The data from the NXAE2 is updated asynchronous to the program scan at the RPI time configured in the Ethernet scanner module. The following rung ensures that the data from the NXAE2 does not change in the middle of the ladder logic program by copying it to the internal tag array NXAE2_buffered_data[0] through NXAE2_buffered_data[9]. It is this buffered data that MUST be used by your ladder logic program for all compare purposes.

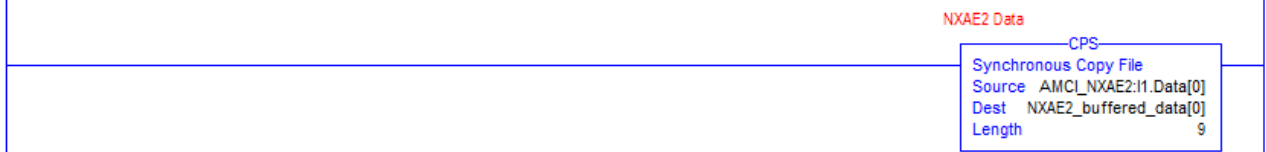


Figure T3.9 Buffer Input Data

Notes

IMPLICIT COMMUNICATIONS WITHOUT AN EDS

This chapter tells you how to configure implicit connections in EtherNet/IP systems that do not use EDS files. Implicit connections can be used to read position and velocity data from the NXAE2. Configuring the NXAE2, and presetting the position, requires explicit messaging. Refer to the next chapter for information on using message instructions for explicit messaging.

Rockwell Automation's RSLogix 5000 version 20+ software is used for the example installation in this chapter.

4.1 Host System Configuration

RSLogix 5000 is used to configure both the ControlLogix and CompactLogix platforms. When using these platforms, you will use a separate Ethernet Bridge module or an Ethernet port built into the processor.

If the Ethernet port is built into processor, the only step you have to take before adding the NXAE2 is to create a new project with the correct processor or modify an existing project. Once this is done, the Ethernet port will automatically appear in the Project Tree. If you are using an Ethernet bridge module, you will have to add it to the I/O Configuration tree before adding the unit to your project.

Refer to your Rockwell Automation documentation if you need instructions for configuring the ethernet port.

4.2 Add the NXAE2

You can add the NXAE2 to the project once the Ethernet port (built-in or bridge module) is configured.

1) Right click on the Ethernet port and then click on "New Module..." in the pop-up menu.

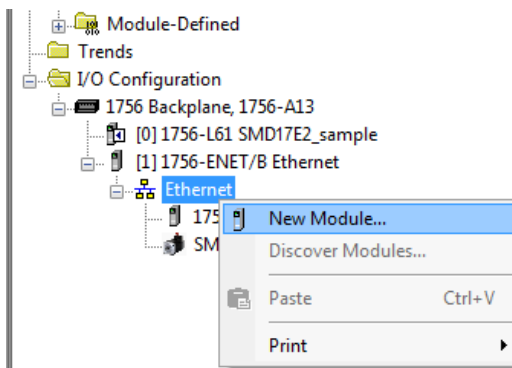


Figure T4.1 Adding an AMCI NXAE2

4.2 Add the NXAE2 (continued)

- 2) In the resulting Select Module Type screen, type “generic” into the filter as shown in figure T4.2. This will limit the results in the Catalog Number list.
- 3) Select the Catalog Number “ETHERNET-MODULE” in the list.
- 4) Click on the [Create] button to create the module.
- 5) Click on [Close] if necessary to close the Select Module Type screen.

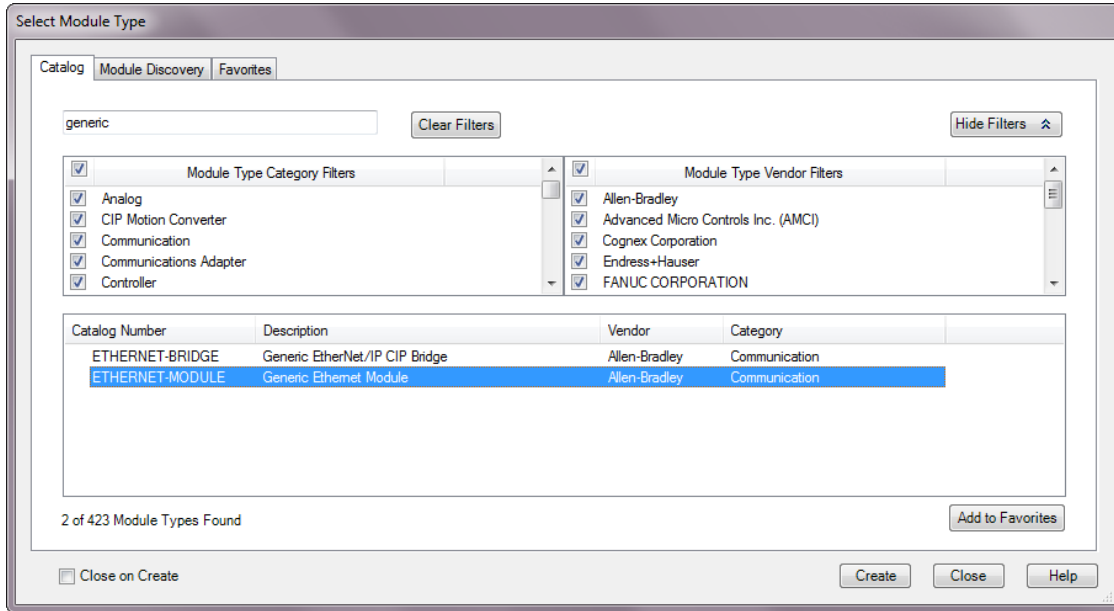


Figure T4.2 Selecting a Generic Device

4.2 Add the NXAE2 (continued)

- 6) Set the following parameters in the Module Properties window. All parameters not listed here are optional. Figure T4.3 shows a completed screen.

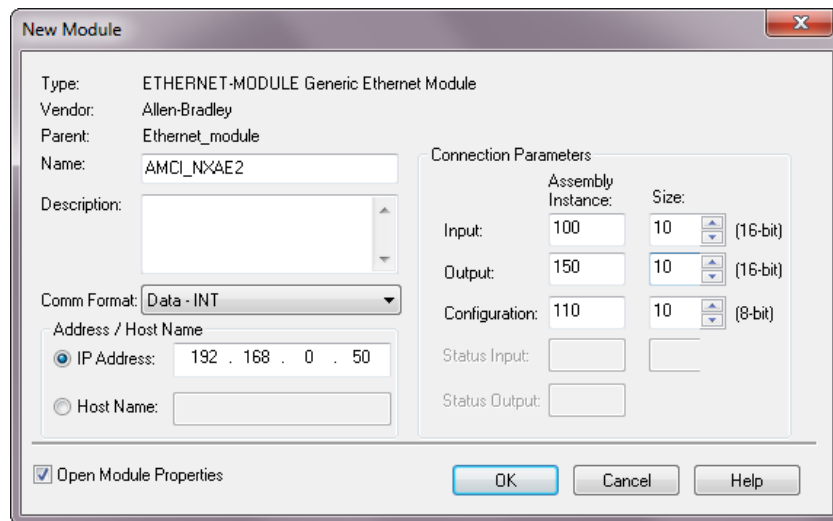


Figure T4.3 Configuration Screen - Generic Device

- **Name:** A descriptive name for the NXAE2
- **Comm Format:** Data - INT

! CAUTION

The Comm Format defaults to Data - DINT. The NXAE2 will not be able to communicate with the host controller if this format is not changed when the device is added to the system. Once added, the Comm Format cannot be changed. The device must be deleted and again added to the project if the Comm Format is incorrect.

- **IP Address:** Must be the address you set for the NXAE2. Refer to the [Set the IP Address and Protocol](#) task chapter starting on page 39 for information on setting the IP Address of the unit.
 - **Input:** Assembly Instance = 100, Size = 10 words.
 - **Output:** Assembly Instance = 150, Size = 10 words.
 - **Configuration:** Assembly Instance = 110, Size = 0 bytes.
- 7) Verify that the “Open Module Properties” check box is selected and click on [OK]. The Module Properties window will open.

4.2 Add the NXAE2 (continued)

8) Click on the “Connections” tab and set the RPI time that is required for your system. The suggested RPI time for an NXAE2 is eight milliseconds. The minimum RPI time is two milliseconds. The number of nodes on the network has an effect on the minimum RPI time. You may have to increase this RPI time if your network is heavily loaded. The remaining checkboxes can be left at their default settings. *The Unicast Connection field that is shown as checked in the figure is an optional setting.* When done, click on [OK] to complete the setup.

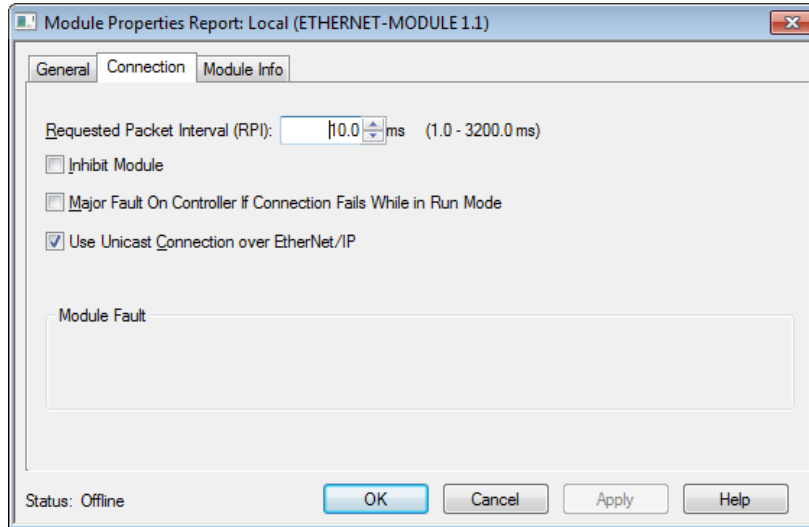


Figure T4.4 Setting the RPI Time

4.3 Check for Communication Errors

You can immediately check for errors if you are on-line with the processor while setting up the NXAE2. These error codes will appear in the Module Fault section of the Connection tab of the Module Properties window.

- **Error Code 16#0315 Connection Request Error: Invalid Segment Type.** You have specified an invalid assembly instance in the connection parameters.
- **No communications, but no error code.** Most commonly caused when the Comm Format not set to “Input Data - INT” or when the number of inputs words is incorrect.

4.4 Configure the NXAE2

The device will join the EtherNet/IP network as soon as the request is made to it. The NXAE2 will use the configuration data stored in flash memory to configure the unit on power up. You can change this configuration at anytime and store this new configuration to flash. Configuration is accomplished by writing a block of data to the device that is formatted according to the specifications in the *Data Formats* reference, starting on page 15.

It is possible to store configuration data in the flash memory of the NXAE2 using the AMCI Net Configurator software, and this configuration will be used on power up.

4.5 Buffer I/O Data

Data to and from the NXAE2 should be buffered once per scan using Synchronous Copy instructions. This is to insure stable input data during the program scan and guarantee that complete command data is delivered to the device. Ten word integer arrays can be used for this purpose.

These data tags should be buffered with Synchronous Copy File instructions to guarantee stable input data during the program scan and guarantee that complete command data is delivered to the device.

The data from the NXAE2 is updated asynchronous to the program scan at the RPI time configured in the Ethernet scanner module. The following rung ensures that the data from the NXAE2 does not change in the middle of the ladder logic program by copying it to the internal tag array NXAE2_buffered_data[0] through NXAE2_buffered_data[9]. It is this buffered data that MUST be used by your ladder logic program for all compare purposes.

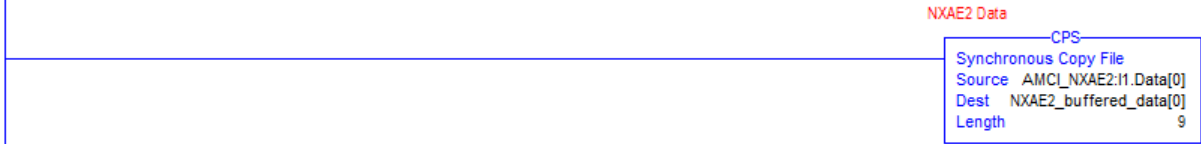


Figure T4.5 Buffer I/O Data

Notes

ETHERNET/IP EXPLICIT MESSAGING

All controllers that support EtherNet/IP support explicit messaging. When using explicit messaging, Message Instructions must be added to your program to communicate with the NXAE2. Explicit messaging can be use on platforms that also support implicit messaging.

Rockwell Automation controllers which are programmed with the RSLogix 500 software only support explicit messaging. A MicroLogix 1100 will be used as an example in this chapter.

5.1 Required Message Instructions

Only two instructions are required to transfer data between the PLC and the NXAE2. One instruction reads data from the unit and the other writes data to it. The sample programs available from AMCI use this style of programming. The two instructions are alternately triggered using the instruction's ENABLE bits. The remainder of the program controls when data in the source tags of the write instruction changes. The following table gives the required attributes for the instructions.

	Read Instruction	Write Instruction
Service Type	Read Assembly	Write Assembly
Service Code	E (hex)	10 (hex)
Class	4 (hex)	4 (hex)
Instance	100 (decimal)	150 (decimal)
Attribute	3 (hex)	3 (hex)
Length	20 bytes	20 bytes

Table T5.1 Message Instruction Attributes



Only RSLogix 500 version 8.0 or above can be used to configure Message Instructions to communicate with an EtherNet/IP device. Message Instructions do not work correctly in version 10 of RSLogix 500.

5.2 Create Four New Data Files.

- An Integer file to contain the data read from the NXAE2. This file must be at least 10 words in length.
- An Integer file to contain the data written to the NXAE2. This file must be at least 10 words in length.
- 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.

5.3 Add the Message Instructions to your Ladder Logic

The following rungs show how you can alternately read data from and write data to the unit.

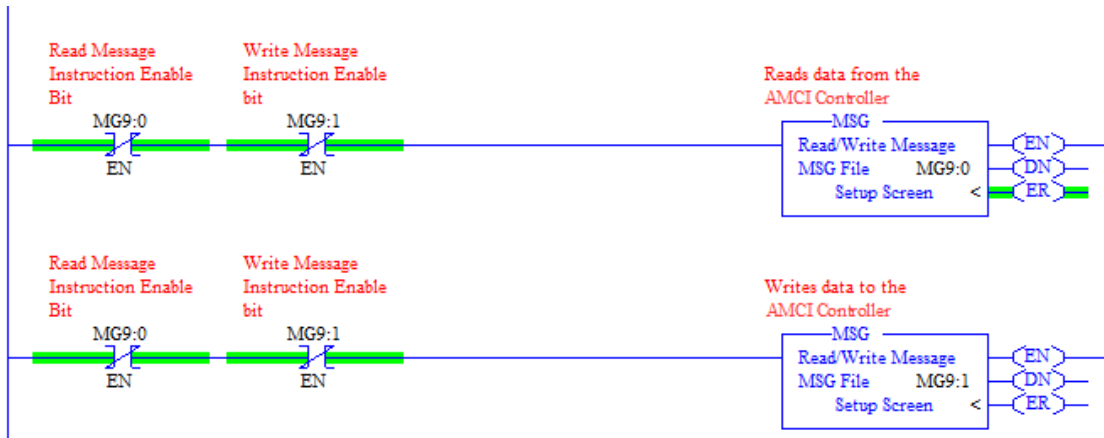


Figure T5.1 Message Instruction Example

- 1) Double click on *Setup Screen* text inside the Message Instruction. The following window will open. Note that this is the default window and its appearance will change considerably as you progress through these steps.

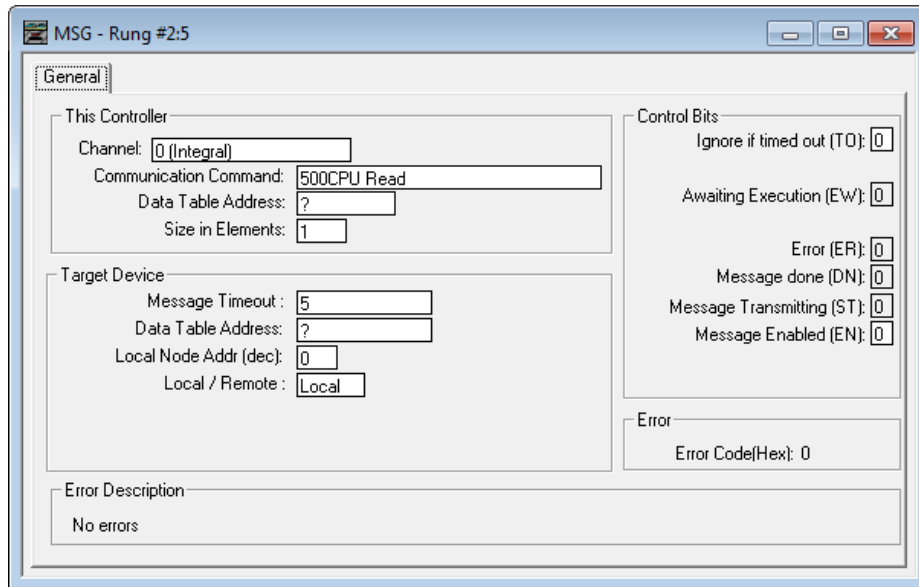


Figure T5.2 Message Instruction Setup Screen

- 2) Double click in the *Channel* field, click on the ▼, select “1 (Integral)”, and press Enter.
- 3) Double click in the *Communication Command* field, click on the ▼, select “CIP Generic” and press Enter.
- 4) If the Message Instruction is being used to read data from the NXAE2, enter the integer file where the data will be placed in the *Data Table Address (Received)* field and press enter.
- 5) If the Message Instruction is being used to write data to the NXAE2, enter the integer file where the source data will be located in the *Data Table Address (Send)* field and press Enter.
- 6) Enter “20” as the number of bytes needed in either the *Size In Bytes (Receive)* or *Size In Bytes (Send)* fields. The NXAE2 requires 20 bytes for both Receive and Send.
- 7) Enter a RIX address in the *Extended Routing Info* field. Please note that each Message Instruction must have its own RIX address.

5.3 Add the Message Instructions to your Ladder Logic (continued)

- 8) Double click in the *Service* field and select “Read Assembly” for a Message Instruction that is being used to read data from the NXAE2, or “Write Assemble” for a Message Instruction that is being used to send data to the NXAE2, and press Enter.
- 9) 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).
- 10) For Read operations, enter a value of 100 decimal (64 hex) in the *Instance* field.
For Write operations, enter a value of 150 decimal (96 hex) in the *Instance* field.

The figure below show a typical configuration for Message Instructions being used to read data from the NXAE2. Please note that the Data Table Address (Receive) field may be different in your application.

MSG - Rung #2:5

General | MultiHop | Send Data | Receive Data

This Controller

Channel: 1 (Integral)

Communication Command: CIP Generic

Data Table Address (Receive): N9:0 (Send): N/A

Size in Bytes (Receive): 20 (Send): N/A

Target Device

Message Timeout: 5

Local / Remote: Local MultiHop: Yes

Extended Routing Info File(RIX): RIX10:0

Service: Read Assembly Service Code (hex): E

Class (hex): 4 (dec): 4

Instance (hex): 64 (dec): 100

Attribute (hex): 3 (dec): 3

Control Bits

Ignore if timed out (TO): 0

Break Connection (BK): 0

Awaiting Execution (EW): 0

Error (ER): 0

Message done (DN): 0

Message Transmitting (ST): 0

Message Enabled (EN): 0

Error

Error Code(Hex): 0

Error Description

No errors

Figure T5.3 Read Message Instruction Setup Screen

5.3 Add the Message Instructions to your Ladder Logic (continued)

The figure below show a typical configuration for Message Instructions being used to write data to the NXAE2. Please note that the Data Table Address (Send) field may be different in your application.

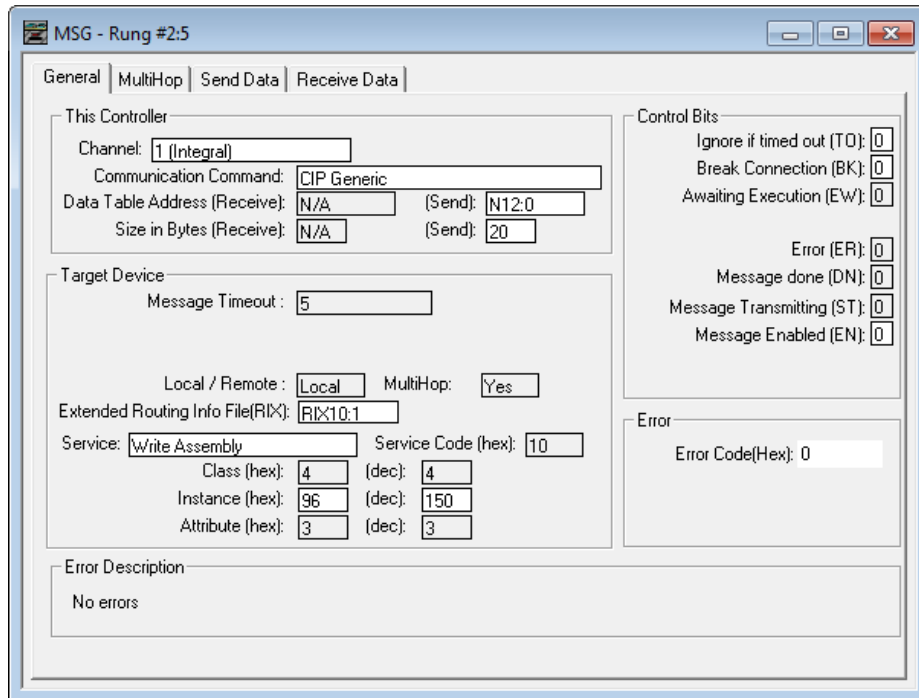


Figure T5.4 Write Message Instruction Setup Screen

Click on the MultiHop tab on the top of the window. As shown in figure T5.5, enter the IP address of the NXAE2 and press Enter.

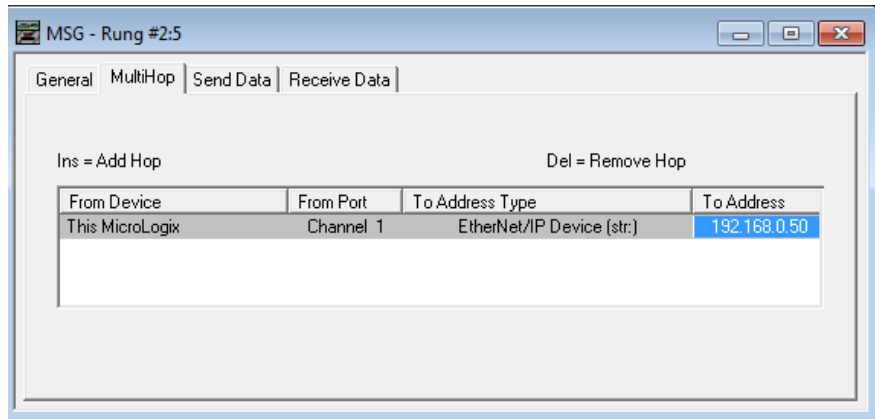


Figure T5.5 Message Instruction MultiHop Settings

After you are finished adding both the read and write message instructions to your program, save and download the program to the PLC.

5.4 Troubleshooting

If you are unable to communicate with the NXAE2, the problem may be that the Ethernet port of your MicroLogix 1100 has not been configured. To check this:

- 1) Double click on Channel Configuration in the Project Tree and then select the Channel 1 tab. The following window will open.

The screenshot shows the 'Channel Configuration' dialog box with the 'Channel 1' tab selected. The 'Driver' is set to 'Ethernet'. The 'Hardware Address' is 'C8:8E:D1:B1:4A:56'. The 'IP Address' is '192.168.0.1', 'Subnet Mask' is '255.255.255.0', and 'Gateway Address' is '0.0.0.0'. The 'Network Link ID' is '0'. Under 'Protocol Control', 'BOOTP Enable', 'DHCP Enable', and 'SNMP Server Enable' are unchecked. 'HTTP Server Enable' and 'SMTP Client Enable' are checked. 'Msg Connection Timeout (x 1mS)' is '15000', 'Msg Reply Timeout (x 1mS)' is '3000', and 'Inactivity Timeout (x Min)' is '30'. 'Auto Negotiate' is checked, and 'Port Setting' is '10/100 Mbps Full Duplex/Half Duplex'. 'Contact' and 'Location' fields are empty. Buttons for 'OK', 'Cancel', 'Apply', and 'Help' are at the bottom.

Figure T5.6 MicroLogix Ethernet Configuration Screen

- 2) Enter the IP address and Subnet Mask of your MicroLogix 1100, (not the address of the NXAE2) and click on [Apply]. The Ethernet Port should now be working.

NOTE AMCI is aware of an issue with the RIX data type in version 10 of RSLogix 500. If you are experiencing communications errors and are running version 10, please contact Rockwell Automation for support.

Notes

MODBUS TCP CONFIGURATION

An AMCI NXAE2 that has been configured for the Modbus TCP protocol requires a host controller to issue configuration data and read data from the unit. This chapter tells you how the I/O words used by an AMCI NXAE2 are mapped to the Modbus I/O registers.

Enable Modbus TCP Protocol

The internal web page utility can be used to change the communications protocol used by the NXAE2. This is typically done while setting the IP address. Specifically, follow the steps in section 2.2b, *Use the Embedded Web Server* which starts on page 40.

Modbus Addressing

The register addresses used in this manual are the *Modbus logical reference numbers*[†], which are unsigned integers starting at zero. This is often called *zero based* addressing. In this scheme, the first register is given an address of zero. This is the actual addressing scheme used in the Modbus packets.

Another common addressing scheme is *one based* or *data model* addressing. In this scheme, the register's number is used as its address, so the first register, Register 1 in the data model, has an address of 1.

Modbus Table Mapping

The Discrete Input and Input Register tables in the Modbus data model map to the same physical memory locations in the NXAE2 units.

- These registers hold data that is reported from the NXAE2 to the host controller.
- Addresses for these registers and inputs start at 0 in zero based addressing.

As examples:

- Discrete Input 0 is the same memory location as bit 0 of the first Input Register.
- Register address 3, the fourth register, contains Discrete Inputs 48 through 63.

The Coil and Holding Register tables in the Modbus data model map to the same physical memory locations in the NXAE2 units.

- These registers hold data that is from the host controller to the unit. This data is typically commands.
- Addresses for these registers start at 1024 in zero based addressing. Coil addresses start at 16,384 in zero based addressing (1024*16).

As examples:

- Coil 16384 is the same memory location as bit 0 of the first Holding Register.
- Register address 1025, the address of the second Holding Register, contains Discrete Inputs 16,400 through 16,415 in zero based addressing.

Host Addressing

Your host controller may not use these basic addressing schemes for communicating over a Modbus connection. For example, Modicon controllers use addresses starting at 30000 for Input Registers and addresses starting at 40000 for Holding Registers. GE hosts internally use their %R memory for Holding Registers and %AI memory for Input Registers.

If this is the case, you will define a mapping between your host controller's addressing scheme and the zero based Modbus TCP addresses when you add the NXAE2 to your host controller. Refer to your host controller's documentation for information on how to accomplish this.

[†] MODBUS Application Protocol Specification V1.1b3, section 4.3: MODBUS Data model. www.modbus.org

AMCI Modbus TCP Memory Layout

The NXAE2 has a starting Input Register address of 0 and a starting Output Register address of 1024. Input Registers hold the data from the unit while Output Registers hold the data to be written to the unit. Figure T6.1 shows how an NXAE2 is mapped to the Modbus data reference. The complete specification for the Modbus protocol can be downloaded at <http://www.modbus.org/specs.php>.

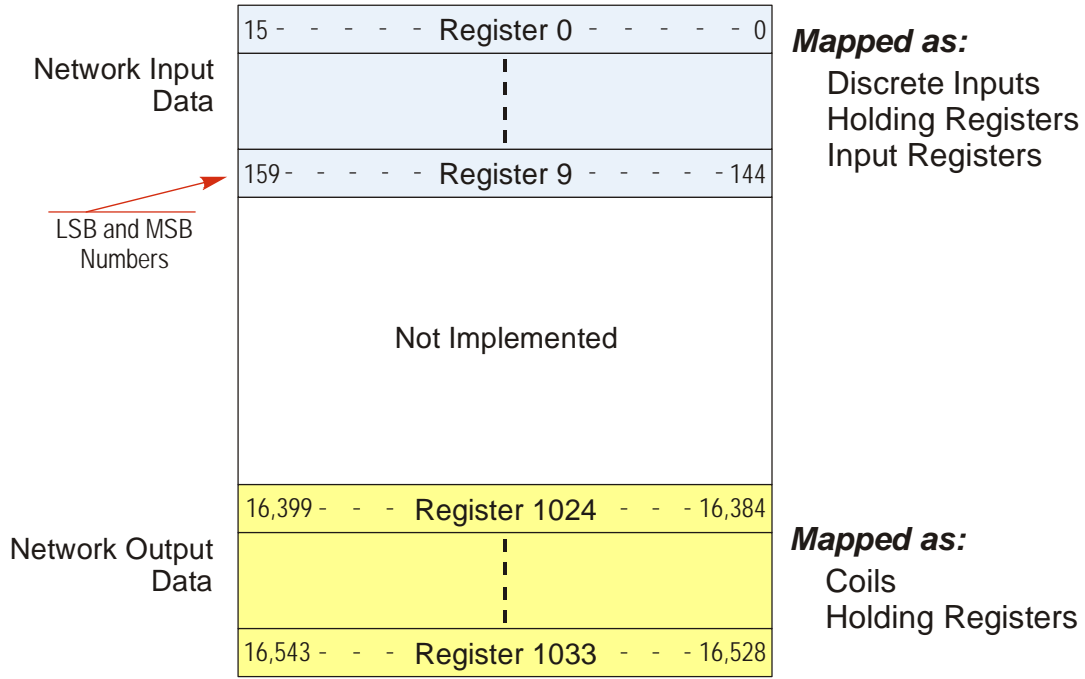


Figure T6.1 Modbus Data Reference Map

Supported Number of Connections

All NXAE2 units support five concurrent connections. When connections exist, the Network Status (NS) LED on the front of the unit will flash green. The number of blinks indicate the number of active connections. There is a two second break between groups of flashes.

Supported Modbus Functions

Function Code	Function Name	SD4840E2 Register	Addressing method
1	Read Coils	OUTPUT	Bit:Addresses starting at 16,384
2	Read Discrete Inputs	INPUT	Bit:Addresses starting at 0
3	Read Holding Registers	OUTPUT & INPUT	Word: Out Regs.Starting at 1024 In Regs.Starting at 0
4	Read Input Registers	INPUT	Word:Addresses starting at 0.
5	Write Single Coil	OUTPUT	Bit:Addresses starting at 16,384
6	Write Single Register	OUTPUT	Word:Addresses starting at 1024
15	Write Multiple Coils	OUTPUT	Bit:Addresses starting at 16,384
16	Write Multiple Registers	OUTPUT	Word:Addresses starting at 1024
22	Mask Write Register	OUTPUT	Word:Addresses starting at 1024
23	Read/Write Registers	INPUT/OUTPUT	Word: Out Regs.Starting at 1024 In Regs.Starting at 0

Table T6.1 Supported Modbus Functions

Table T6.1 above lists all of the Modbus functions supported by an NXAE2. AMCI supports all of these functions so that you can control the unit as you see fit. However, if you are looking for the easiest way to interface with your unit, then you only need to use the *Read/Write Registers* function, which is function code 23.

NOTE 

Each NXAE2 buffers the data that is sent to it over the network. If you use the *Read/Write Registers* function to write data to the unit, the data read with that command will not contain the response to the new write data. The response to the new data will be sent with the next data read.

Supported Modbus Exceptions

Code	Name	Description
01	Illegal function	The NXAE2 does not support the function code in the query.
02	Illegal data address	The data address received in the query is outside the initialized memory area.
03	Illegal data value	The data in the request is illegal.

Table T6.2 Supported Modbus Exceptions

Notes

PROFINET NETWORK CONFIGURATION

This chapter outlines the steps commonly needed to get an NXAE2 communicating with the PROFINET master. A Siemens SIMATIC S7-1212C controller is used in this example.

Basic Steps

Configuring a PROFINET host requires a few basic steps.

- 1) Download the ZIP archive that contains the GSDML files for the NXAE2 from the www.amci.com website.
- 2) Install the GSDML file into the configuration software for your host controller.
- 3) Add the NXAE2 to the PROFINET Network.
- 4) Set the I/O word addresses used to communicate with the unit.

7.1 Download the GSDML files

The GSDML files are available on the AMCI website on the <http://www.amci.com/industrial-automation-support/configuration-files/> web page. The file is a ZIP archive that has to be extracted to a folder on your computer. Extracting the ZIP file will leave you with multiple files. One is the GSDML file and the others are icon files for the various devices.

7.2 GSDML File Installation

- 1) Open or create a new project that will include the NXAE2 and open the Project View of the project.
- 2) In the menu, select *Options -> Manage general station description files (GSD)*.
- 3) In the window that opens, click on the [...] button and navigate to the folder that contains the extracted GSDML file you downloaded from the AMCI website. Once at the folder, click on the [OK] button.
- 4) Click on the check box next to the name of the GSD file and click on the [Install] button. The system will install the GSD file.
- 5) Click the [Close] button and wait for the software to finish installing the file and updating the Hardware Catalog.

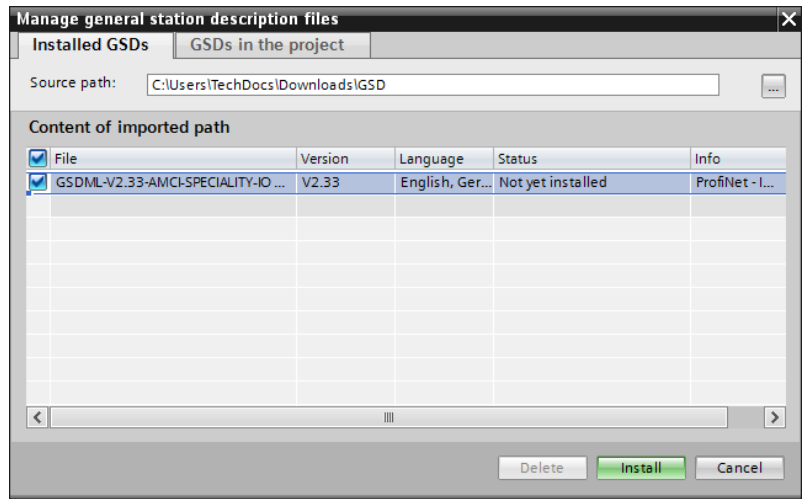


Figure T7.1 GSD File Installation

7.3 Configure the PROFINET Network

A CPU must be added to the project and the PROFINET network must be configured before an NXAE2 can be added to the system.

Refer to Siemens documentation for information on configuring the PROFINET network to suit your application.

7.4 Add the NXAE2 to the PROFINET Network

- 1) With the project open in Project View, double click on “Device & Networks” in the project tree.
- 2) If need be, click on the “Hardware Catalog” vertical tab to open the Hardware Catalog.
- 3) You can search for “NXA”, or browse to the NXAx2 icon by clicking through *Other field devices* +> *PROFINET IO* +> *IO* +> *Advanced Micro Controls Inc.* +> *AMCI_Products* +> *AMCI_Speciality_IO*. Drag and drop the appropriate icon onto the PROFINET network.
- 4) Drag the green square on the NXAx2 icon onto the PROFINET network line to connect the device to the network.

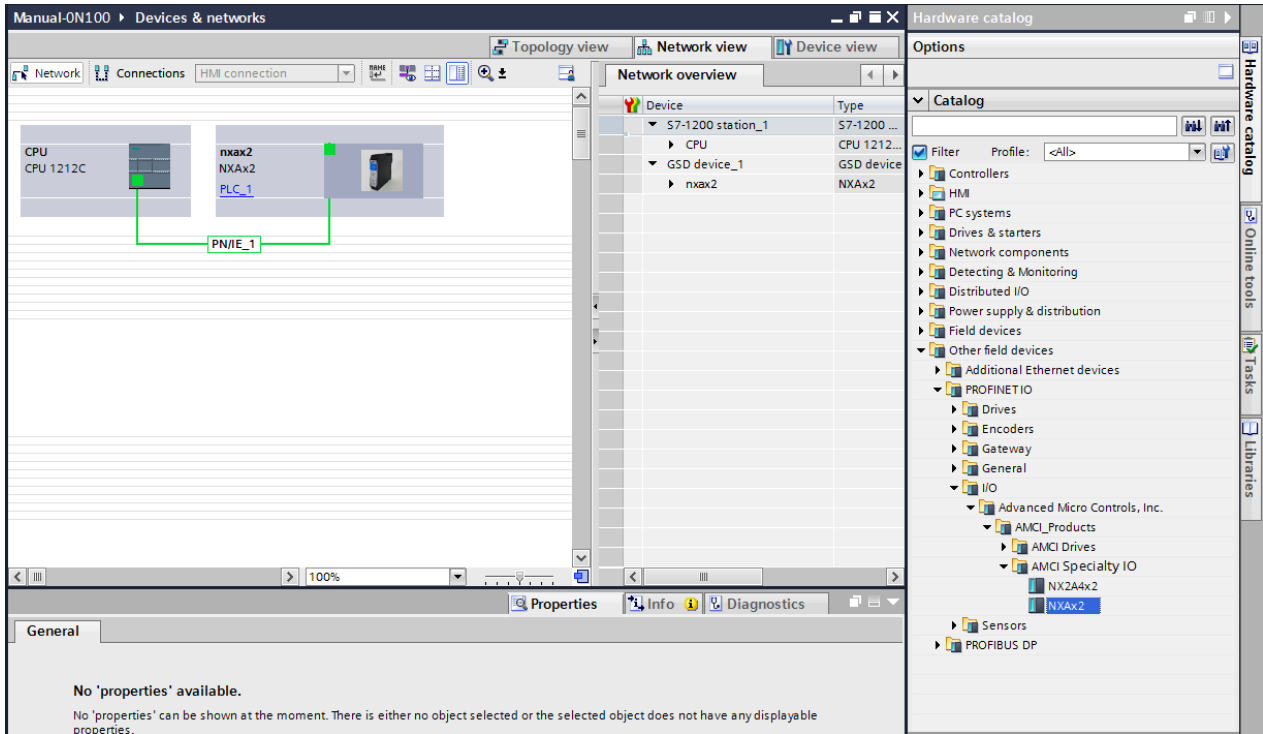


Figure T7.2 NXAE2 Added to PROFINET Network

7.4 Add the NXAE2 to the PROFINET Network (continued)

- 5) Right click on the NXAx2 icon and select “Properties” from the pop up menu. The Inspector window will open at the bottom of the screen. Under the “General” tab, select the “►General” heading. You can rename the NXAE2 by changing the Name: field.
- 6) Under the “►PROFINET interface [x1]” heading, select “Ethernet addresses”. Under the IP protocol section, set the desired IP address and subnet mask for the NXAE2.

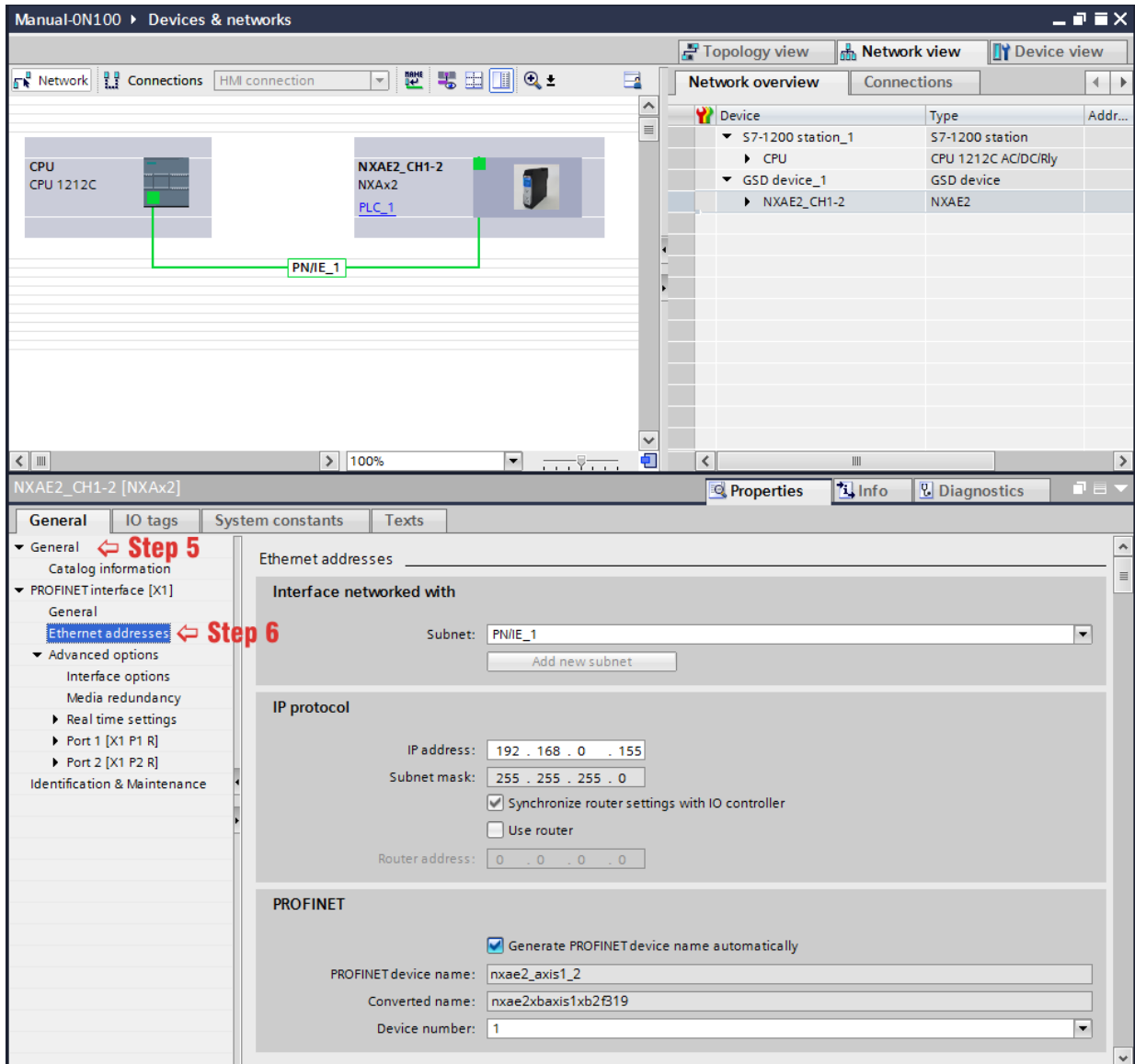


Figure T7.3 NXAE2 IP Addressing

7.5 Set the I/O Configuration

The NXAE2 units require 10 Input Words (20 Input Bytes) and 10 Output Words (20 Output Bytes). All required Input and Output Bytes are defined by the GSDML file and divided into suitable modules. These settings are shown in the Table T7.1.

Input / Output Bytes of an NXAE2	Input / Output Modules of an NXAE2
20 Input Bytes	Input Module - Slot 1: 20 bytes
20 Output Bytes	Output Module - Slot 2: 20 bytes

Table T7.1 PROFINET I/O Configuration

- 1) With the NXAx2 icon selected on the PROFINET bus, click on the “Device view” tab. The view in the Hardware Catalog will change. Expand the Module tree to show both the Input and Output modules.
- 2) To map the I/O bytes to the CPU, double click on the “20 bytes IN” and “20 bytes OUT” icons in the Hardware Catalog. The system will automatically assign the next I and Q addresses to the data table.

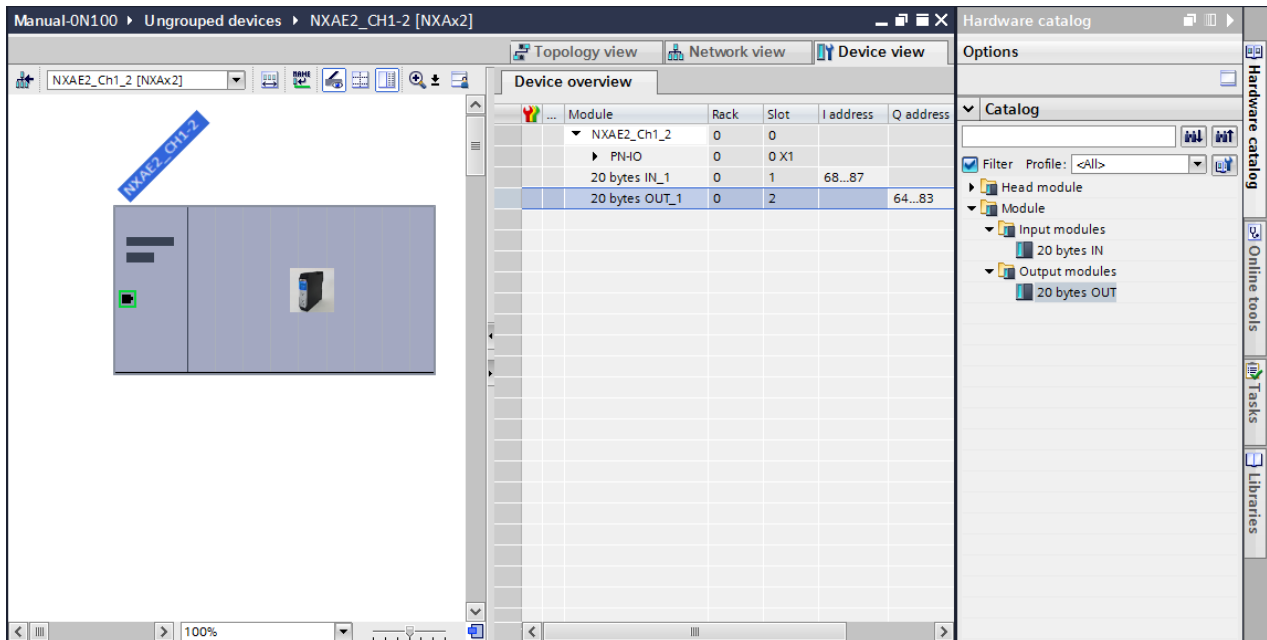


Figure T7.4 I/O Byte Mapping

7.6 Verify and Download the New Configuration

- 1) Continue by adding any remaining devices to your PROFINET network.
- 2) Compile and download the project to the CPU.

MRP Installations

At this point, the NXAE2 is configured and ready to use. If you are using the unit in a redundant, ring based, network that uses the Media Redundancy Protocol (MRP), continue with the following instructions.

Media Redundancy Protocol (MRP) installations require that the NXAE2 be installed in a ring topology. In these applications, both Ethernet ports are used when wiring the ring, daisy chaining from one unit in the ring to the next. The steps below covers typical software configuration that must also be completed.

7.7 Configure the NXAE2 as an MRC

The NXAE2 functions as a Media Redundancy Client (MRC) in an MRP network.

- 1) Switch to Topology view and drag the additional connections between the appropriate ports.
- 2) Click on the NXAx2 icon to select it. In the Inspector window, select *Advanced options +> Media redundancy*. Use the “MRP domain:” drop down menu to select the appropriate domain. Use the “Media redundancy role:” drop down menu to select “Client”.
- 3) Continuing in the Inspector window, select *Advanced options +> Port 1 +> Port interconnection*. Under “Partner port:”, the partner port you assigned to the port when you drew the topology is shown. If you do not know which port will be the partner port in the actual installation, you can use the drop down menu to select “Any partner”.
- 4) If need be, repeat step 3 for Port 2 of the NXAE2.

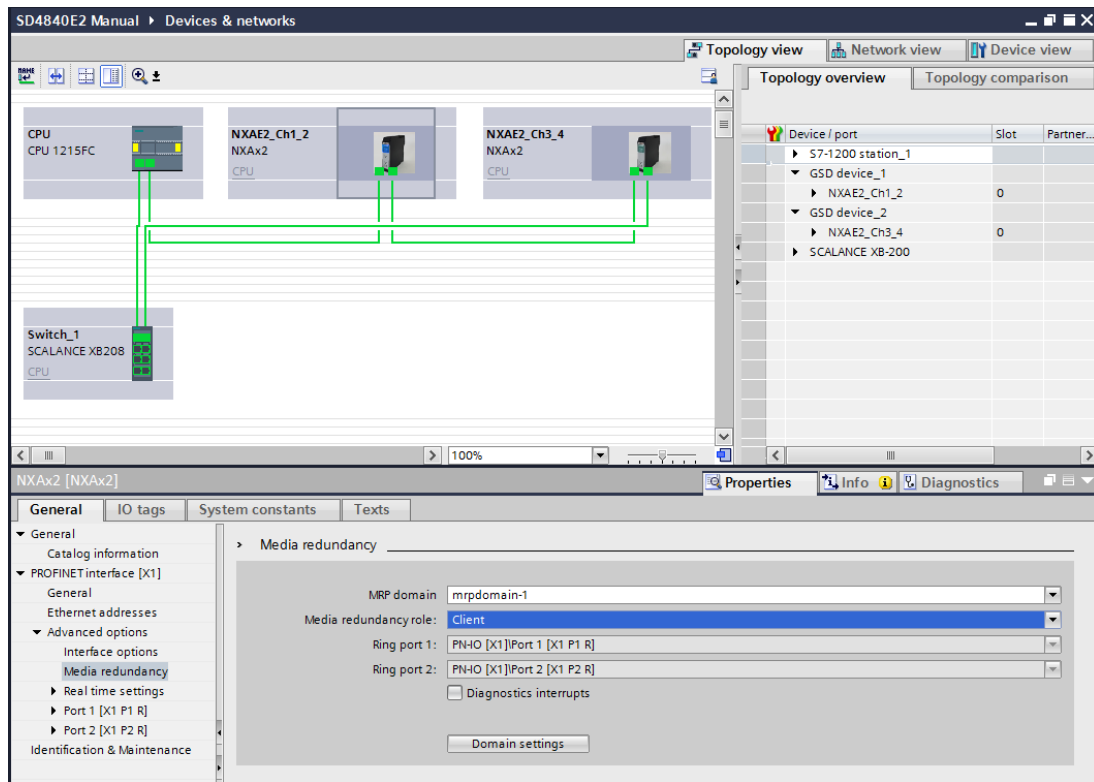


Figure T7.5 MRP Topology and Client settings

- 5) Continue configuring the rest of the devices on the network before compiling the project and downloading it to the CPU.



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