



NX2A4X Specifications Rev 0.0

Networked Four Channel Resolver Interface Module

Module Overview

The AMCI NX2A4X is a four resolver input module that communicates on a network. The networks covered by this manual, along with the corresponding AMCI part numbers, are shown in the following table.

Network	Part Number
DeviceNet	NX2A4D
Ethernet IP	NX2A4E
Profibus	NX2A4P
Modbus TCP/IP	NX2A4T

The NX2A4C ControlNet resolver interface is not covered by this manual. It has its own separate manual that is available on our website www.AMCI.com
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The four resolvers connected to this module can be configured as four single turn transducers, two single turn transducers and one multi turn transducer, or two multi turn transducers.

This unit has two discrete inputs labeled *Brake* and *Preset*. The Brake Input is used to measure the time between when the brake input makes an *ON to OFF* transition and the stopping of the transducer attached to channel 1. Note that channel 1 must be configured as a single turn channel in order to use the stop time monitoring function. The Preset Input is currently not used by the NX2A4X.

The NX2A4X uses 21 sixteen bit input words and 10 sixteen bit output words to communicate on the network.

Sample programs for this and other AMCI products are available from the following page of our website.

<http://www.amci.com/sampleprograms.asp>



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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. Throughout this manual the following two notices are used to highlight important points.

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

CAUTIONS tell you when equipment may be damaged if the procedure is not followed properly. No patent liability is assumed by AMCI, with respect to use of information, circuits, equipment, or software described in this manual. The information contained within this manual is subject to change without notice. UNDER NO CIRCUMSTANCES WILL ADVANCED MICRO CONTROLS, INC. BE RESPONSIBLE OR LIABLE FOR ANY DAMAGES OR LOSSES, INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM THE USE OF ANY INFORMATION CONTAINED WITHIN THIS MANUAL, OR THE USE OF ANY PRODUCTS OR SERVICES REFERENCED HEREIN.

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ADVANCED MICRO CONTROLS, INC. warrants that all equipment manufactured by it will be free from defects, under normal use, in materials and workmanship for a period of [18] months. Within this warranty period, AMCI shall, at its option, repair or replace, free of charge, any equipment covered by this warranty which is returned, shipping charges prepaid, within 18 months from date of invoice, and which upon examination proves to be defective in material or workmanship and not caused by accident, misuse, neglect, alteration, improper installation or improper testing. The provisions of the "STANDARD WARRANTY" are the sole obligations of AMCI and excludes all other warranties expressed or implied. In no event shall AMCI be liable for incidental or consequential damages or for delay in performance of this warranty.

Returns Policy

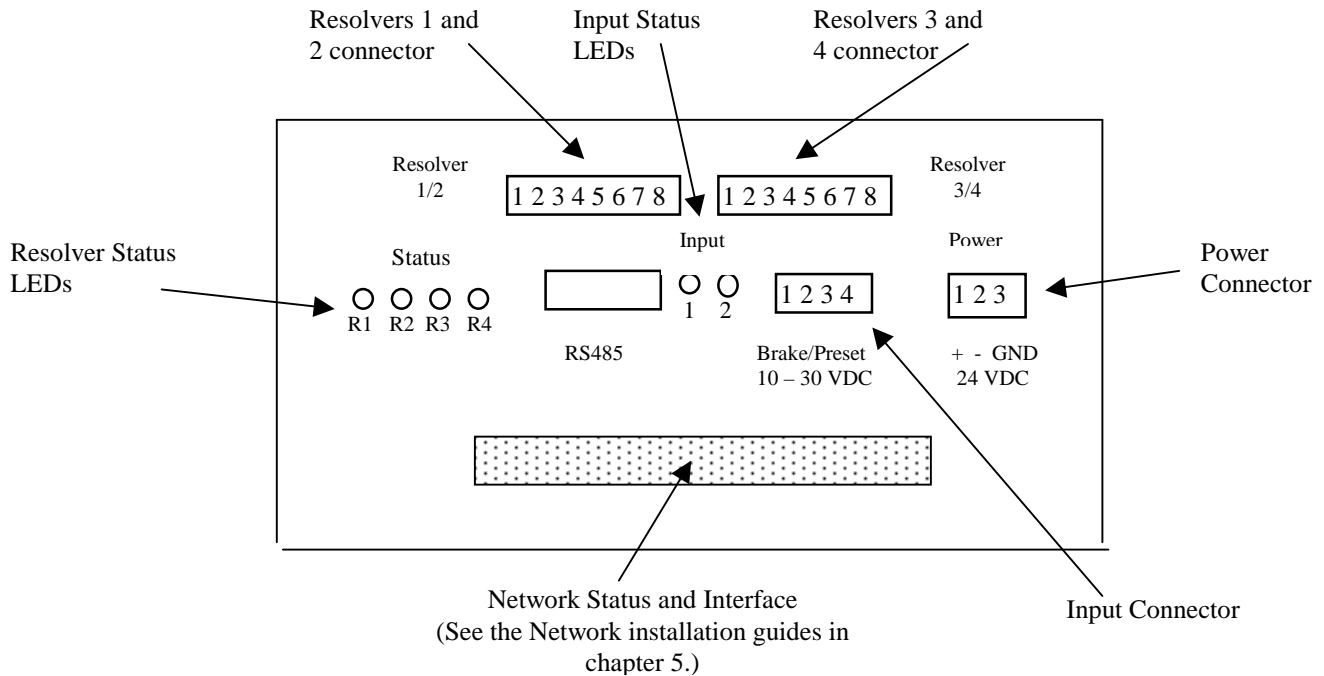
All equipment being returned to AMCI for repair or replacement, regardless of warranty status, must have a Return Merchandise Authorization number issued by AMCI. Call (860) 585-1254 with the model and serial numbers along with a description of the problem. A "RMA" number will be issued. Equipment must be shipped to AMCI with transportation charges prepaid. Title and risk of loss or damage remains with the customer until shipment is received by AMCI.

24 Hour Technical Support Number

Technical Support, in the form of documents, FAQs, and sample programs, is available from our website, www.amci.com. 24 Hour technical support is also available on this product. For technical support, call (860) 583-7271. Your call will be answered by the factory during regular business hours, Monday through Friday, 8AM - 5PM EST. During non-business hours, an automated system will ask you to leave a detailed message and the telephone number that you can be reached at. The system will page an engineer on call. Please have your product model number and a description of the problem ready before you call.

Chapter 1: Installation

NX2A4X Hardware Overview



Dimensions:

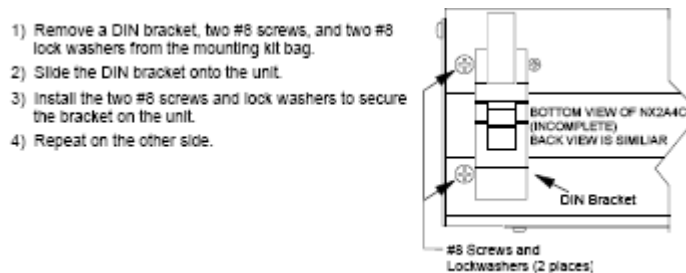
Length = 5.75 inches, Height = 3 inches, Width = 3.76 inches

Mounting

The NX2A4X can be panel mounted in two ways, either on a DIN rail or panel mounted. The mounting kit, included with the unit, contains two DIN brackets, two panel brackets, and four #8 screws needed to attach your choice of brackets to the NX2A4X. Note that the enclosure is not sealed and the NX2A4X must be installed in an adequate enclosure to protect it from environmental contaminants.

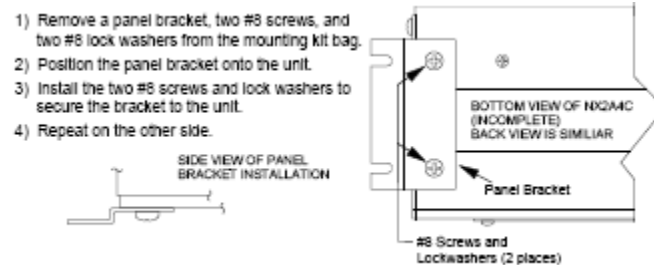
Attaching the DIN Brackets

The following figure shows how to install the DIN brackets so that the NX2A4X can be mounted on EN 50 022 or EN 50 035 rail. Note that the bottom view of the unit is shown. The rear view is similar and the brackets are installed in the same fashion.



Attaching the Panel Brackets

The following figure shows how to install the panel brackets so that the NX2A4X can be securely mounted to an enclosure. Note that the bottom view of the unit is shown. The rear view is similar and the brackets are installed in the same fashion.



Resolver Transducer Connections

The four resolvers connected to this module can be configured as four single turn transducers, two single turn transducers and one multi turn transducer, or two multi turn transducers. The Transducer Input Connectors, labeled “RESOLVER 1/2” and “RESOLVER 3/4” have eight contacts. The mating connectors are supplied with the NX2A4X. The AMCI part number for the mating connector is MS-8, while the Phoenix Contact part number is MSTB2.5/8-ST-5.08, order number 1757077.

The RESOLVER 1 / 2 connector is used for connecting to Single turn Transducers channels 1 and 2 or Multi turn Transducers channel 1. The RESOLVER 3 / 4 connector is used for connecting to Single turn Transducers channels 3 and 4 or Multi turn Transducers channel 2.

The following table shows the connections between the NX2A4X and the various resolver transducers that AMCI offers.

Resolver Connectors

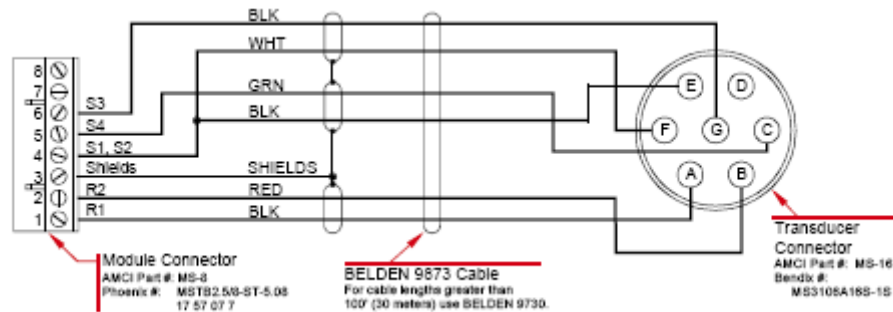
Pin Number	Single turn Function	AMCI Multi turn Function	Autotech Multiturn SAC-RL210
1	R1 both channels	R1	R1
2	R2 both channels	R2	R2
3	Shields	Shields	Shields
4	S1 & S2 both channels	S3F, S2F, S1C, S2C	S3C, S4C, S1F, S2F
5	S4 channel 1	S3C	S2C
6	S3 channel 1	S4C	S1C
7	S4 channel 2	S1F	S4F
8	S3 channel 2	S4F	S3F

Note: The reference voltage signal, R1 and R2, of both connectors, is common. In the multiturn columns, “C” is for the Coarse resolver and “F” is for the Fine resolver.

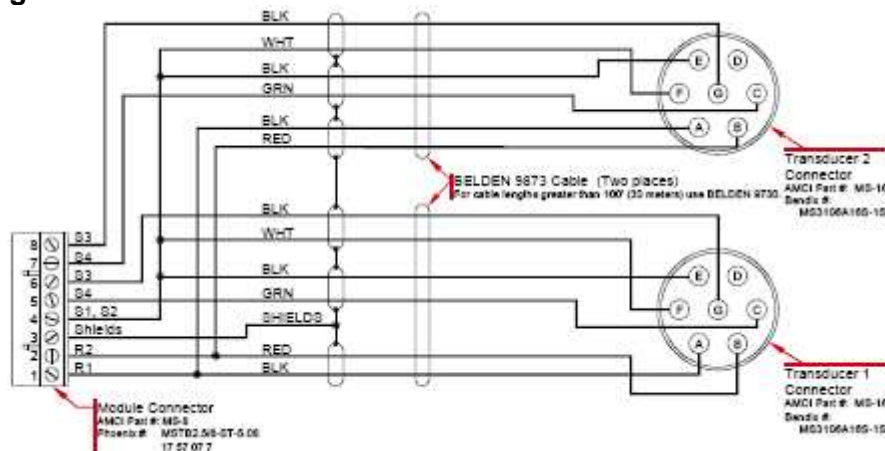
Pre made cables are available from AMCI. These cables come with a Bendix connector that mates with the resolver transducer. The other end is pigtailed at the factory for easy connection to the MS-8 connector that is included with the NX2A4X. These cables have a part number of CTL-X for single turn transducers and CML-X for the multiturn transducers. In both cases, X equals the length in feet.

The following three diagrams show how to wire the CTL-X and CML-X cables to the NX2A4X.

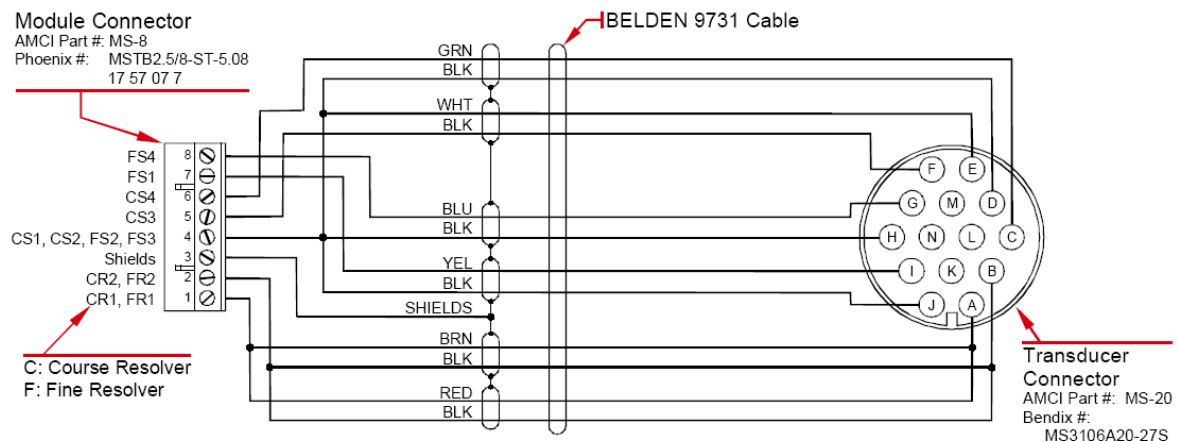
One Single turn Transducer Cable



Two Single turn Transducer Cable



One Multi turn Transducer Cable



Wiring Notes:

- Resolver signals are low voltage, low power signals. It can be installed in conduit along with other low power cabling such as communication cables and low power ac/dc I/O lines. It cannot be installed in conduit with ac power lines or high power ac/dc I/O lines.
- AMCI recommends the use of either the Beldin 9873 or 9730 or equivalent cables to connect the single resolver transducer to the NX2A4X module. While the Beldin 9730 can be used for any length of cable run, the 9783 can only be used for runs less than 100 feet.
- AMCI recommends the use of the Beldin 9731 or equivalent cable to connect a dual resolver multiturn transducers, including an Autotech SAC-RL210, to the NX2A4X module.
- To reduce or eliminate the influence of electrical noise on the system, the resolver cable shields must be connected to shield pin 3. The shields pins on the Transducer Input Connectors are brought to the Chassis Ground pin on the power supply connector.
- The shields must be connected to only one end of the cable run and treated as conductors at any junctions. Do not ground the shields at the junction box.
- If electrical noise is causing your resolver counts to jump, try running a heavy wire from the power connectors Chassis Ground pin to your earth ground bus. This will provide a better low impedance path to ground.
- If the resolver cable must cross power feed lines, it should do so at right angles.
- Route the cable at least five feet from high voltage enclosures, or sources of “rf” radiation.

Resolver Status LEDs

The following table describes the function of the four resolver status LEDs.

1 = Resolver 1, 2= Resolver 2, 3 = Resolver 3, 4 = Resolver 4

LED Pattern	Function
Off	LED Disabled
Solid green	Resolver OK
Flashing green	Clearable Transducer Fault
Flashing red	Non Clearable Transducer Fault
Solid red	Module Fault
Flashing red & green	Channel 1 Status only. No communication between the main board and the network board.

Power Requirements

Power Connector

Pin	Function
1	+24Vdc
2	DC Common
3	Chassis Ground

Note: The Chassis Ground Pin is connected to the NX2A4X's body and must be connected to your earth ground bus for proper module operation.

The Nexus Module requires 500mA of current @24Vdc to operate.

Power Up Delay

There is an eight second delay between power up and when the NX2A4X begins to communicate with the network.

New Position Update Time

200 microseconds

Tachometer Resolution and Range

Resolution: 1 RPM

Range: 1 to 5000 RPM

Input Function and Status LEDs

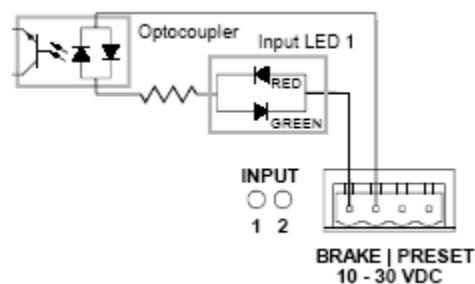
The NX2A4X has two discrete inputs labeled *Brake* and *Preset*. The Brake Input is used to measure the time between when the brake input makes an *ON to OFF* transition and the stopping of the transducer attached to channel 1. Note that channel 1 must be configured as a single turn channel to use the stop time monitoring. The Preset Input is currently not used by the NX2A4X.

The inputs are bipolar. Connecting one of the inputs pins to +Vdc and the other to the power supply common will cause the input to activate.

- Logic 0 = 0 to 2Vdc
- Logic 1 = 10 to 30Vdc
- 10mA minimum current required to activate the input

Input Connector		Input LED Active State	
Pins	Function	LED Color	
1 to 2	Brake Input	Red	Pin 1 or 3 = Vdc Pin 2 or 4 = Common
3 to 4	Preset Input	Green	Pin 2 or 4 = Vdc Pin 1 or 3 = Common

The following figure shows the pin out and simplified schematic of the Brake Input. The schematic of the Preset input is identical.



Chapter 2: Programmable Parameters

You configure your unit by setting the values of its *Programmable Parameters*. These parameters are stored in a nonvolatile memory. Therefore, there is no need to configure the NX2A4X after every power up. The nonvolatile memory is an EEPROM that is rated for approximately 100,000 write cycles.

Apply Preset

There are four Apply Preset bits, one for each channel. Setting one of these bits while programming the NX2A4X module will cause the channel's current position data to be changed to the programmed Preset value. The result of the Apply Preset operation is saved through power down.

Note: Programming a channel's setup data will undo the result of an Apply Preset operation.

Count Direction

This parameter sets the direction of transducer shaft rotation that increases the position count. *If the transducer is wired as specified in this manual* and the count direction is set to *Clockwise*, the count will increase with clockwise rotation, (looking at the shaft). If the count direction is set to *Counter Clockwise*, the position count will increase with counter-clockwise rotation.

- The default Count Direction Value is *Clockwise*.

Note: It is also possible to reverse the count direction by reversing S2 S4 wire pairs in the transducer cable. If you are designing the NX2A4X into an older system, it is possible that your drawings already have the pairs reversed and you may not need to set this parameter. Once the machine is setup, you can easily change this parameter if the position is increasing in the wrong direction.

Transducer Fault Latch

Normally, a transducer fault is latched by the NX2A4X. Transducer faults can be caused by improper wiring, electrical noise, or a damaged transducer. When the unit detects a fault condition, it reports this fault over the network until a *Clear Errors* command is issued to it. If you have a situation where electrical noise is causing spurious transducer faults that you can safely ignore, you can disable the Transducer Fault Latch and force the NX2A4X to clear a fault as soon as possible. Note that an intermittent wiring problem may also cause spurious faults. If you want to reliably capture these transient faults, then you must leave the Transducer Fault Latch enabled because the NX2A4X can detect and clear transducer faults much faster than the network scans the unit.

- The default Transducer Fault Latch value is *enabled*.

Tachometer Response

This parameter sets the time between tachometer updates. It *only* affects the update time of the tachometer. It *does not* affect the update time of the position value, which is always 200 microseconds.

- The default Tachometer Response is 120 milliseconds.
- The Tachometer Response can be set to 120 or 24 milliseconds.

Resolver Type

The *Resolver Type* parameter allows you to use the NX2A4X with Autotech transducers. Unlike the other NX2A4X parameters, the Resolver Type parameter only exists on channel 1 because this parameter affects all channels.

- The default Resolver Type value is *AMCI*.

Note

1. AMCI has bolt-in replacements for most Autotech transducers and we strongly suggest using them in place of Autotech transducers whenever possible.
2. You can bring both AMCI and Autotech single-turn resolvers into one unit. Set the Resolver Type to *AMCI* and install a RM-3 to interface the Autotech transducers.
3. You can bring AMCI single-resolver transducers into a NX2A4X with an Autotech multi-turn transducer. Set the Resolver Type to *Autotech* and install an RM-3 Reference Module to interface the AMCI transducers.
4. You cannot bring AMCI and Autotech multi-turn transducers into one unit.
5. For more information on interfacing with Autotech transducer, see the AMCI's FAQ, "*Using Transducers From Other Manufacturers*", posted on our website, www.amci.com.

Channel LED Enable

This bit level parameter allows you to enable or disable the resolver status LEDs. This parameter is useful if you do not want the NX2A4X to display resolver errors on channels that are not being used in your application.

- The default state of the channel 1 resolver status LED is enabled
- The default state of the channel 2 through 4 resolver status LEDs is disabled.

Full Scale Count

The Full Scale Count specifies the total number of counts generated by the NX2A4X. In the case of single turn transducers, it is the total number of counts over the one turn. In the case of multi turn transducers, it is the total number of counts over the programmed Number of Turns.

For All Single-Resolver Transducers

- The default Full Scale Count is 8,192.
- Range is 2 to 8,192. Setting the Full Scale Count to 360 gives 1 degree resolution.

For AMCI Multi turn Transducers

- Default value is (Number of Turns * 4,096) if Transducer Type equals 100 or 180
- Default value is (Number of Turns * 409.6) if Transducer Type equals 1,000 or 1,800
- Range is 2 to (Default Value)

For Autotech Multi turn Transducers (Transducer Type equals 128)

- Default value is (Number of Turns parameter) * 1,024
- Range is 2 to (Default Value)

Linear Offset

The Linear Offset parameter changes the *range* of count values output by the unit and is used when the transducer position directly correlates to a linear measurement that does not start at zero. One such example is an overhead crane. Another example is a press shut height measurement. As an example of how the Linear offset works, when the **Full Scale Count** is set to 1,500 and the Linear Offset is set to zero, the NX2A4X will output position values from 0 to 1,499. If the Linear Offset is changed to 100, then the unit will then output values from 100 to 1,599.

- The default Linear Offset is zero.
- For single-turn channels, the range of the Linear Offset is 0 to (32,767 – Full Scale Count).
- For multi-turn transducers, the range of the Linear Offset is 0 to 999,999.

Preset Value

The Preset Value parameter allows you to set the value of the position data to any count value within its range. The range of the count values is (Linear Offset) to (Linear Offset + (Full Scale Count - 1)). When the **Linear Offset** equals zero, this translates into 0 to (Full Scale Count - 1). Programming the Preset Value does not change the position data; it only sets the value that the position will change to when an *Apply Preset Command* is issued.

- The default Preset Value is equal to the Linear Offset, which is typically zero. Programming the Linear Offset resets the Preset Value to equal it.
- The Preset Value range is (Linear Offset) to (Linear Offset + (Full Scale Count - 1)). When the Linear offset equals zero, this reduces to 0 to (Full Scale Count - 1)

Transducer Type

(Multi turn Transducer Parameter Only)

The Transducer Type parameter exists for multi-turn transducers only. If a channel is programmed to be used with a single-resolver transducer, then this parameter does not exist for that channel. The Transducer Type parameter defines the type of multi-turn transducer attached to the channel. The NX2A4X needs this information in order to decode the multi-turn position correctly. This parameter also defines the values that can be programmed into the **Number of Turns** parameter.

- If the **Resolver Type** parameter is set to *AMCI*, the Transducer Type parameter can be set to 100, 180, 1,000, or 1,800.
- If the **Resolver Type** parameter is set to *Autotech*, the Transducer Type parameter must be set to 128.

Number of Turns

(Multi turn Transducer Parameter Only)

The maximum number of turns a multi-turn transducer can encode is fixed by the gearing inside of it. However, the NX2A4X has the ability to divide this maximum number of turns into smaller multi-turn cycles. The unit does this without loss of absolute position within the smaller cycle. For example, the 180 turn mechanical cycle of an HTT-20-180 can be broken down into three electronic cycles of sixty turns each. The 180 turn cycle could also be broken down into sixty cycles of three turns each.

The range of values for the Number of Turns parameter is dependent on the value of the *Transducer Type* parameter.

- **When Transducer Type = 100:** Number of Turns is programmable to 1, 2, 4, 5, 10, 20, 25, 50, or 100.
- **When Transducer Type = 180:** Number of Turns is programmable to 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, or 180.
- **When Transducer Type = 1,000:** Number of Turns is programmable to 10, 20, 40, 50, 100, 200, 250, 500, or 1,000.
- **When Transducer Type = 1,800:** Number of Turns is programmable to 10, 20, 30, 40, 50, 60, 90, 100, 120, 150, 180, 200, 300, 360, 450, 600, 900, or 1,800.
- **When Transducer Type = 128:** Number of Turns is programmable to 1, 2, 4, 8, 16, 32, 64, or 128.

Chapter 3: Input Registers (Data sent from the NX2A4X module to the network)

The following table shows the input data format for the NX2A4X module.

Word Number	Single turn Transducers	Multi turn Transducers
0	Channel 1 Status Word	Channel 1 Status Word
1	0	Channel 1 upper 3 digits position
2	Channel 1 Position	Channel 1 lower 3 digits position
3	Channel 1 Velocity in RPM	Channel 1 velocity in RPM
4	Channel 2 Status Word	0
5	0	0
6	Channel 2 Position	0
7	Channel 2 Velocity in RPM	0
8	Channel 3 Status Word	Channel 2 Status Word
9	0	Channel 2 upper 3 digits position
10	Channel 3 Position	Channel 2 lower 3 digits position
11	Channel 3 Velocity in RPM	Channel 2 velocity in RPM
12	Channel 4 Status Word	0
13	0	0
14	Channel 4 Position	0
15	Channel 4 Velocity in RPM	0
16	Stopping Time	0
17	Brake Applied Position	0
18	0	0
19	0	0
20	0	0

Status Word Layout

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Acknowledge bit (ch 1 only)	Module Fault	Transducer Fault Bit	0	0	Channel Type (0=single turn, 1=multi turn)	Velocity at zero	Motion Direction (0=increasing, 1=decreasing)	Message Ignored	Command Error	Preset Value Error	Linear Offset Error	Full Scale Count Error	Number of Turns Error	Transducer Type Error	Configuration Error



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Configuration Error: Set if any of the unused bits in the configuration word are set.

Transducer Type Error: Multi turn Transducer Programming Error only. This bit is set if the transducer type is not equal to 100, 180, 1000, or 1800 if the module is configured for AMCI transducers, or 128 if the module is configured for Autotech transducers. This bit will always be reset when the channel is being used as a single turn resolver.

Number of Turns Error: Multi turn Transducer Error only. This bit will always be reset when the channel is being used as a single turn resolver. This bit is set if the number of turns is invalid for the transducer type selected. The following list shows the valid Number of Turns for the selected resolver transducer.

100 turn = 100, 50, 25, 20, 10, 5, 4, 2, or 1
180 turn = 180, 90, 60, 45, 36, 30, 20, 18, 15, 12, 10, 9, 6, 5, 4, 3, 2, 1
1000 turn = 1000, 500, 250, 200, 100, 50, 40, 20, 10
1800 turn = 1800, 900, 600, 450, 360, 300, 200, 180, 150, 120, 100, 90
60, 50, 40, 30, 20, 10
128 turn = 128, 64, 32, 16, 8, 4, 2, 1

Full Scale Count Error: Set if the Full Scale Count is outside of the range of,

2 to 8192 for Single turn transducers
2 to (4096 * Number of Turns) for 100 or 180 turn transducer
2 to (409.6 * Number of Turns) for 1000 or 1800 turn transducer
2 to (1024 * Number of Turns) for an Autotech 128 turn transducer

Linear Offset Error: Set if the linear offset is outside of the range of:

0 to (32767 - Full Scale Count) for single turn transducers
0 to 999,999 for multi turn transducers

Preset Value Error: Set if the preset value is outside of the range of Linear Offset to (Linear Offset -(Full Scale Count -1))

Command Error: Set if any of unused bits in the command word are set, if you try to program a channel that is not present, if you try to program more than one channel at a time, or if you attempt to preset single channels 2 or 4 if they have been configured as multiturn channels.

Message Ignored: Set if an attempt is made to program a parameter if an error already exists on a different parameter. This bit will also be set if you use the Apply Preset command on a channel that is in transducer fault.

Motion Direction: This bit will be "0" if the counts are increasing, or "1" if the counts are decreasing. The bit will remain in its last state when there is no motion.

Velocity at Zero: This bit will be set if there has been no motion for 125ms.

Channel Type: This bit will be reset if the input channel is configured to be used with single turn transducers, and set if the input channel is configured to be used with multi turn transducers.

Transducer Fault: This bit will be set if a transducer Fault has been detected. Transducer faults can be caused by improper wiring, electrical noise, a damaged NX2A4X, or a damaged transducer.

Module Fault: Set if there is a module fault, such as an EEPROM error.

Acknowledge Bit: Set when the Transmit bit is set in output word 0. This bit is present only in the channel 1 status data.

Position Data: This register shows the current position data from the resolver transducer. This register will count from 0 to (Full Scale Count –1). If the resolver transducer continues to rotate in the same direction, the count value will then roll over to zero and start counting again. The position data is updated every 200 microseconds.

When configured to read the position data from a multiturn transducer, the NX2A4X reports the position data in two words. The upper word contains the thousands places and the lower word contains the 100s, 10s, and 1s places. For example, if the position value is 12,345, then the upper word would contain 12, and the lower word would contain 345. Multiply the upper word by 1000 and add the lower word to it to combine these two values into one register.

Velocity Data: This register shows the current rate of change of the position data and has units of Revolutions/Minute (RPM). The velocity data is updated every 120 or 24ms, depending on the channel's configuration.

Stopping Time This parameter only exists on channel 1 and only when it has been configured for a single turn resolver. This register shows the time between the *ON to OFF* transition of the Brake Input and the stopping of the transducer. The Stop Timer measures a stopping time of 34 milliseconds to 64.140 seconds with a resolution of 1 millisecond.

Brake Applied Position The channel 1 resolver position where the brake input transitioned from *ON to OFF*. This value is updated only when the Stopping Time value has been determined.

Input Data Notes

1. It is possible to configure the module for one Multi turn and two Single turn transducers at the same time. If channel 1 is used for the Multi turn input, then the channel 1 and 2 Single turn data is replaced by the channel 1 Multi turn data. However, the channel 3 and 4 single turn data will remain. If the channel 2 Multi turn is used, then the channel 3 and 4 Single turn data is replaced by the channel 2 Multi turn data, and the channel 1 and 2 Single turn data remains. It is not necessary to use the channel 1 Multi turn data before using the channel 2 Multi turn data.
2. If the module is configured to work with Multi turn transducers, programming either of the Single turn channels associated with the Multi turn channel will replace the Multi turn channel data with the data of both Single turn channels. For example if Multi turn channel 1 is being used, and Single turn channel 2 is programmed, then single turn channel 1 and channel 2 data will replace Multi turn channel 1 data in the input registers.
3. The data in the input registers remains in its last state if the Nexus module is removed from the network.

Chapter 4: Output Registers (Data sent from network to the NX2A4X)

The format of the output data is shown in the following table. Please note that only one channel can be programmed at a time. However, you can program one channel and Apply the Preset to multiple channels with one write operation.

Word Number	Single Resolver Transducers	Multi turn Transducers
0	Control	Control
1	Configuration	Configuration
2	0	Upper 3 Digits Full Scale Count
3	Full Scale Count	Lower 3 Digits Full Scale Count
4	0	Upper 3 Digits Linear Offset
5	Linear Offset	Lower 3 Digits Linear Offset
6	0	Upper 3 Digits Preset Value
7	Preset	Lower 3 Digits Preset Value
8	0	Transducer Type
9	0	Number of Turns

Control Word Function

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Transmit Bit	Clear Errors	0	0	0	0	Program Multi turn channel 2	Program Multi turn channel 1	Program Single turn channel 4	Program Single turn channel 3	Program Single turn channel 2	Program Single turn channel 1	Apply Preset channel 4	Apply Preset channel 3 (Single or Multi turn)	Apply Preset channel 2	Apply Preset channel 1 (Single or Multi turn)



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Configuration Word Function

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
0	0	0	0	0	0	0	Enable Channel LED (0=disable, 1=enable)	0	0	0	0	Resolver Type (0=AMCI, 1=Autotech) (Programmed on channel 1 only)	Tachometer Response (0=120ms, 1=24ms)	Transducer Fault Latch (0=yes, 1=no)	Direction (0=CW, 1=CCW increasing)

Transducer Type Range: Single Turn: “don’t care.”

Multiturn: 100, 180, 1000, 1800 for AMCI or 128 for Autotech

Number of Turns Range: Single Turn: “don’t care.”

100 turn = 100, 50, 25, 20, 10, 5, 4, 2, or 1

Multiturn 180 turn = 180, 90, 60, 45, 36, 30, 20, 18, 15, 12, 10, 9, 6, 5, 4, 3, 2, 1

1000 turn = 1000, 500, 250, 200, 100, 50, 40, 20, 10

1800 turn = 1800, 900, 600, 450, 360, 300, 200, 180, 150, 120, 100, 90

60, 50, 40, 30, 20, 10

128 turn = 128, 64, 32, 16, 8, 4, 2, 1

Full Scale Count Range: 2 to 8192 for Single Turn resolvers

2 to (4096 * Number of Turns) for 100 or 180 turn transducer

2 to (409.6 * Number of Turns) for 1000 or 1800 turn transducer

2 to (1024 * Number of Turns) for an Autotech 128 turn transducer

Linear Offset Range: 0 to (32767 - Scale Factor) for single turn resolvers

0 to 999,999 for multiturn resolvers

Preset Range: Linear Offset to (Linear Offset + (Full Scale Count -1))

Output Data Notes

1. Words 8 and 9, the transducer type and number of turns parameter, apply only for multiturn channels and are not used for single turn resolvers. When programming single turn resolvers, words 8 and 9 are “don’t cares.”
2. When programming multiturn transducers for Autotech, channel 1 must be programmed before channel 2 because channel 1 configures the module for Autotech transducers.
3. When programming the setup data for a multiturn transducer, the Full Scale Count, Linear Offset, and Preset Value parameters are programmed in two data words. The upper word contains the thousands places and the lower word contains the 100s, 10s, and 1s places. For example, if your desired Full Scale Count is 12,345, then the upper word would contain 12, and the lower word would contain 345.

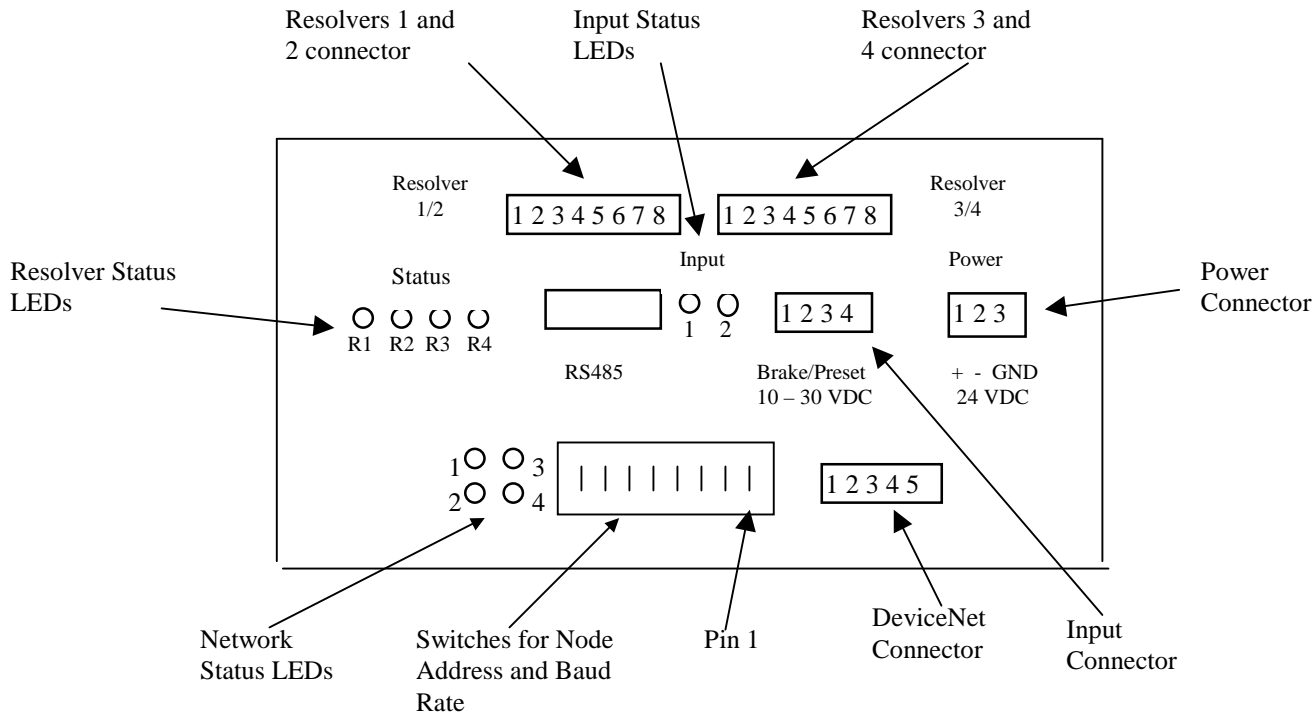
Programming Cycle

1. The ladder logic program writes the data into the output registers.
2. The ladder logic program then sets the transmit bit.
3. When the module detects the 0 to 1 transition of the transmit bit, it will respond by setting any error bits and the Acknowledge bit in the input registers.
4. When the ladder logic program sees that the acknowledge bit is set, it will examine any error bits, and then reset the transmit bit.
5. The module will reset the Acknowledge bit.
6. The programming sequence is now complete.

Warning: The EEPROM used to store parameter values, and the internal offset that is calculated every time you use the Apply Preset Command, is guaranteed for approximately 100,000 write cycles before writing to it will cause it to fail. Therefore, continuously presetting the position or writing new parameters should be avoided. If your application requires you to continuously Apply the Preset to the position, consider calculating the required position offset in your ladder logic program. A description of how to perform this operation is shown in the FAQ section of our website, www.AMCI.com.

Chapter 5: Network Configurations

NX2A4D DeviceNet Hardware Overview



DeviceNet Connector

The 5 pin DeviceNet Connector has the following wiring.

Pin Number	Function	Standard Wire Color
1	+24Vdc	Red
2	Can High	White
3	Shields	Bare
4	Can Low	Blue
5	Common	Black

Node Address and Baud Rate Selection

The NX2A4D uses eight DIP switches to select the Node Address and the Baud Rate. Switches 1 and 2 set the Baud rate and switches 3 to 8 set the node, with switch 8 being the least significant bit. The following table shows the possible switch setting combinations.

The DIP switch package is mounted so that the numbers are upside down. However, “1” or “ON” is still in the up position and “0” or “OFF” is in the down position.

Baud Rate	Switches 1 & 2 1 2
125k	0 0
250k	0 1
500k	1 0
Reserved	1 1

Node Address	Switches 3 to 8 3 4 5 6 7 8
0	0 0 0 0 0 0
1	0 0 0 0 0 1
2	0 0 0 0 1 0
3	0 0 0 0 1 1
61	1 1 1 1 0 1
62	1 1 1 1 1 0
63	1 1 1 1 1 1

Example: For a Baud Rate = 250K and the Node Address = 5, switches 2, 6, and 8 would be ON, up towards the top of the module and switches 2, 3, 4, 5, and 7 would be OFF, down towards the bottom of the module.

Note: The state of the switch settings is only taken into account at power up.

DeviceNet Status LEDs

The following table describes the function of the four network status LEDs.

LED Number	Name	LED Pattern	Description
1	Module Network Status	Steady Off Steady Red Steady Green Flashing Red	No Power Unrecoverable Fault Device Operational Minor Fault
2	Network Status	Steady Off Steady Red Steady Green Flashing Red Flashing Green	Not Powered / Not On Line Critical link failure Link OK, On Line, Connected Connection Time Out On Line not connected
3	Reserved		
4	Reserved		

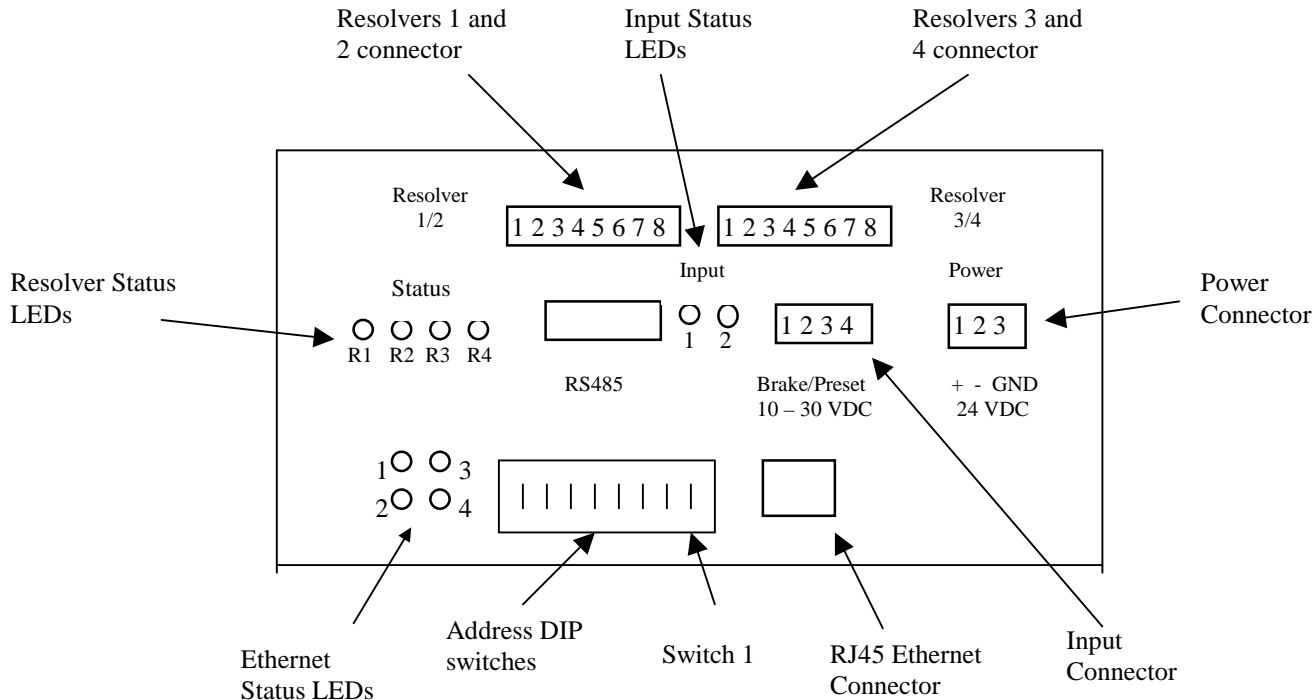
Adding the NX2A4D to your network

Before the NX2A4D can be attached to a network, it must be added to the RSNetWorx for DeviceNet software. The EDS and icon files are available in the *Tech Library* section of our website, www.amci.com. The following procedure to add the EDS file to RSNetWorx assumes that you have already downloaded and un-zipped these files.

1. With the power off, use the dip switches on the front of the NX2A4D to set the node address and the baud rate.
2. Start RSNetWorx for DeviceNet.
3. In the RSNetWorx program, click on **Tools** in the menu bar.
4. Click on **EDS Wizard...** from the pull down menu that appears.
5. Click on **Next>** in the window that appears.
6. Select **Register an EDS file(s)** and click on **Next>**.
7. Select **Register and EDS file**.
8. Click on **Choose File...** and navigate to the folder where you placed the un-zipped EDS and icon files.
9. Double click on **NX2A4D_r01.eds** file.
10. Click on **Next>**.
11. Click on **NX2A4D_r01.eds** file so that it is highlighted.
12. Click on **Next>** to assign an icon to the device.
13. Click on the NX2A4D and then click on **Change icon...** to select the icon for the Nexus unit. You can choose one of the built in icons from Rockwell Automation or click on the **Browse...** button and select the **NX2A4D_r01.ico** icon file.
14. Click on **Next>** and then click on **Finish** to complete the installation of the AMCI NX2A4D EDS file to the RSNetWorx system.

Once the EDS file is added to your system, add the NX2A4D to your network as you would any other device, including adding it to the scanlist configuration of the scanner module.

NX2A4E Ethernet IP Hardware Overview



Changing the Ethernet IP Address

The NX2A4E has a default IP address of 192.168.000.XXX where “XXX” can be any number between 1 and 254 and is set by the dip switches located on the front of the module.

Use the following procedure if you want your IP address to be something other than 192.168.000.XXX.

1. Remove power from the Nexus Unit.
2. Set all of the unit's dip switches to the OFF (Down) position. This will set the unit's address to 0000 0000.
3. Start and configure your BootP server. Any DHCP/BootP server running on a computer, which is connected to the same network, may be used for this purpose. Please note that the Nexus Unit's MAC ID address is located on a label on the module's cover.
4. Apply power to the Nexus Unit.
5. At power-up the module will attempt to get an IP address by sending several BootP requests. This operation will require approximately 30 seconds. At this point LED2 will be flashing green. If retrieved, the IP configuration will be used and stored in the Nexus Unit's Flash Memory, overwriting older IP settings.
6. The Nexus Unit will now join the network with the newly set IP configuration.
7. If a BootP server is not found, the Nexus Unit will use the IP configuration that had been previously stored in its flash memory.
8. Cycle power to the NX2A4E. The changes to the IP address will not be permanent until power has been cycle.

Ethernet Address Selection using the DIP switches

The NX2A4E uses an IP address of 192.168.000.XXX where “XXX” can be any number between 1 and 254. Eight dip switches on the NX2A4E are used to set the “XXX” portion of the address. Switch 8, the left most switch, is the least significant bit and switch 1, the right most switch, is the most significant bit. The address is programmed using the following procedure.

1. Determine the address of the NX2A4E. It can be any unused address between 1 and 254.
2. Convert the address to a binary number. A value of 50 will be 0011 0010.
3. Enter the address on the dip switches. Continuing the above example, switches 8, 6, 5, 2 and 1 will be off (down) and switches 7, 4, and 3 will be on (up).

Ethernet Status LEDs

The following table describes the function of the four network status LEDs.

LED Number	Name	LED Pattern	Function
1	Network Status	Steady Off Steady Green Flashing Green Flashing Red Steady Red Flashing Green/Red	The module has no power or an IP address has been assigned. The module has at least one established Ethernet/IP connection. There are no Ethernet/IP connections established to the module One or more of the connections in which this module is the target has timed out The module has detected that its IP address is already in use The module is performing a power on self test
2	Module Status	Steady Off Steady Green Flashing Green Flashing Red Steady Red Flashing Green/Red	No Power. The module is operating correctly. The module has not been initialized. A minor recoverable fault has been detected. A major internal error has been detected. The module is performing a power on self test.
3	Activity LED		This LED flashes green each time a packet is received or transmitted
4	Link		This LED indicates that the module is connected to an Ethernet network

Setup Example

AMCI NX2A4E to Rockwell Automation 1756-ENET/B module

1. With power removed, use the dip switches to set the address of the NX2A4E.
2. Open an existing or create a new ControlLogix program.
3. From the project tree, right click on I/O configuration and select New Module.
4. From the Module Type list that appears, select 1756-ENET/B, the 1756 Ethernet Bridge module.
5. Type a name for the Bridge module, which must begin with a letter, in the Name field.
6. Enter the slot number where the 1756-ENET/B module is located in the ControlLogix rack.
7. In the Address/Host Name field, select the IP Address and enter the address 192.168.000.XXX where XXX can be a unique number between 1 and 254.
8. Click the Finish button.
9. From the project tree, right click on the 1756-ENET/B module and select New Module.
10. Select ETHERNET-MODULE Generic Ethernet Module from the list that appears and click on OK.
11. In the module properties that appear, enter the following parameters.

Name: **Your Choice** (must begin with a letter)

Comm Format: **Data-INT** (must be Data-INT)

IP Address: **192.168.000.XXX** where XXX is the number entered on the DIP switches

	Assembly Instance	Size
Input	100	21
Output	150	10
Configuration	110	0

12. Click on Next.
13. Select the RPI time, minimum = 3ms.
14. Click on Finish.
15. Save and download the program to the ControlLogix rack.
16. While online with the PLC, right click on the Ethernet Bridge module and select Properties.
17. Click on the Port Configuration tab and modify the following fields.

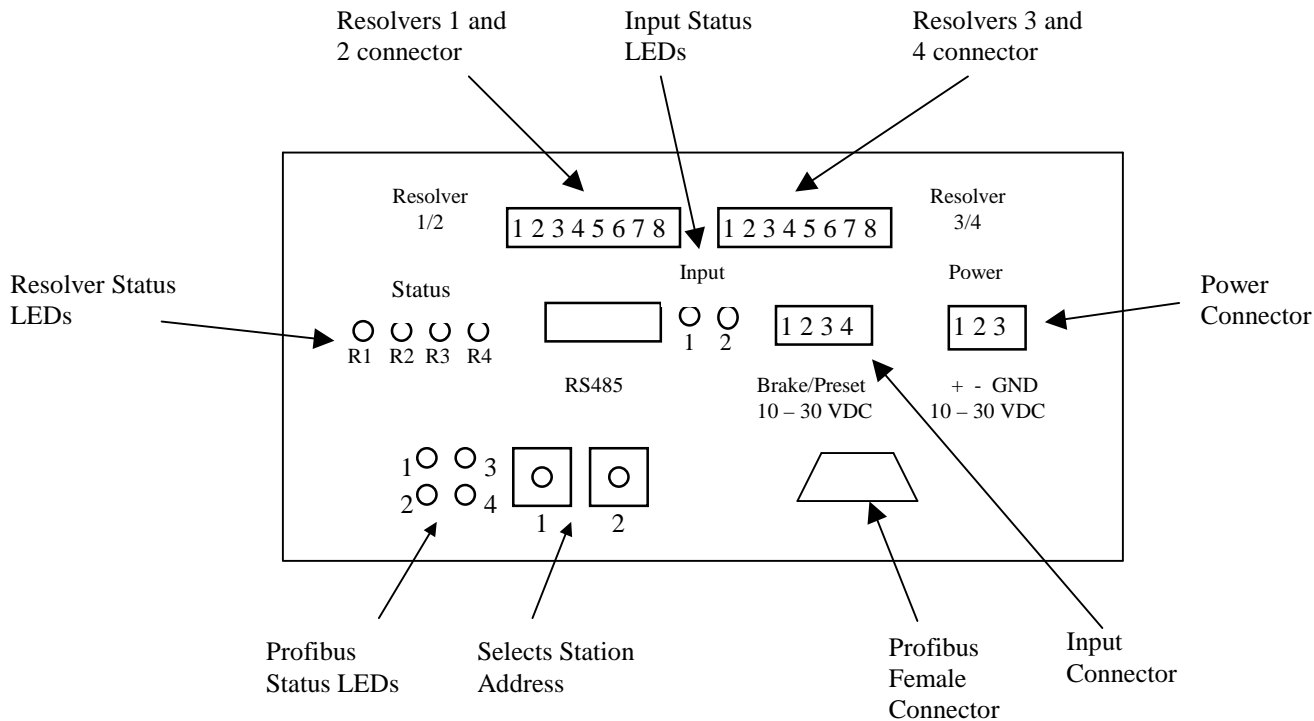
Enable Bootp: **Unselected** (This will allow the data to be manually entered in the IP address and Domain Name fields.)

IP Address: **192.168.000.XXX** (must be the same as step 7 above)

Subnet Mask: **255.255.255.0**

The Gateway Address, Domain Name, Primary DNS Server Address, and Secondary DNS Server Addresses all remain unchanged.

NX2A4P Profibus Hardware Overview



Profibus Connector

The Nexus module uses a 9 pin female D-sub connector to communicate with the Profibus network.

Station Address Selection

The Nexus module has two rotary switches used to set the module's address on the network. Any station from 0 to 99 can be selected. Switch 1 sets the one digit and switch 2 sets the 10s digit of the address. For example, if the Nexus is to be installed at station 46, switch 1 would be set to 6, and switch 2 would be set to 4. Note, changing the station address only takes affect at power up. Changing the address while power is applied to the Nexus module will generate a minor fault.

Profibus Status LEDs

The following table describes the function of the four network status LEDs.

LED Number	LED Pattern	Function
1	Red Off	Module is Offline and no data exchange is possible The module is Online
2	Green Off	Module is Online and data exchange is possible The module is Off line
3	Flashing Red 1Hz Flashing Red 2Hz Flashing Red 4Hz Off	Error in configuration: IN and/or OUT length set during initialization of the module is not equal to the length set during the configuration of the network Error in User Parameter data: The length/contents of the user parameter data set during initialization of the module is not equal to the length/contents set during configuration of the network. Error in initialization of the Profibus communication ASIC. No diagnostic present
4	Off	Not Used

Network Baud Rate

The NX2A4P supports the following network baud rates

9.6 kbits/sec, 19.2 kbits/sec, 93.75 kbits/sec, 187.5 kbits/sec, 500 kbits/sec, 1.5 Mbits/sec, 3 Mbits/sec, 6 Mbits/sec, and 12 Mbits/sec

Quick Start Guide

AMCI Nexus to SST-PFB-SLC Profibus interface module

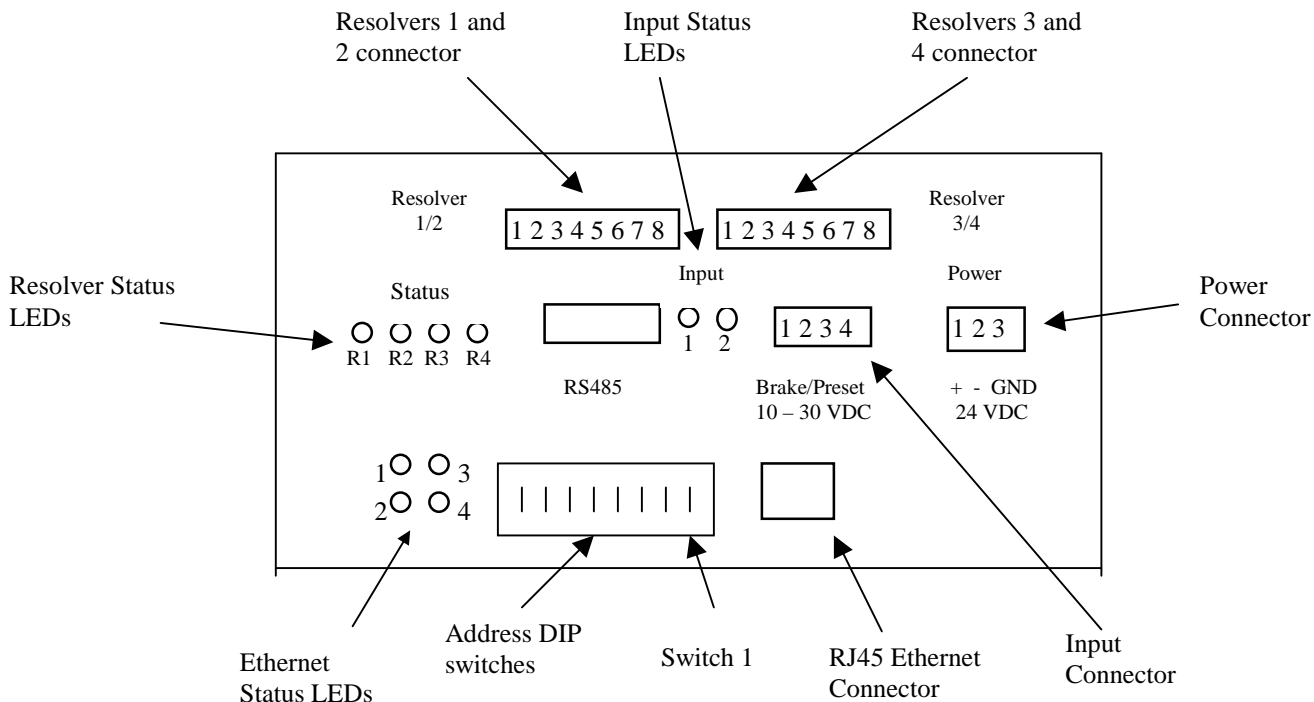
1. If it is not already present, install the SST-PFB-SLC module in the SLC rack and configure the rack (the ID code is 13635) for the module.
2. Place the PLC in program mode.
3. Connect a serial cable from the computer's COM port to the RS232 port of the SST-PFB-SLC module.
4. With the power off, use the rotary switches on the Nexus unit to select the desired station address. The left switch sets the 1s digit and the right switch sets the 10s digit of the station address.
5. Attach the Nexus unit to the Profibus network.
6. Apply power to the Nexus unit.
7. Start the SST Profibus Configuration software.
8. Either create a new or open an existing network.
9. If it has not already present, register the Nexus unit's GSD file, **AnyBPRfB.GSD**. This file is available for download from our website, www.AMCI.com.

Click on Library in the toolbar and then select Add GSD file. Choose the directory where the GSD file is located, and then select the file. When registered this module will appear under Slaves as:

HMS Fieldbus Systems AB ANYBUS-S PDP

10. If SST-PBF-SLC module is not already present, click on Masters. Click and drag the Master (Rev 1.4) into the network. Right click on it and configure it according to your system's requirements.
11. Under slaves, click and drag the ANYBUS-S PDP module into the network. The setup window will appear.
 - Under the **General** tab, set the station number to match the station number set by the rotary switches on the Nexus unit.
 - Click on the **Modules** tab and then click on Add. The NX2A4P must be set for 21 input words and 10 output words. If a different number of words is programmed, Network LED 3 will flash indicating an Error in the Configuration. The input words can be located in either the Input Image table or in the M1 file, however, all 21 input words must be located in one file. Likewise, the 10 output words can be located in either the Output Image table or the M0 file, however, all 10 words must be located in one file.
 - Click on Input 32 Byte (16 word) and then on OK.
 - Click on the **SLC Address** tab and then select the Input Type, either I or M1, and the offset value, that is where in the I or M1 table the data begins. It is important not to leave gaps between an existing Profibus module and the data used by the Nexus unit.
 - Again click on the **Modules** tab and click on Add.
 - Click on Input 8 Byte (4 word) and then on OK.
 - Click on the **SLC Address** tab and then select the Input Type to be the same as was selected above. Set the offset value to the value assigned above plus 16.
 - Again click on the **Modules** tab and click on Add.
 - Click on Input 2 Byte (1 word) and then on OK.
 - Click on the **SLC Address** tab and then select the Input Type to be the same as was selected above. Set the offset value to the offset value assigned to the 8 byte address plus four.
 - Again click on the **Modules** tab and click on Add.
 - Click on Output 16 Byte (8 word) and then on OK.
 - Click on the **SLC Address** tab and then select the Output Type to be either O or M0 and then select an offset value. As with the input data, it is important not to leave gaps between an existing Profibus module and the data used by the Nexus unit.
 - Again click on the **Modules** tab and click on Add.
 - Click on Output 4 Byte (2 word) and then on OK.
 - Click on the **SLC Address** tab and then select the Output Type to be the same as was selected above. Set the offset value to the value assigned to the 16 Byte plus eight.
 - Click on OK to accept.
12. Save the network file.
13. Right click on the Master Module and select Connect from the menu that appears.
14. Click on Yes if asked to retain the configuration.
15. Again right click on the Master Module and then select Load Configuration from the menu that appears.
16. Place the PLC in Run mode.

NX2A4T Modbus TCP/IP Hardware Overview



Changing the Modbus TCP/IP Address

The NX2A4T has a default IP address of 192.168.000.XXX where “XXX” can be any number between 1 and 254 and is set by the dip switches located on the front of the module.

Use the following procedure if you want your IP address to be something other than 192.168.000.XXX.

1. Remove power from the Nexus Unit.
2. Set all of the unit's dip switches to the OFF (Down) position. This will set the unit's address to 0000 0000.
3. Start and configure your BootP server. Any DHCP/BootP server running on a computer, which is connected to the same network, may be used for this purpose. Please note that the Nexus Unit's MAC ID address is located on a label on the module's cover.
4. Apply power to the Nexus Unit.
5. At power-up the module will attempt to get an IP address by sending several BootP requests. This operation will require approximately 30 seconds. At this point LED2 will be flashing green. If retrieved, the IP configuration will be used and stored in the Nexus Unit's Flash Memory, overwriting older IP settings.
6. The Nexus Unit will now join the network with the newly set IP configuration.
7. If a BootP server is not found, the Nexus Unit will use the IP configuration that had been previously stored in its flash memory.
8. Cycle power to the NX2A4T. The changes to the IP address will not be permanent until power has been cycle.

Modbus TCP/IP Address Selection using the DIP switches

The NX2A4T uses an IP address of 192.168.000.XXX where “XXX” can be any number between 1 and 254. Eight dip switches on the NX2A4X are used to set the “XXX” portion of the address. Switch 8, the left most switch, is the least significant bit and switch 1, the right most switch, is the most significant bit. The address is programmed using the following procedure.

1. Determine the address of the NX2A4T. It can be any unused address between 1 and 254.
2. Convert the address to a binary number. A value of 50 will be 0011 0010.
3. Enter the address on the dip switches. Continuing the above example, switches 8, 6, 5, 2 and 1 will be off (down) and switches 7, 4, and 3 will be on (up).



Modbus TCP/IP Ethernet Status LEDs

LED Number	Name	LED Pattern	Function
1	Network Status	Flashing Green with 2 seconds interval Flashing Green/Red	This LED indicates the number of established Modbus/TCP connections to the module. The number of connections is equal to the number of flashes on this LED. Power-on self test
2	Module Status	Steady Off Steady Green Flashing Green Flashing Red Steady Red Flashing Green/Red	No Power The module is operating correctly The module has not been initialized Minor recoverable fault Major internal error Power-on self test
3	Activity	Flashing Green	This LED flashes green each time a packet is received or transmitted
4	Link	Steady Green	This LED indicates that the module is connected to an Ethernet network

Setup Example

AMCI NX2A4X to Group Schneider's 140 NOE 771 01 module

This setup example assumes that the 140 NOE 771 01 module has already been installed in the PLC system.

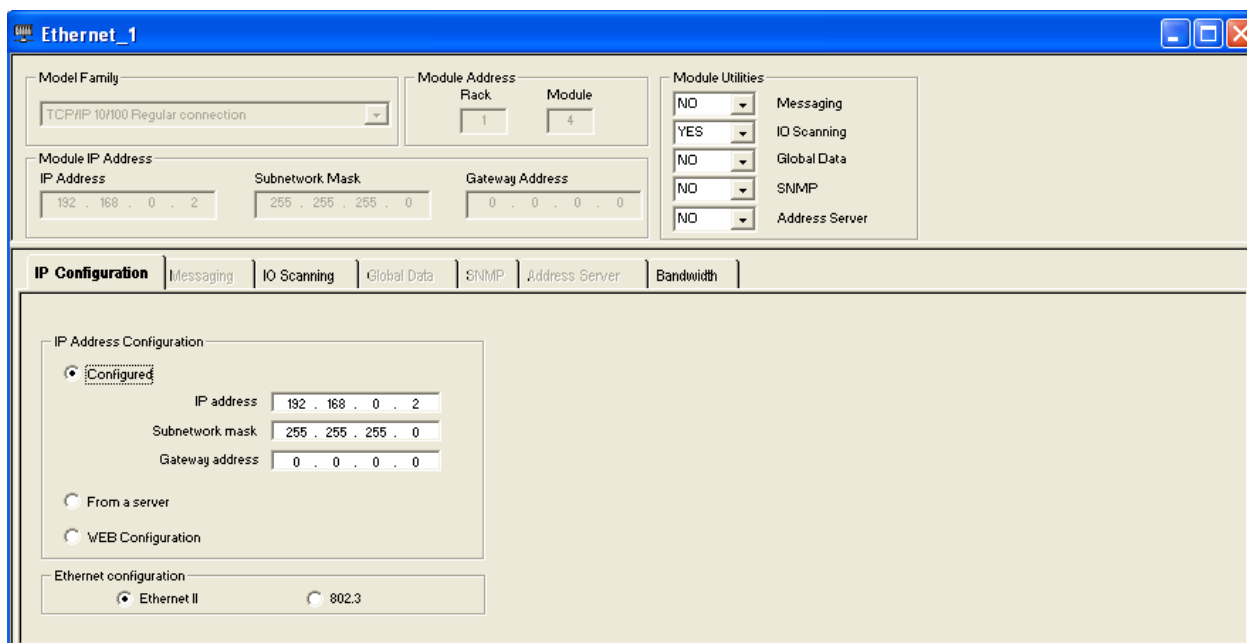
1. With power removed, use the dip switches to set the IP address of the NX2A4T.
2. Open an existing or create a new Unity program.
3. Open the Project Browser and click on the  symbol next to Communication.
4. Click on the  symbol next to Networks to show the available networks.
5. If you are creating a new network for the NX2A4T, right click on Networks and select New Network from the window that appears. If you are adding the NX2A4T to an existing network, ignore this step.

Click on the down arrow to the right of the *List of available Networks* field and select *Ethernet* from the drop down menu that appears.

Type the new networks name in the Change Name field

Click on OK to create the new network.

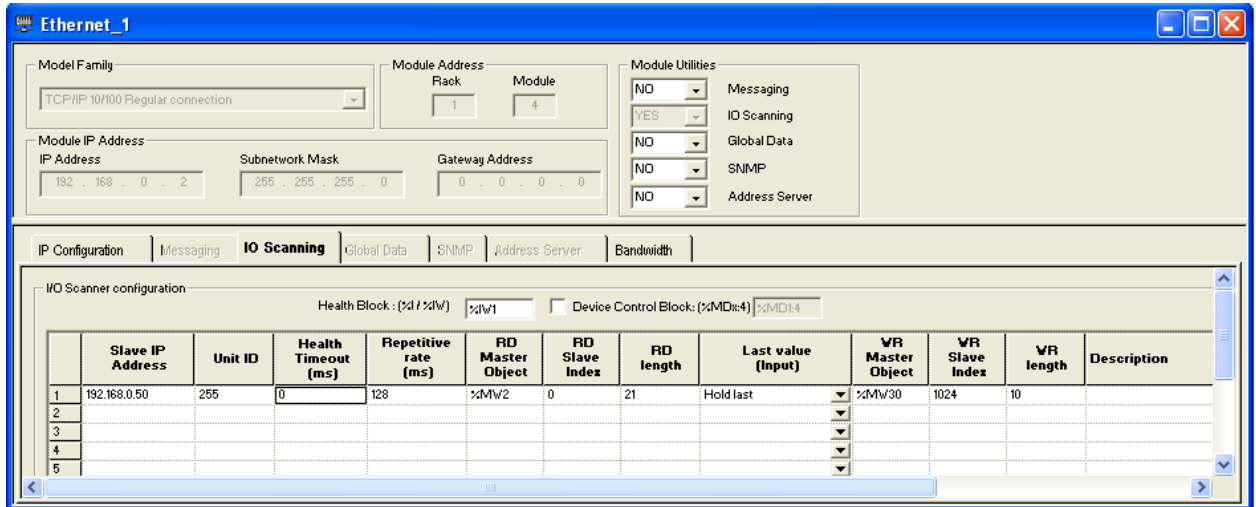
6. Right click on the existing network and select open from the window that appears. The following window will appear.



7. Enter the following parameters.

Module Family: TCP/IP 10/100 Regular Connection
 Module Address: Location of the 140 NOE 771 01 module
 IP Address: The TCP/IP address of the 140 NOE 771 01 module
 Subnet Mask: 255.255.255.000

8. Click on the I/O scanning tab. The following screen will appear.



Ethernet_1

Model Family: TCP/IP 10/100 Regular connection

Module Address: Rack: 1, Module: 4

Module IP Address: IP Address: 192.168.0.2, Subnetwork Mask: 255.255.255.0, Gateway Address: 0.0.0.0

Module Utilities: Messaging: NO, IO Scanning: YES, Global Data: NO, SNMP: NO, Address Server: NO






I/O Scanning

I/O Scanner configuration: Health Block: (%d / %dW) %dW1, Device Control Block: (%dMx4) %dM14

	Slave IP Address	Unit ID	Health Timeout (ms)	Repetitive rate (ms)	RD Master Object	RD Slave Index	RD Length	Last value (Input)	WR Master Object	WR Slave Index	WR Length	Description
1	192.168.0.50	255	0	128	%dMw2	0	21	Hold last	%dMw30	1024	10	
2												
3												
4												
5												

9. Enter the following parameters.

Slave IP Address: IP Address of the NX2A4T module.
 Unit ID: Not necessary for the NX2A4T module. The default value of 255 can remain.
 Health Timeout: Timeout value measured in ms. Can be any value for the NX2A4T module
 Repetitive Rate: Update time of the NX2A4T in ms. A value of zero will result in the fastest transfer of data between the NX2A4T and the NOE module. A value other than zero must be in a multiple of 16.
 RD Master Object. First destination address register where the data transmitted from the NX2A4T will be located.
 RD Slave Index: Must be 0.
 RD Length: Must be set to 21. (The NX2A4T uses 21 16 bit input words)
 Last Value (input): Status of the input registers, either last state or zero, in the event of an error. The data from the NX2A4T will remain in the registers if communications are lost.
 WR Master Object: First source address register location where the data sent from the PLC to the NX2A4T is located.
 WR Slave Index: Must be set to 1024
 WR Length: Must be set to 10 (The NX2A4T uses 10 16 bit output words)
 Description: Your choice of text or leave blank.

10. Close the network.
11. Click on Yes when asked “Do you want to save your modifications?”
12. Click on Yes when asked “Do you Confirm the Modification?”
13. On the Project Tree, expand the I/O configuration by clicking on the  symbol to the left of Configuration.
14. Further expand the I/O configuration by clicking on  symbol to the left of the Local Bus.
15. Continue to expand the I/O configuration by clicking on the  symbol to the left of the Local Quantum Drop.
16. Continue to expand the I/O configuration by clicking on  symbol to the left of the rack that contains the 140 NOE 771 01 module.
17. Expand the networks attached to the NOE module by clicking on the  symbol to the left of the 140 NOE 771 01 module.
18. Right click on the network associated with the 140 NOE 771 01 module and select OPEN from the window that appears.
19. Click on the down arrow on the field just below where it asks you to “Please choose a Network.” Select the network that was created above.
20. Save and build the project, and download it to the PLC. If the NX2A4T is powered up and attached to the network, network LED 3 (the upper right network status LED) should now be flashing and network LED 4 (the lower right network status LED) should now be on solid.

Chapter 6: Revision History

Revision 0.0 was released on 6/12/06. This revision combined the NX2A4D, NX2A4E, and NX2A4P literature into one document. Information on mounting, wiring, programmable parameters, and the NX2A4T (Modbus TCP/IP) was also added to the specifications.

File: NX2A4X_SPECS.doc
date: 6/13/06