Module Overview

The AMCI NX2A4E is a four resolver input module that communicates on Ethernet. The four resolvers connected to this module can either be configured as four single turn resolvers, two single turn resolvers and one multiturn resolver, or two multiturn resolvers.

The NX2A4E uses 21 input and 10 output words to communicate on Ethernet. The unit's address is 192.168.000.XXX where XXX is DIP switch programmable.

Input Words (Data sent from the NX2A4E module to the network)

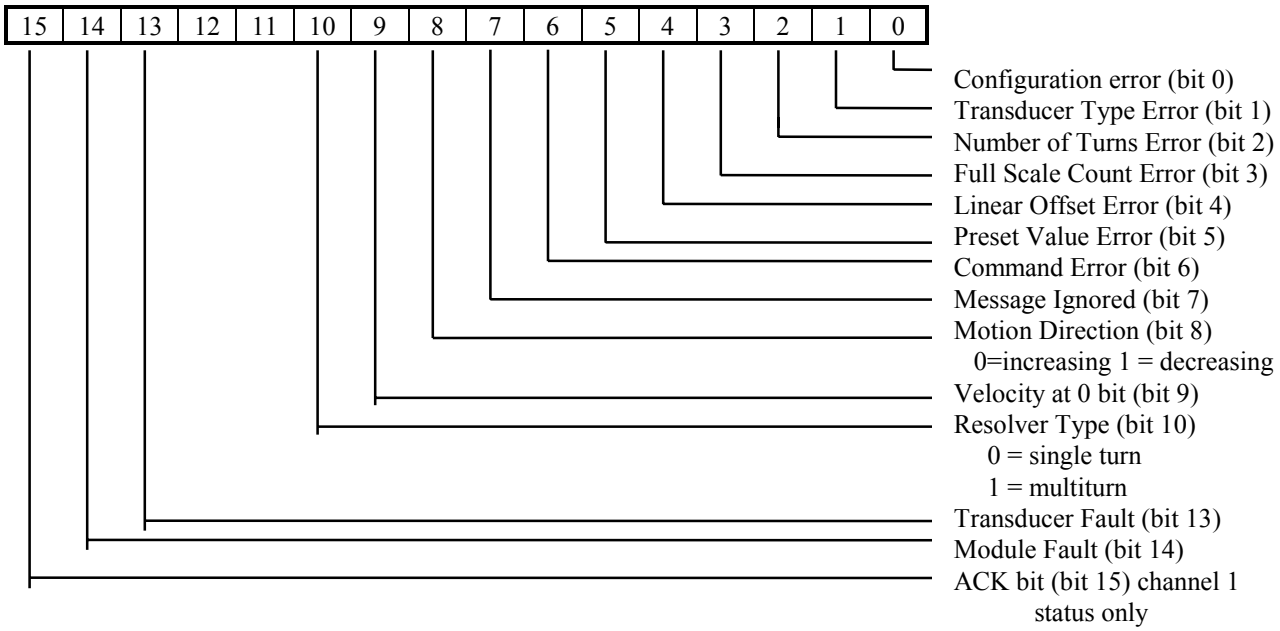
The following table shows the input data format for the NX2A4E module.

Word Number	Single Turn Resolvers	Multiturn Resolvers
0	Channel 1 Status	Channel 1 Status
1	0	Channel 1 upper 3 digits position
2	Channel 1 Position	Channel 1 lower 3 digits position
3	Channel 1 Velocity	Channel 1 velocity
4	Channel 2 Status	0
5	0	0
6	Channel 2 Position	0
7	Channel 2 Velocity	0
8	Channel 3 Status	Channel 2 Status
9	0	Channel 2 upper 3 digits position
10	Channel 3 Position	Channel 2 lower 3 digits position
11	Channel 3 Velocity	Channel 2 velocity
12	Channel 4 Status	0
13	0	0
14	Channel 4 Position	0
15	Channel 4 Velocity	0
16	Stop Time	0
17	Stop Position	0
18	0	0
19	0	0
20	0	0

Input Data Notes:

1. The Stop Time and Stop Position Input Parameters are only available on channel 1 if it is configured as a single turn resolver. These parameters are calculated on the 1 to 0 transition, on to off, of the brake input.
2. It is possible to configure the module for one multiturn and two single turn resolvers at the same time. If channel 1 multiturn is used, than the channel 1 and 2 single turn data is replaced by the channel 1 multiturn data. However, the channel 3 and 4 single turn data will remain. If channel 2 multiturn is used, than the channel 3 and 4 single turn data is replaced by the channel 2 multiturn data, and the channel 1 and 2 single turn data remains. It is not necessary to use the channel 1 multiturn data before using the channel 2 multiturn data.
3. If the module is configured to work with multiturn transducers, programming either of the single turn channels associated with the multiturn channel will replace the multiturn channel data with the data of both single turn channels. For example if multiturn channel 1 is being used, and single turn channel 2 is programmed, than single turn channel 1 and channel 2 data will replace multiturn channel 1 data in the input registers.
4. The data in the input registers remains in its last state if the Nexus module is removed from the network.

Status Word Layout (The status word for each channel will reflect any errors occurred when programming that channel. The ACK bit is located only in the channel 1 status data. A command error or message ignored error will be displayed in all status words.)



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

Transducer Type Error: Multiturn 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 module is being used as a single turn resolver.

Number of Turns Error: Multiturn Programming Error only. This bit is set if the number of turns is invalid for the transducer type selected. This bit will always be reset when the module is being used as a single turn resolver.

Full Scale Count Error: Set if the Full Scale Count is outside of the range of:
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 Error: Set if the linear offset is outside of the range of:
0 to (32767 - Full Scale Count) for single turn resolvers
0 to 999,999 for multiturn resolvers

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 exits on a different parameter.

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.

Resolver Type: This bit will be reset if the input channel is configured to be used with single turn resolvers, and set if the input channel is configured to be used with multiturn resolvers.

Transducer Fault: This bit will be set if a transducer Fault has been detected.

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

Acknowledge Bit: Set when the transmit bit is set. This bit is present only in the channel 1 status data.

Output Data (Words sent from the Network to the NX2A4E)

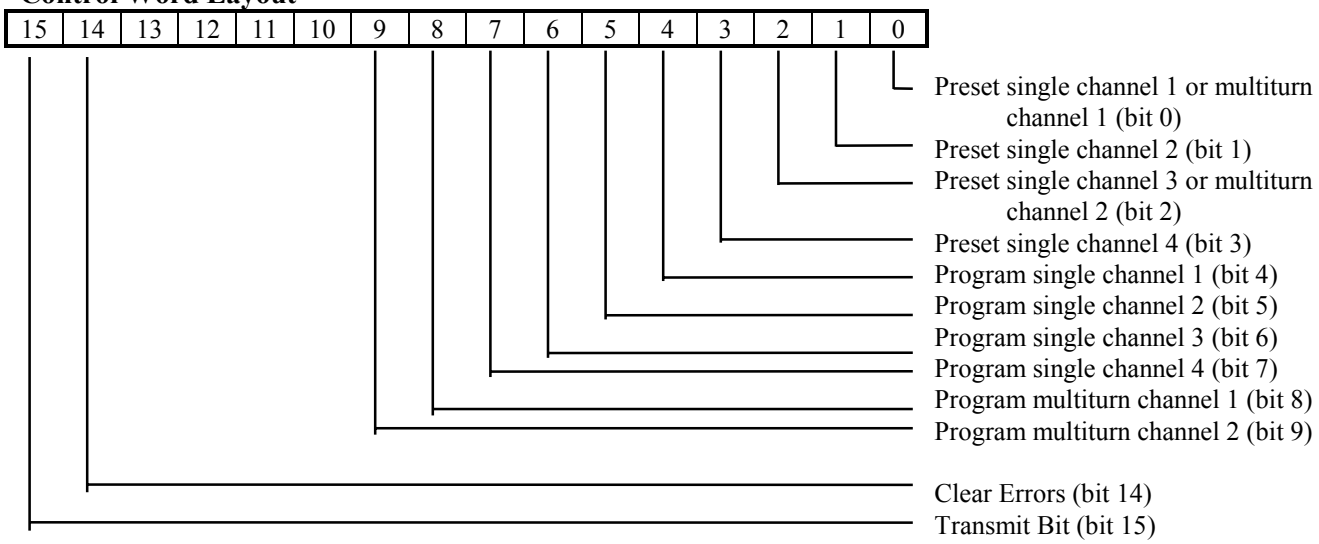
The format of the output data is shown in the table below. Please note that only one channel can be programmed at a time. However, the position of more than one channel can be preset, and a channel programmed, with one write operation.

Word Number	Single Turn Resolvers	Multiturn Resolvers
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

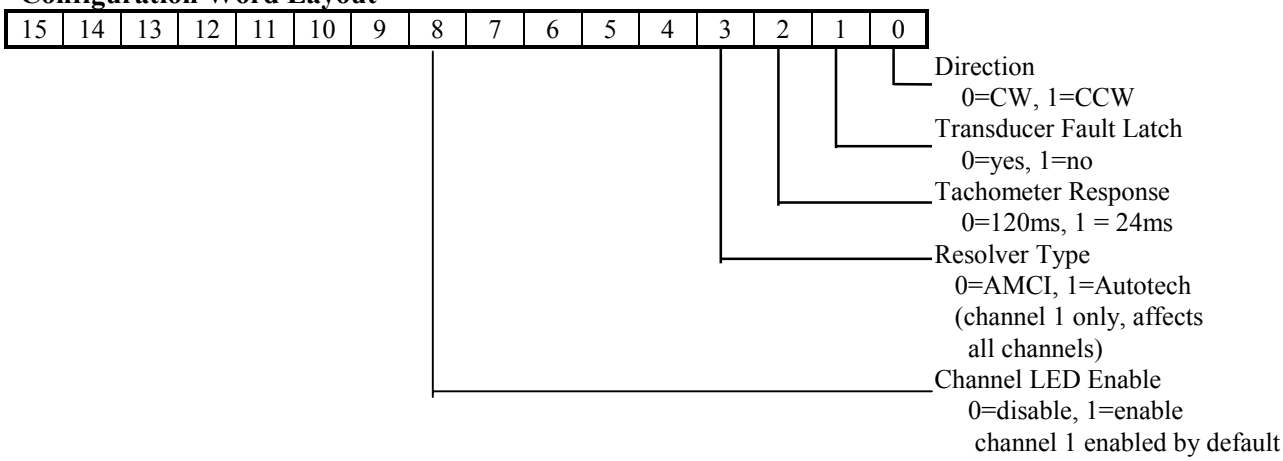
Output Data Notes

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.

Control Word Layout



Configuration Word Layout



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."

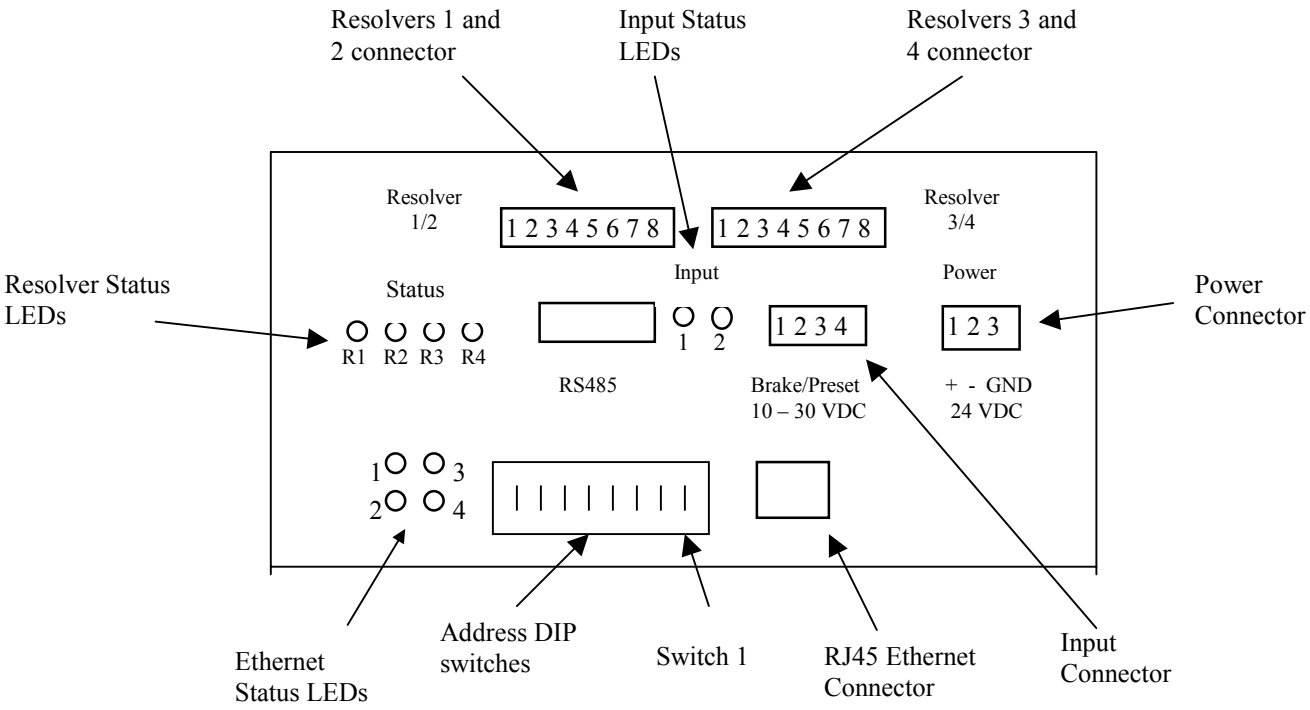
Multiturn
100 turn = 100, 50, 25, 20, 10, 5, 4, 2, or 1
180 turn = 180, 90, 60, 45, 36, 30, 20, 18, 15, 12, 10, 9, 6, 5, 4, 3, 2, 1
1000 turn = 1000, 500, 250, 200, 100, 50, 40, 20, 10
1800 turn = 1800, 900, 600, 450, 360, 300, 200, 180, 150, 120, 100, 90 60, 50, 40, 30, 20, 10
128 turn = 128, 64, 32,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

Full Scale Count 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))

Programming Sequence

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.

Nexus Hardware Overview



Dimensions:

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

Resolver Connectors

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

Note: The reference voltage signal, R1 and R2, of both connectors, is common.

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

Input Status LEDs

1 = Lit when the Brake Input is receiving power
2 = Lit when Input 2 is receiving power (The function of this input has not been defined)

Input Connector

Pins	Function
1 to 2	Brake Input
3 to 4	Undefined Input

The inputs are bipolar. Connecting one of the inputs pins to 10Vdc to 30Vdc, and the other to GND will cause the input to activate.

Power Requirements

Power Connector

Pin	Function
1	+24Vdc
2	DC Common
3	Shields

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 NX2A4E begins to communicate with the network.

Ethernet Address Selection

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 on 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

Throughput Time

Regardless of the configuration, the Nexus module requires 200µs to update the position data of all four resolvers.

Revision History:

Version 0.0 was released on 5/7/02 and was the initial release of the specifications.
Version 0.1 was released on 6/28/02. A note was added to Ethernet Status LED 1.

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.

File: NX2A4E_REV_0_SPECS
date: 5/7/02