Overview

The AMCI NX2E4E module can be used to connect up to four SSI sensors to an Ethernet Network.

The NX2E4E uses 28 16 bit input words and 33 16 bit output words to communicate with the network. The unit's address is 192.168.000.XXX where XXX is DIP switch programmable.

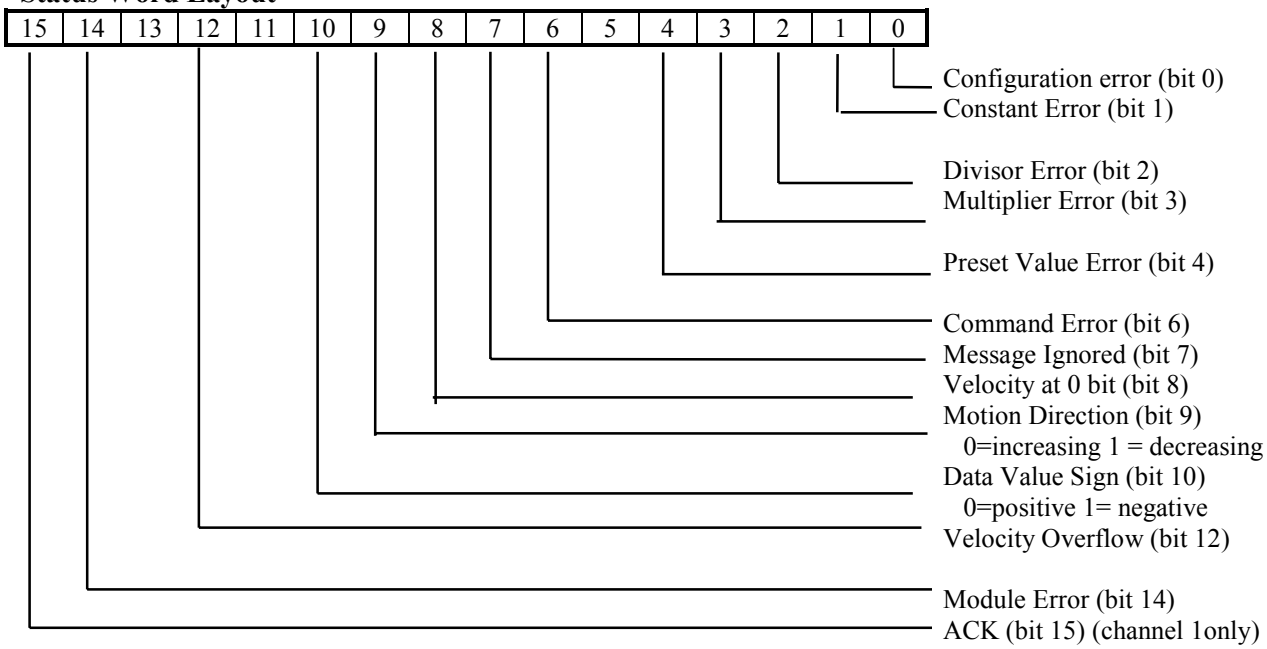
Input Data (Words sent from the NX2E4E module to the network)

Input Words

Word #	LDT Parameter
0	Channel 1 Status
1	Channel 1 upper 4 digits data value
2	Channel 1 lower 4 digits data value
3	Channel 1 upper 4 digits velocity
4	Channel 1 lower 4 digits velocity
5	Channel 1 upper 16 bits SSI Data
6	Channel 1 lower 16 bits SSI Data
7	Channel 2 Status
8	Channel 2 upper 4 digits data value
9	Channel 2 lower 4 digits data value
10	Channel 2 upper 4 digits velocity
11	Channel 2 lower 4 digits velocity
12	Channel 2 upper 16 bits SSI Data
13	Channel 2 lower 16 bits SSI Data
14	Channel 3 Status
15	Channel 3 upper 4 digits data value
16	Channel 3 lower 4 digits data value
17	Channel 3 upper 4 digits velocity
18	Channel 3 lower 4 digits velocity
19	Channel 3 upper 16 bits SSI Data
20	Channel 3 lower 16 bits SSI Data
21	Channel 4 Status
22	Channel 4 upper 4 digits data value
23	Channel 4 lower 4 digits data value
24	Channel 4 upper 4 digits velocity
25	Channel 4 lower 4 digits velocity
26	Channel 4 upper 16 bits SSI Data
27	Channel 4 lower 16 bits SSI Data

Note: The SSI data becomes all zero if there is no transducer attached to the unit.

Status Word Layout



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

Constant Error: This bit is set if the number of the SSI bits, the number of data bits, or the MSB number is outside the limits (1…32). This is also true if the (number of data bits + MSB number-1) > the number of the SSI bits.

Divisor Error: The Scalar Divisor is outside the expected range (1 to 32767)

Multiplier Error: Set if the Scalar Multiplier is outside the range of (1 to 32767), or if the multiplier parameter is greater than the divisor parameter.

Preset Value Error: Set if the preset value is outside of the range of ±268,435,455.

Command Error: Set if any of unused bits in the command word are set, or if you try to both program and apply the preset value to a channel in one programming sequence.

Message Ignored: Set if an attempt is made to program a parameter if an error already exits on a different parameter. This bit is not set if the same channel is programmed a second time with incorrect data.

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

Data Value Sign: This bit will be "0" if the data value is positive, or "1" if the data value is negative.

Velocity at Zero: This bit will be set if there has been no motion for the last portion of the Velocity Update Time.

Velocity Overflow: This bit will be set if the rate of change value exceeds 2^32 counts per second. When this occurs, the last valid value is sent to the processor.

Module Fault: Set on EEPROM or PLD fault.

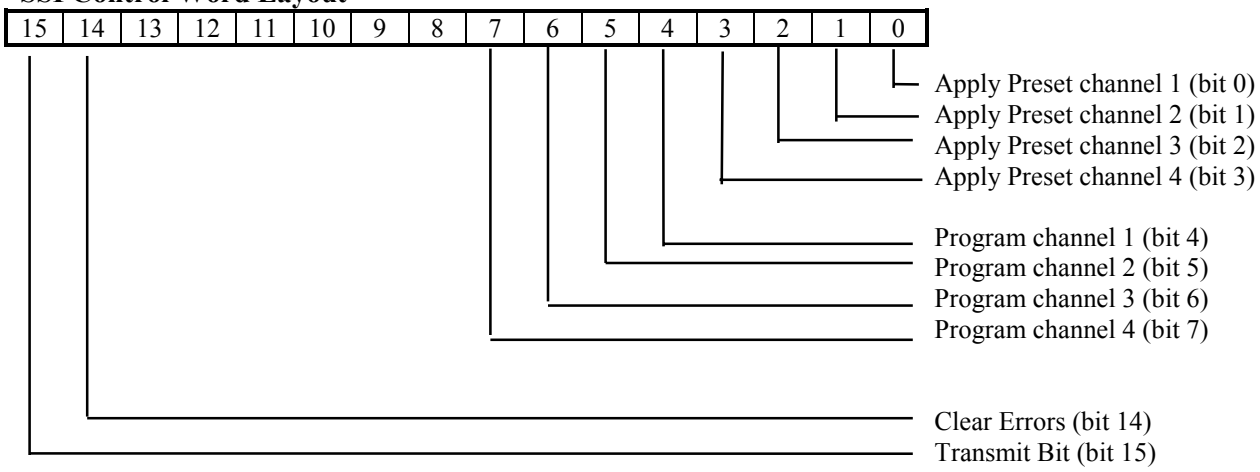
Acknowledge Bit: Set when the transmit bit is set. This bit is present only in the channel 1 status data.

Output Data (Words sent from the Network to the NX2E4E)

Word Number	LDT Set Up Word
0	Control
1	Channel 1: Configuration
2	Channel 1: Number of SSI Bits
3	Channel 1: MSB Number
4	Channel 1: Number of Data Bits
5	Channel 1: Scalar Multiplier
6	Channel 1: Scalar Divisor
7	Channel 1: Upper 4 Digits Preset Value +sign
8	Channel 1: Lower 4 Digits Preset Value
9	Channel 2: Configuration
10	Channel 2: Number of SSI Bits
11	Channel 2: MSB Number
12	Channel 2: Number of Data Bits
13	Channel 2: Scalar Multiplier
14	Channel 2: Scalar Divisor
15	Channel 2: Upper 4 Digits Preset Value + sign
16	Channel 2: Lower 4 Digits Preset Value
17	Channel 3: Configuration
18	Channel 3: Number of SSI Bits
19	Channel 3: MSB Number
20	Channel 3: Number of Data Bits
21	Channel 3: Scalar Multiplier
22	Channel 3: Scalar Divisor
23	Channel 3: Upper 4 Digits Preset Value + sign
24	Channel 3: Lower 4 Digits Preset Value
25	Channel 4: Configuration
26	Channel 4: Number of SSI Bits
27	Channel 4: MSB Number
28	Channel 4: Number of Data Bits
29	Channel 4: Scalar Multiplier
30	Channel 4: Scalar Divisor
31	Channel 4: Upper 4 Digits Preset Value + sign
32	Channel 4: Lower 4 Digits Preset Value

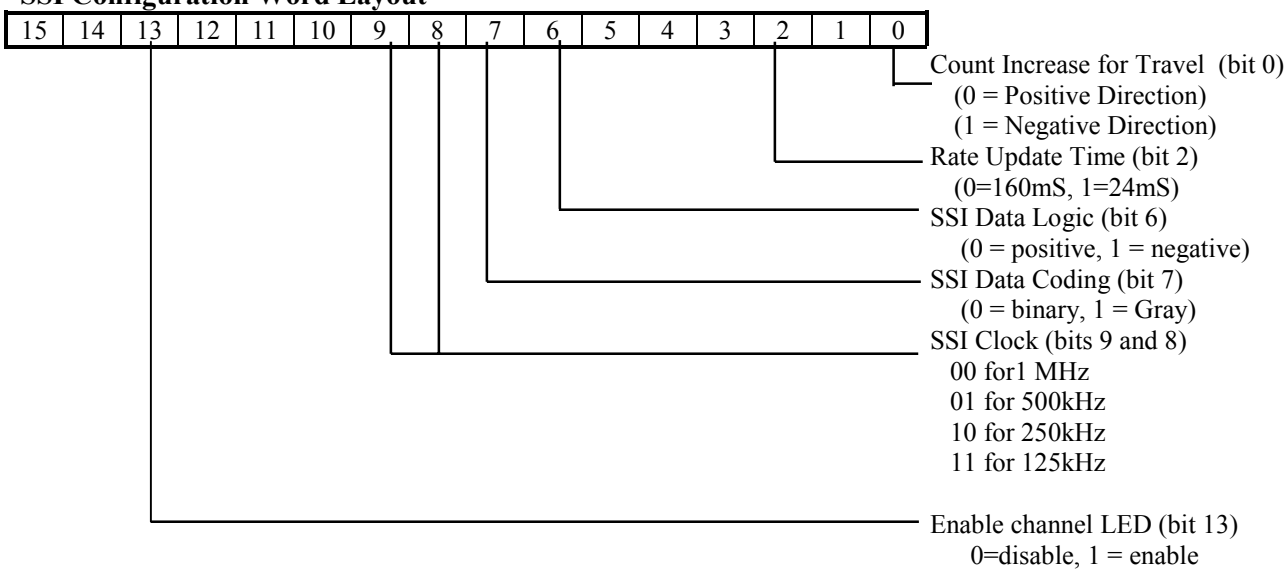
1. The Number of SSI Bits (default=24) and the MSB Number (default=1) have a range of 1 to 32, the Number of Data Bits (default=24) has a range of 1 to 28. The Number of SSI Bits cannot be less than the sum of the (MSB Number + (Number of Data Bits – 1)).
2. Scalar Multiplier (default=1) and Scalar Divisor (default=1) can range in value from 1 to 32,767. The Scalar Multiplier must be less than or equal to the Scalar Divisor. Entering a value of zero in both parameters generates a multiplier error.
3. The Preset Value has a range of ±268,435,455 and a default of "0". Negative Preset Values are transmitted with bit 15 set in the Preset Value's upper word.

SSI Control Word Layout



Note: A Command Error is generated if you try to both preset and program a channel in a single programming sequence. However, it is possible to program a channel while presetting a different channel.

SSI Configuration Word Layout



1. The Configuration Word has a default value of 0.
2. All bits that are not used, 1, 3, 4, 5, 10, 11, 12, 14, and 15, must be reset to zero or a configuration error will be generated.
3. The Count Direction parameter is useful if the Data Value represents a linear position. It gives you the ability to reverse the direction of motion needed to increase the position count. Changing the direction of increasing counts to negative sets the data value sign bit in the input register's status data. The absolute value of the data value is not affected. This parameter will not reverse the direction of increasing counts of a rotary encoder.
4. The default clock frequency is 1MHz.
5. The time in which the data value is updated is 500µs, regardless of the clock frequency.

General Programming Notes

1. It is possible to enable or disable the four status LEDs. The channels are always are enabled, and will function normally, even if the LED is disabled. By default, only the channel 1 LED is enabled.
2. It is possible to program multiple channels at one time.
3. When programming a channel, all of the data must be correct before it will be acted upon. However, if the data on one channel is incorrect, and the data on another channel is correct, than the data from the correct data will be accepted even if the channel with the incorrect data comes first.
4. If a programming error exists on any of the channels, the error must be cleared before a different channel can be programmed.
5. It is not possible to program and apply the preset value to the same channel with one programming sequence. However, it is possible to program one channel and apply the preset to another channel.
6. Default parameters are loaded with jumper strap installed on JP3 at power up.

Programming Sequence

1. The controller's program writes the data into the output registers.
2. The controller's 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 controller's 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.

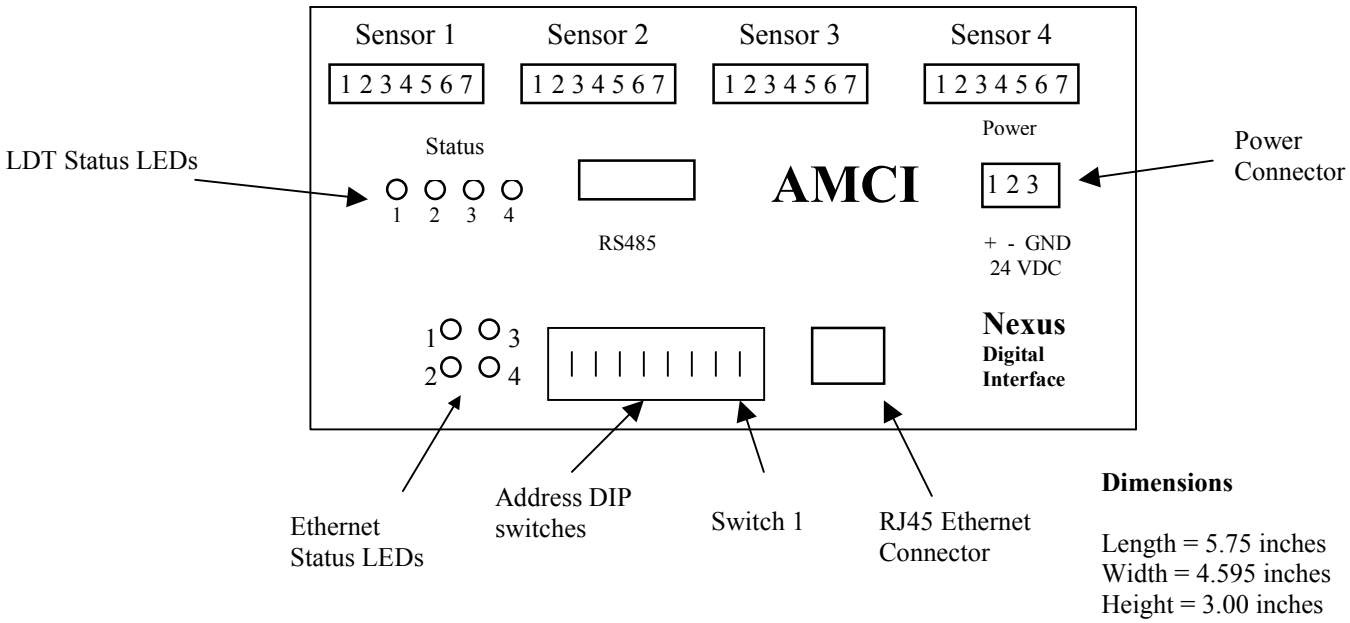
EEPROM Parameter Memory

Parameter values are stored in a non-volatile EEPROM memory. This memory type can store parameter values in the absence of power for over twenty years, but you can only write to it a limited number of times before it will be damaged. The EEPROM that AMCI uses is guaranteed for a minimum of 100,000 write cycles.

WARNING!

Every time the Apply Preset command is issued, the NX2E4E calculates and stores an offset value in its EEPROM memory. If your application requires you to continuously apply the Preset Value, consider performing the preset operation in the controller's software, instead of having the NX2E4E do it.

Hardware Information



Dimensions

Length = 5.75 inches
Width = 4.595 inches
Height = 3.00 inches

LDT Connectors

Pin Number	SSI Function Description
1	+Clock
2	-Clock
3	+Data
4	-Data
5	DC Ground
6	VCC
7	Frame

The +Vcc and DC Ground terminals can be used to power sensors that operate at 24Vdc.

However, if the sensor operates at a different voltage level, then connect the common of both the Nexus and the sensor's power supply together, and leave the +Vcc terminal open.

LDT Status LEDs

Function	LED Pattern
LDT OK	solid green
Module Fault	solid red

It is possible to enable or disable the LEDs when programming the Nexus module. The default LED function has only LED 1 enabled. The NX2E4E LED's do not indicate a transducer fault.

Power Connector

Pin	Function
1	+24Vdc
2	DC Common
3	Shields

The NX2E4E requires 0.5A of current @24Vdc to operate. If the sensor is being powered from the Nexus unit, add the power requirements of the sensor to those of the Nexus.

Power Up Delay

There is an eight second delay between power up and when the NX2E4E begins to communicate with the network.

Ethernet Address Selection

The NX2E4E uses an IP address of 192.168.000.XXX where "XXX" can be any number between 1 and 254. Eight dip switches on the NX2E4E 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 NX2E4E. 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

NX2E4E: 192µs minimum, 468µs maximum. The update time is also depended on how often the sensor updates the serial data that is sent to the Nexus module.

Revision History

Version 0.0 was released on 7/1/02 and was the initial release of the firmware

Setup Example
AMCI NX2E4E to Rockwell Automation 1756-ENET/B module

1. With power removed, use the dip switches to set the address of the NX2E4E.
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**	**28**
Output	**150**	**33**
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.

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: NX2E4E_rev_0.0
date: 7/1//02