Module Overview

The AMCI NX2A4P module is a four resolver input module that communicates on Profibus. 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 NX2A4P uses 21 input and 10 output words to communicate on the Profibus network. The module will indicate an error and will not communicate with the network if the Profibus system is configured for any other number of input and output words.

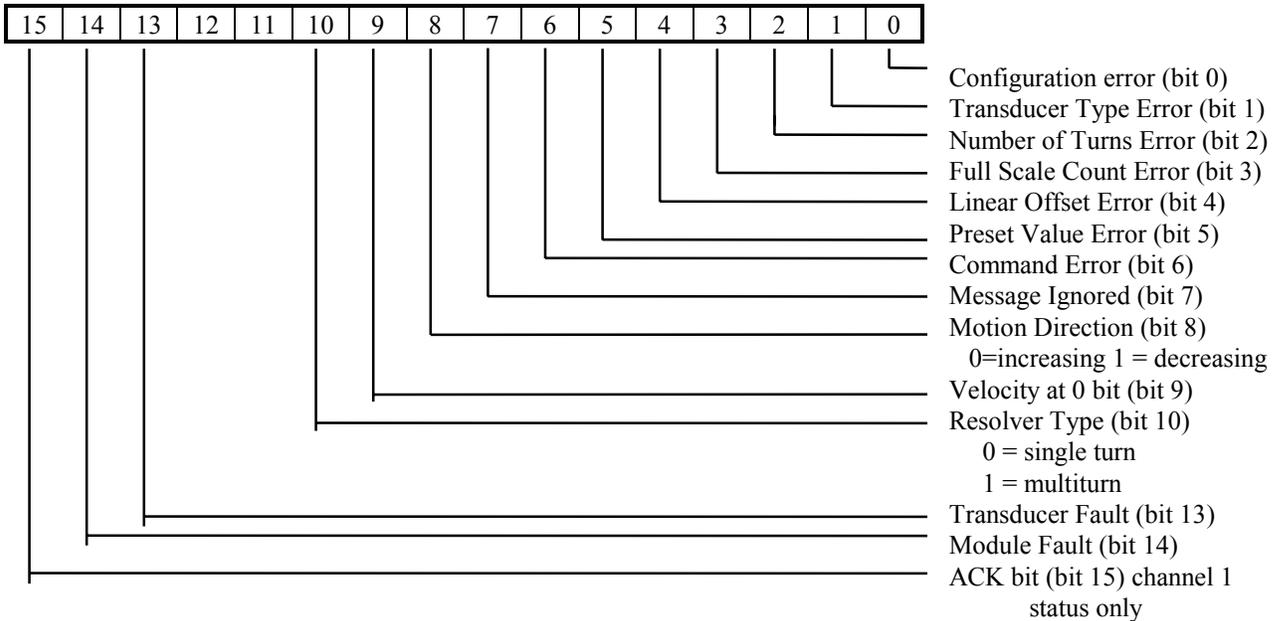**Input Words** (Data sent from the NX2A4P to the network)

The following table shows the input data format for the Nexus 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 to interface with one multiturn and two single turn resolvers at the same time. If channel 1 multiturn is being used, than the channel 1 and 2 single turn data will be replaced by the channel 1 multiturn data. If channel 2 multiturn is being used, than the channel 3 and 4 single turn data will be replaced by the channel 2 multiturn data. It is not necessary to use the channel 1 multiturn data before using the channel 2 multiturn data.
3. If a command is issued to program either of the single turn channels associated with a multiturn channel, than the data of both single turn channels will replace the multiturn channel's data. 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.

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.)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Configuration error (bit 0)
Transducer Type Error (bit 1)
Number of Turns Error (bit 2)
Full Scale Count Error (bit 3)
Linear Offset Error (bit 4)
Preset Value Error (bit 5)
Command Error (bit 6)
Message Ignored (bit 7)
Motion Direction (bit 8)
   0=increasing 1 = decreasing
Velocity at 0 bit (bit 9)
Resolver Type (bit 10)
   0 = single turn
   1 = multiturn
Transducer Fault (bit 13)
Module Fault (bit 14)
ACK bit (bit 15) channel 1
   status only

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: If an error occurs when programming a parameter, the only way to clear the error is by setting the Clear Error bit or by reprogramming the parameter to an acceptable value. This bit is set if neither of these actions occurr in the programming cycle immediately after the one that caused the error

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.

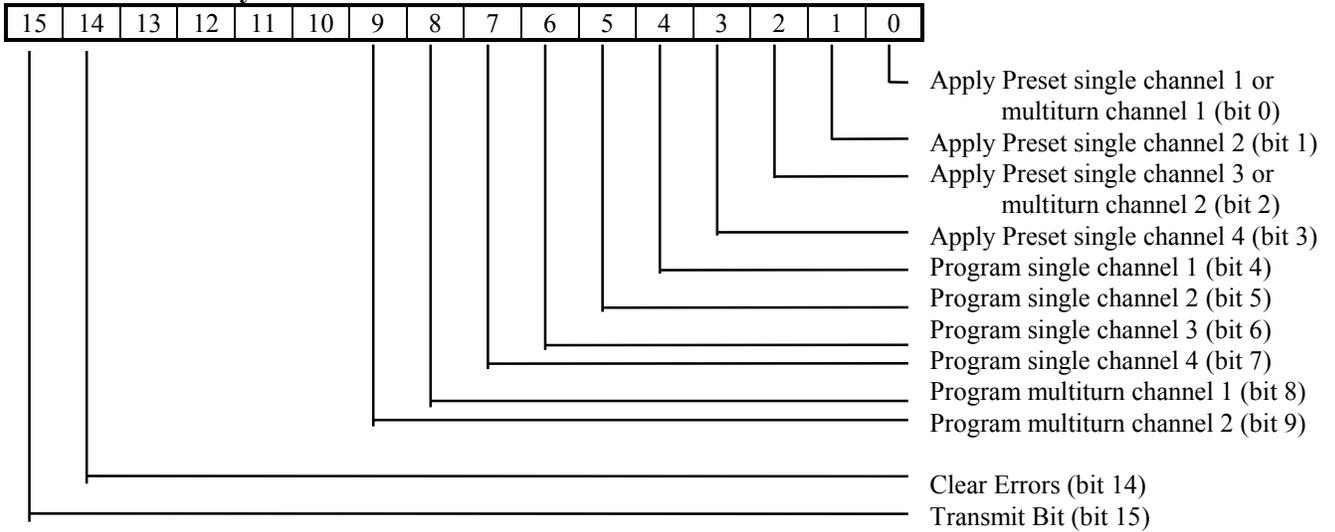**Output Data** (Words sent from the network to the NX2A4P)

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, multiple Apply Preset command bits can be set at one time and it is also possible to Program the channel and Apply the Preset value with one programming cycle.

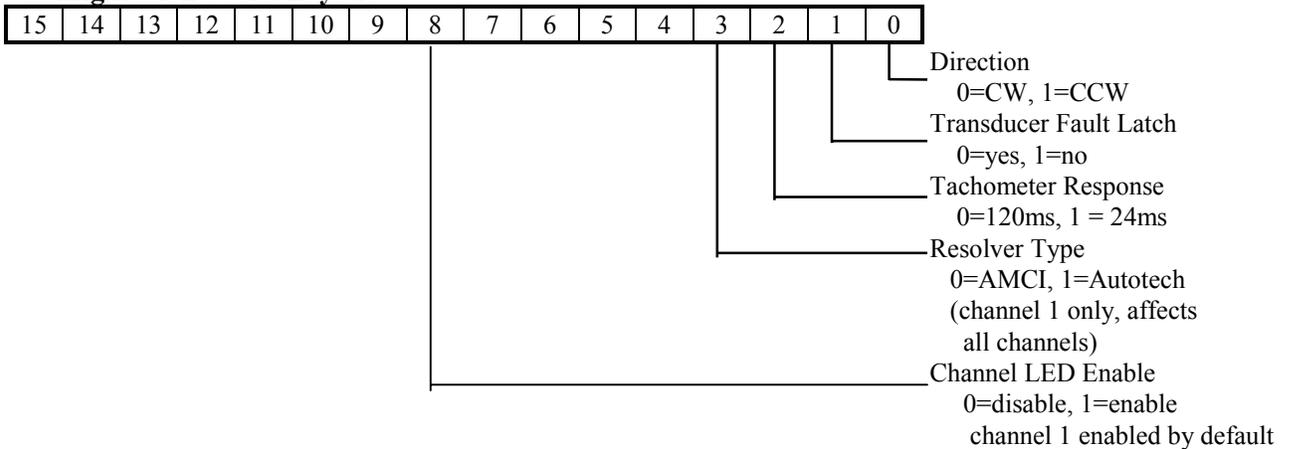| Word Number	Single Turn Resolvers	Multiturn Resolvers
0	Control	Control
1	Configuration	Configuration
2	0	Upper 3 Digits Full Scale Count
3	Full Scale Count	Lower 3 Digits Full Scale Count
4	0	Upper 3 Digits Linear Offset
5	Linear Offset	Lower 3 Digits Linear Offset
6	0	Upper 3 Digits Preset Value
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

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Apply Preset single channel 1 or
   multiturn channel 1 (bit 0)
Apply Preset single channel 2 (bit 1)
Apply Preset single channel 3 or
   multiturn channel 2 (bit 2)
Apply Preset single channel 4 (bit 3)
Program single channel 1 (bit 4)
Program single channel 2 (bit 5)
Program single channel 3 (bit 6)
Program single channel 4 (bit 7)
Program multiturn channel 1 (bit 8)
Program multiturn channel 2 (bit 9)

Clear Errors (bit 14)
Transmit Bit (bit 15)

Configuration Word Layout

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Direction
   0=CW, 1=CCW
Transducer Fault Latch
   0=yes, 1=no
Tachometer Response
   0=120ms, 1 = 24ms
Resolver Type
   0=AMCI, 1=Autotech
   (channel 1 only, affects
   all channels)
Channel LED Enable
   0=disable, 1=enable
   channel 1 enabled by default

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))

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
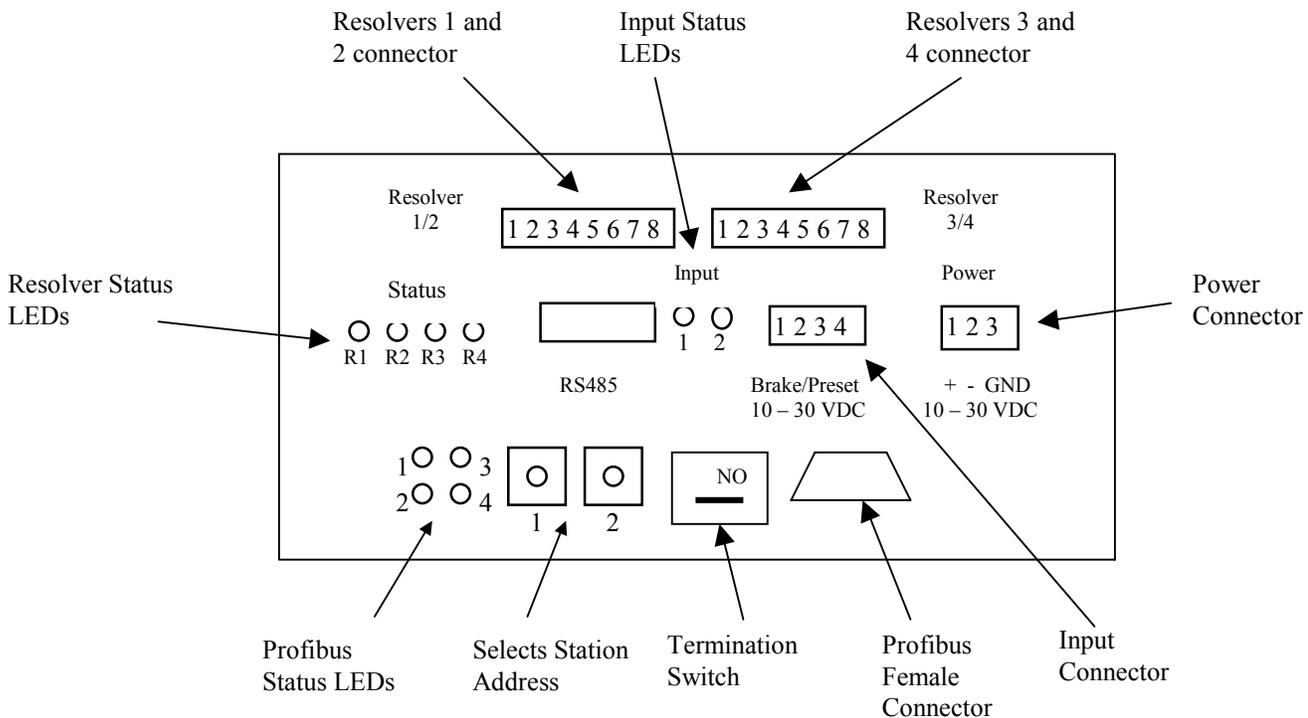
Dimensions:

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

Resolver Connectors

Pin Number	Single Turn Function	AMCI Multiturn Function	Autotech Multiturn Function
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 and that C is for the Coarse resolver and F is for the Fine resolver is a two resolver multiturn package.

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.

Throughput Time

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

Termination Switch

This switch is used to avoid reflections on the bus line. If the module is used as the first or last module in a network, the termination switch must be in the ON position. Otherwise it must be in OFF position. Because the Profibus interface board in mounted upside down, the ON appears as NO on the NX2A4P.

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

Power Up Delay

There is an eight second delay between power up and when the NX2A4P begins to communicate with the network.

Revision History

Version 0.0 was released on 6/25/02 and was the initial release of the specifications.

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 <u>must</u> 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.