NXC-VAI4 Voltage Output/Analog Input Card

NetLinx Control Cards and NetModules - Overview

NetLinx Control Cards can be installed in either the NXF CardFrame, NI-4000, or NetModules. This document provides basic specifications and wiring information for the NetLinx Control cards. For detailed information on the cards, refer to the *NetLinx CardFrame, Control Cards, and NetModules* Instruction Manual available on-line via www.amx.com.

NXC-VAI4 Analog Voltage Control Card

The NXC-VAI4 Analog Voltage Control Card (FG2025) provides 4 independent analog-to-digital inputs and four independent digital-to-analog outputs, which are controllable over the ICSP network. Each port can be configured for a variety of DC input and output signals. The NXC-VAI4 incorporates the functionality of the AXC-VAI2 and AXC-VRG AXlink cards.

NXC-VAI4 SPECIFICATIONS

Power Requirements:	330 mA @ 12 VDC
Inputs:	Four high-impedance analog DC inputs.
Outputs:	Four analog DC outputs (user-configurable).
D/A, A/D conversion:	0-bit A/D and D/A converters for analog sampling and control.
Available input voltages:	0 V to +12 V.
Available output voltages:	
-12 V to +12 V:	The output voltage may be software-configured for any min and max levels between -12 and +12 VDC. • Maximum output current = 60 mA per output. • Over-voltage protection to +28 VDC.
External reference:	A user supplied external reference voltage can be used to set the maximum voltage range for the D/A outputs. The full analog output range is scaled to fit the maximum range set by the external reference. Output voltage may be set to any level between 0-12 VDC, referenced to the external reference voltage input and the NXC-VAI4 power supply GND.
External reference input: (EREF, 1 for each output)	Maximum external reference input voltage = +12VDC. Over-voltage protection to +28 VDC.
Internal reference output: (IREF)	+5 V reference output, maximum current = 60 mA. This output is intended to drive a ground-referenced load.
I/O Status LEDs 1-8: (two LEDs per channel)	LEDs light to indicate ON status. 4 yellow LED's (one per channel) light to indicate input signal changes reported to the Master. 4 red LED's (one per channel) light to indicate output signal changes. Output LEDs blink to indicate that the power-up or limit levels have not been set. • LED 1: Output #1 (red) • LED 2: Input #1 (yellow) • LED 3: Output #2 (red) • LED 4: Input #2 (yellow) • LED 5: Output #3 (red) • LED 6: Input #3 (yellow) • LED 7: Output #4 (red) • LED 8: Input #4 (yellow)
Wiring:	Captive-wire connectors.
Device ID:	0x010D
Firmware ID:	• 0x0113 (Download) • 0x0114 (Boot)

Pinouts and Functions

NXC-VAI4 PINOUTS, SIGNALS, AND FUNCTIONS

Pin	Function	Pin	Function	Pin	Function
1	Output #1 (GND)	9	Input #1 (GND)	17	+5 V Reference output (GND)
2	Output #1	10	Input #1	18	+5 V Reference output
3	Output #2 (GND)	11	Input #2 (GND)	19	External Reference input (GND)
4	Output #2	12	Input #2	20	External Reference input
5	Output #3 (GND)	13	Input #3 (GND)		
6	Output #3	14	Input #3		
7	Output #4 (GND)	15	Input #4 (GND)		
8	Output #4	16	Input #4		

Channel Assignments

Off = 50% voltage, and all channel assignments are mutually exclusive.
Note: PU, PN and PX must be set for all eight levels before using the card.

NXC-VAI4 CHANNEL ASSIGNMENTS

Channel	State	Function
Channel 1	ON	While channel 1 is ON, the voltage on Output 1 will ramp up at the "CURRENT OUTPUT 1 RAMP UP TIME" rate. The voltage ramp stops if the maximum is reached.
	OFF	Stops voltage ramping on Output 1 at current value.
Channel 2	ON	While channel 2 is ON the voltage on Output 2 will ramp up at the "CURRENT OUTPUT 2 RAMP UP TIME" rate. The voltage ramp stops if the maximum is reached.
	OFF	Stops voltage ramping on Output 2 at current value.
Channel 3	ON	While channel 3 is ON the voltage on Output 3 will ramp up at the "CURRENT OUTPUT 3 RAMP UP TIME" rate. The voltage ramp stops if the maximum is reached.
	OFF	Stops voltage ramping on Output 3 at current value.
Channel 4	ON	While channel 4 is ON the voltage on Output 4 will ramp up at the "CURRENT OUTPUT 4 RAMP UP TIME" rate. The voltage ramp stops if the maximum is reached.
	OFF	Stops voltage ramping on Output 4 at current value.
Channel 5	ON	While channel 5 is ON the voltage on Output 1 will ramp down at the "CURRENT OUTPUT 1 RAMP DOWN TIME" rate. The voltage ramp stops if the minimum is reached.
	OFF	Stops voltage ramping on Output 1 at current value.
Channel 6	ON	While channel 6 is ON the voltage on Output 2 will ramp down at the "CURRENT OUTPUT 2 RAMP DOWN TIME" rate. The voltage ramp stops if the minimum is reached.
	OFF	Stops voltage ramping on Output 2 at current value.
Channel 7	ON	While channel 7 is ON the voltage on Output 3 will ramp down at the "CURRENT OUTPUT 3 RAMP DOWN TIME" rate. The voltage ramp stops if the minimum is reached.
	OFF	Stops voltage ramping on Output 3 at current value.
Channel 8	ON	While channel 8 is ON the voltage on Output 4 will ramp down at the "CURRENT OUTPUT 4 RAMP DOWN TIME" rate. The voltage ramp stops if the minimum is reached.
	OFF	Stops voltage ramping on Output 4 at current value.
Channel 9	ON	Reserved [do not use].
	OFF	Reserved [do not use].
Channel 10	ON	While channel 10 is ON the voltage on Output 1 is set to 100%.
	OFF	Sets Output 1 voltage to 50%.
Channel 11	ON	While channel 11 is ON, the voltage on Output 2 is set to 100%.
	OFF	Sets Output 2 voltage to 50%.
Channel 12	ON	While channel 12 is ON, the voltage on Output 3 is set to 100%.
	OFF	Sets Output 3 voltage to 50%.
Channel 13	ON	While channel 13 is ON, the voltage on Output 4 is set to 100%.
	OFF	Sets Output 4 voltage to 50%.
Channel 14	ON	While channel 14 is ON, the voltage on Output 1 is set to 0%.
	OFF	Sets Output 1 voltage to 50%.
Channel 15	ON	While channel 15 is ON, the voltage on Output 2 is set to 0%.
	OFF	Sets Output 2 voltage to 50%.
Channel 16	ON	While channel 16 is ON, the voltage on Output 3 is set to 0%.
	OFF	Sets Output 3 voltage to 50%.
Channel 17	ON	While channel 17 is ON, the voltage on Output 4 is set to 0%.
	OFF	Sets Output 4 voltage to 50%.
Channel 18	ON	While channel 18 is ON, the voltage on Output 1 is set to 75%.
	OFF	Sets Output 1 voltage to 50%.
Channel 19	ON	While channel 19 is ON, the voltage on Output 2 is set to 75%.
	OFF	Sets Output 2 voltage to 50%.
Channel 20	ON	While channel 20 is ON, the voltage on Output 3 is set to 75%.
	OFF	Sets Output 3 voltage to 50%.
Channel 21	ON	While channel 21 is ON, the voltage on Output 4 is set to 75%.
	OFF	Sets Output 4 voltage to 50%.
Channel 22	ON	While channel 22 is ON, the voltage on Output 1 is set to 25%.
	OFF	Sets Output 1 voltage to 50%.
Channel 23	ON	While channel 23 is ON, the voltage on Output 2 is set to 25%
	OFF	Sets Output 2 voltage to 50%.
Channel 24	ON	While channel 24 is ON, the voltage on Output 3 is set to 25%
	OFF	Sets Output 3 voltage to 50%.
Channel 25	ON	While channel 25 is ON, the voltage on Output 4 is set to 25%
	OFF	Sets Output 4 voltage to 50%.

NXC-VAI4 Level Assignments:

NXC-VAI4 LEVEL ASSIGNMENTS

Level	Description
1	I/O 1 (Output 1). The range is from 0 (min) to 255 (max). Conflicts with channels 1, 5, 10, 14, 18, 22.
2	I/O 2 (Output 2). The range is from 0 (min) to 255 (max). Conflicts with channels 2, 6, 11, 15, 19, 23.
3	I/O 3 (Output 3). The range is from 0 (min) to 255 (max). Conflicts with channels 3, 7, 12, 16, 20, 24.
4	I/O 4 (Output 4). The range is from 0 (min) to 255 (max). Conflicts with channels 4, 8, 13, 17, 21, 25.
5	A level from the VAI4 card returns the current input voltage for I/O 5 (input 1). Range: 0 - 255 (0 - 65,535).
6	A level from the VAI4 card returns the current input voltage for I/O 6 (input 2). Range: 0 - 255 (0 - 65535).
7	A level from the VAI4 card returns the current input voltage for I/O 7 (input 3). Range: 0 - 255 (0 - 65535).
8	A level from the VAI4 card returns the current input voltage for I/O 8 (input 4). Range: 0 - 255 (0 - 65535).

Notes On Levels

For levels 5 - 8, the AD MODE command is used to set the level size to 8 or 16 bits. The VAI4 card will send a CHANNEL OFF STATUS message for any conflicting ON channels. The Input and output Level Values will not be sent until a 'LEVON' Command message is received by the VAI4 card. A transmission of levels will cease after the receipt of a 'LEVOFF' Command message. The values of Levels 1 through 8 (inputs) will be sent at power-up or whenever the level changes by more than the selected amount.

Programming Information

These NetLinx Send_Commands control the NXC-VAI4:

NXC-VAI4 SEND_COMMANDS

AD MODE	Sets the format for data reporting to either 8 or 10 significant bits (16 bit format with 10 significant bits). The default format is 8 bits. Even though the output is specified in the command, the format change really applies to the corresponding input. Input level changes will be reported in this format. In 'servo' mode commanded positions will be in this format. The reporting of the output levels is unaffected. `SEND_COMMAND <DEV>,'AD MODE <I/O> 8|10'` • I/O: Any Output I/O ('1', '2', '3', '4').
GAS	Sets the slowdown distance and slowdown speed. When these variables are set, and a GL command is in progress, the speed output on Output <x> will be reduced to that specified when the position as read on Output <x+4> is within the distance specified away from the target position. `SEND_COMMAND <DEV>, 'G<OUTPUT>A<DISTANCE>S<SPEED>'` • OUTPUT: Any Output '1', '2', '3', or '4'. • DISTANCE: 0-127. • SPEED: 0-127.
GD	Sets the maximum allowable deviation of final servo position when executing the GL command. The default is 2, (the position as read at corresponding input I/O <x+4> can be within +/-2 from the specified position). The input or output level will only be reported when a change greater than this deviation occurs. Deviation 0 is most accurate, but can have some oscillation. `SEND_COMMAND <DEV>, 'G<I/O>D <DEVIATION>'` • I/O: Any input or output ('1', '2', '3', '4', '5', '6', '7'. '8'). • DEVIATION: Number between 0 and 127 (default = 2).
GL	This command puts the card in servo (positional) control mode. Range = 0-255 (if AD MODE is set to '8') or 0-65535 (if AD MODE is set to '10'). See AD MODE for details. Position 0 is the low end of the potentiometer (lowest voltage) and position 255 (or 65535) is the high end (highest voltage) with 128 (or 32768) as the middle of the range. `SEND_COMMAND <DEV>, 'G<OUTPUT>L<POSITION>'` • I/O: Any Output ('1', '2', '3', '4'). • POSITION: Number between 0-255 or 0-65535 (depends on AD MODE).
GS	Sets the speed variable to be used for future positional (GL) commands. Speed '0' is slowest (no movement) and speed '127' (default) is the fastest. The change of speed takes place immediately even if a positional change operation is currently in progress. The voltage output for speed 0 (i.e. no motion) is at the mid-point between the Min and Max output voltages. The positive speed 127 is the max and negative speed 127 is the min. Other speeds are scaled proportionally. `SEND_COMMAND <DEV>, 'G<OUTPUT>S<SPEED>'` • I/O: Any Output ('1', '2', '3', '4'). • SPEED: A fixed output value in the range of 0-127.
DEFAULT	Sets all card settings (except for calibration) back to their original factory settings.
DEFAULT ALL	Sets all card settings back to their original factory settings.
LEVOFF	The VAI4 will not transmit any level value messages until after the receipt of this command. `SEND_COMMAND <DEV>,'LEVOFF'`
LEVON	This command is sent automatically when the CREATE_LEVEL command is executed. `SEND_COMMAND <DEV>,'LEVON'`

PC	This variable sets the shape of the Output <x> voltage ramps.
	`SEND_COMMAND <DEV>,'P<OUTPUT>C<CURVE>'`
	• I/O: Any Output ('1', '2', '3', or '4')
	• CURVE: 'N' - Normal linear
	  'L' - Logarithmic
	  'I' - Inverted logarithmic

PE	Selects which voltage reference (if any) is to be used for scaling of the output voltage. The specified output will then remain proportional to the specified input.
	`SEND_COMMAND <DEV>,'P<OUTPUT>E<REFERENCE SELECTION> B|U'`
	• I/O: any Output ('1', '2', '3', or '4')
	• Reference selection:
	  'N' - Normal/None: Uses no reference scaling.
	  'E' - External: Use the External Reference input to scale the output.
	  'I' - Input: Use the corresponding <x+4> input as the reference for the output.
	• B|U: Bipolar or Unipolar (has no meaning for reference selection 'N')
	Bipolar mode sets the output voltage range to between -reference voltage and + reference voltage.
	Unipolar mode sets the voltage range to between 0V and + reference voltage.

PL	Ramps the specified output from its current level value to the specified level value or percentage of maximum at the rate specified by "CURRENT OUTPUT <x> RAMP UP TIME" or optionally in the specified amount of time. `SEND_COMMAND <DEV>, 'P<OUTPUT>L<LEVEL VALUE> [T<TIME>]'` • I/O: Any Output ('1', '2', '3', or '4') • LEVEL VALUE: 0 - 255 or 0 - 100% (where 0 is low voltage) • TIME (optional): 0 - 255 in 0.1 second increments
PN	Sets the value of either the minimum output voltage allowed for an output, or the minimum position voltage expected for an input. Voltage settings are rounded to the nearest D/A or A/D code. Voltage settings for Outputs are absolute levels and are unaffected by any software scaling functions. Negative voltages are not valid for Input 3. `SEND_COMMAND <DEV>, 'P<I/O>N<level value>'` • I/O: Any input or output ('1','2','3','4','5','6','7','8') • LEVEL VALUE: -12.000V to +12.000V
PR	Sets the CURRENT OUTPUT <x> RAMP UP TIME and/or CURRENT OUTPUT <x> RAMP DOWN TIME of the specified Output where TIME is the time to ramp the full range. The ramp time can be set to ramp both down to up and up to down or just down to up or just up to down. `SEND_COMMAND <DEV>,'P<OUTPUT>R<TIME>[U|D]'` • I/O: Any Output '1', '2', '3', or '4' • TIME: 0 - 255 in 0.1 second increments
PU	Sets the level to which this Output is set immediately after power-up and before any Output is commanded. `SEND_COMMAND <DEV>, 'P<OUTPUT>U<LEVEL VALUE>'` • I/O: Any Output ('1', '2', '3', or '4') • LEVEL VALUE: 0-255
PX	Sets the value of "I/O <x> MAXIMUM" which is either the maximum output voltage allowed for an Output, or the maximum position voltage expected for an Input. Voltage settings are rounded to the nearest D/A or A/D code. Voltage settings are absolute levels and are unaffected by any scaling functions. Negative voltages are not valid for Inputs. `SEND_COMMAND <DEV>, 'P<I/O>X<LEVEL VALUE>'` • I/O: Any input or output ('1', '2', '3', '4', '5', '6', '7', '8') • LEVEL VALUE: 12.000V to +12.000V
PZ	Sets one of the two "set point" variables "I/O <x> SET POINT H|L". (high or low) These variables are used to calculate calibration parameters for I/O <x> (input or output). Receiving this command with no voltage specified returns the specified set point to the default value. `SEND_COMMAND <DEV>,'P<I/O>Z<VOLTAGE>H|L'` *I/O*: Any input or output ('1', '2', '3', '4', '5', '6', '7', '8' plus '0' for EREF) *VOLTAGE*: The current actual/measured voltage at the I/O.

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