



Allen-Bradley

SLC 500™ Analog Input Modules

**Catalog Numbers 1746-NI16I and
1746-NI16V**

User Manual

**Rockwell
Automation**

Overview

This chapter describes the 1746-NI16 analog input module and explains how the SLC 500 processor gathers analog input data from the module. Included is information about:

- the module's hardware and diagnostic features
- an overview of system operation

General Description

The module receives and stores digitally converted analog data into its image table for retrieval by all fixed and modular SLC 500 processors. The modules, 1746-NI16V and 1746-NI16I, support connections for up to 16 voltage or current analog sensors.

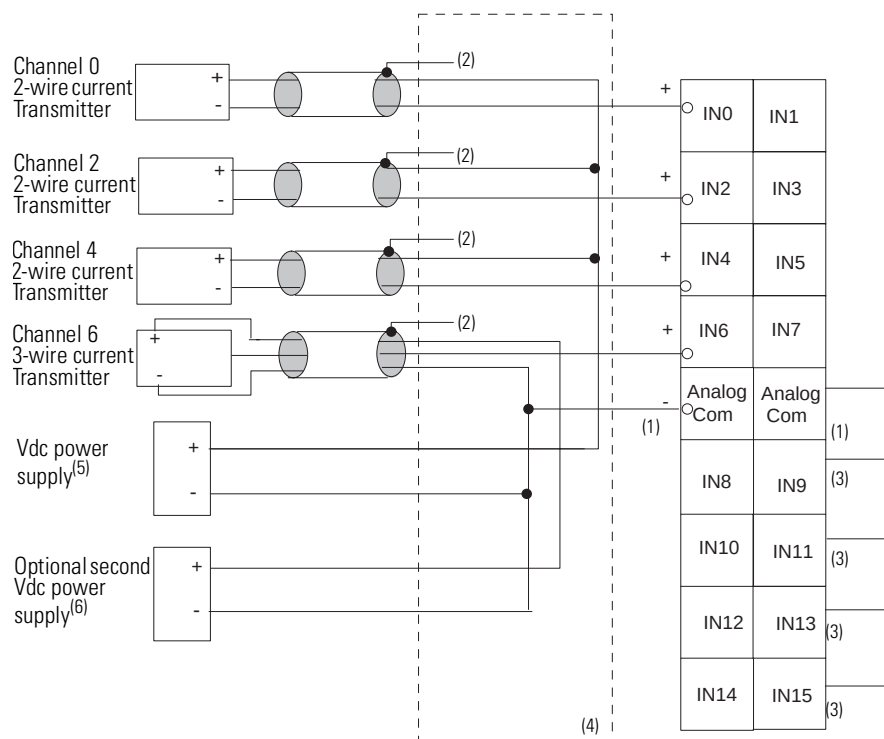
The 1746-NI16 is a multi-class (Class 1 or Class 3) single-slot module. Class 1⁽¹⁾ configuration utilizes 8 input words and 8 output words. Class 3 configuration utilizes 32 input words and 32 output words. Fixed and SLC 5/01 processors can only operate as Class 1. When the module is used in a remote I/O chassis with a 1747-ASB, it can only operate in Class 1 mode. The SLC 5/02, SLC 5/03, SLC 5/04 and SLC 5/05 processors can be configured for either Class 1 or Class 3. When the module is used in a remote ControlNet™ chassis with a 1747-ACN(R), it can also operate in either Class 1 or Class 3 mode. Operate the module in Class 3 mode whenever possible.

The 16 high-impedance input channels can be wired as single-ended inputs. The module provides a direct interface to the following input types:

- $\pm 10\text{V}$ dc
- 1 to 5V dc
- 0 to 5V dc
- 0 to 10V dc
- 0 to 20 mA
- 4 to 20 mA
- ± 20 mA
- 0 to 1 mA

⁽¹⁾ Requires use of block transfer in a remote configuration.

1746-NI16I



- (1) There are two common terminals for all of the 16 current inputs. These two analog common terminals are connected internally.
- (2) All shield wires should be connected to chassis mounting screws.
- (3) Unused channels should be connected to the analog common terminals (0 Volts).
- (4) If separate shielded cables are used for each analog input channel, interposing terminal blocks are needed to terminate up to 16 common wires. Then 1 to 4 common wires should be wired from the interposing terminal block to the 2 common terminals on the 1746-NI16I module.
- (5) The module does not provide loop power for analog inputs. Use a power supply that matches the transmitter specifications.
- (6) More than one power supply can be used if all supplies are class 2.

Specifications

This appendix lists the specifications for the 1746-NI16 Analog Input Module.

Electrical Specifications

Description	Specification
Backplane Current Consumption	125 mA at 5V dc 75 mA at 24V dc
Backplane Power Consumption	2.425W maximum (0.625W at 5V dc, 1.8W at 24V dc)
Number of Channels	16 (backplane isolated)
I/O Chassis Location	Any I/O module slot except slot 0
A/D Conversion Method	Sigma - Delta
Input Filtering	Low-pass digital filter with programmable filter frequencies
Normal Mode Rejection (between [+] input and [-] input)	>80 dB at 50/60 Hz >75 dB at dc >100 dB at 50/60 Hz
Common Mode Rejection (between inputs and chassis ground)	Greater than or equal to 75 dB at DC Greater than or equal to 100 dB at 50/60 Hz
Input Filter Frequencies	6 Hz, 10 Hz, 20 Hz, 40 Hz, 60 Hz, 80 Hz, 100 Hz, 250 Hz
Isolation	500V ac isolation for 1 second
Common-Mode Voltage Range	±10.25V relative to analog common terminal (20.5V maximum between any two signal input terminals)

Physical Specifications

Description		Specification	
LED Indicators		5 green status indicators one for each group of 4 channels, and one for module status	
Module ID Code		Class 1	Class 3
	NI16V	3505	10406
	NI16I	3504	10403
Recommended Cable		Belden #8761 or equivalent	
Maximum Wire Size		Two 14 AWG wires per terminal	
Maximum Cable Impedance	NI16V	Voltage Source (with less than 10 Ω impedance): 1250 Ω maximum loop impedance, for 1LSB error	
	NI16I	Current Source (transmitter properly wired to its power supply): 249 Ω maximum loop impedance, to meet common-mode voltage requirements	
Terminal Block		Removable, Allen-Bradley spare part Catalog Number 1746-RT25G	
Allen-Bradley Prewired Cables		1492-ACAB005A46, 0.5m (1.6 ft.) 1492-ACAB010A46, 1.0 m (3.3 ft.) 1492-ACAB025A46, 2.5 m (8.2 ft.) 1492-ACAB050A46, 5.0 m (16.4 ft.)	
Allen-Bradley User Terminal Blocks		1492-AIFM8-3 1492-AIFM16-F-3	

Environmental Specifications

Description	Specification
Operating Temperature	0°C to +60°C (+32°F to +140°F) in any slot except slot 0
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Relative Humidity	5% to 95% (without condensation)
Agency Certification	UL listed C-UL approved CE compliant for all applicable directives
Hazardous Environment Classification	Class I Division 2 Hazardous Environment

Input Specifications

Description		Specification
Type of Input (Selectable)	NI16V	$\pm 10\text{V}$ dc, 1 to 5V dc, 0 to 5V dc, 0 to 10V dc,
	NI16I	0 to 20 mA, 4 to 20 mA, ± 20 mA, 0 to 1 mA
Type of Data (Selectable)		Engineering Units Scaled-for-PID Proportional Counts (-32,768 to +32,767 range) Proportional Counts (User-Defined Range, Class 3 only) 1746-NI4 Data Format
Input Impedance	NI16V	20 M Ω
	NI16I	249 Ω
Maximum Voltage Input without Damage	NI16V	$\pm 30\text{V}$ between any two signal terminals
	NI16I	$\pm 8\text{V}$ between any two signal terminals
Current Input (maximum)		± 30 mA (Between analog com and any input terminal)
Time to Detect Open Circuit		Less than 5 seconds
Module Update Time		See Chapter 4, Channel Filter Frequency Selection, page 4-6
Input Resolution	NI16V	312 μA
	NI16I	640 nA
Display Resolution		1 mV or 1 μA
Module Error Over Full Temperature Range (0°C to +60°C, +32°F to +140°F)	NI16V	Voltage input types ($\pm 10\text{V}$ dc, 1 to 5V dc, 0 to 5V dc, 0 to 10V dc): 0.1%
	NI16I	Current input types (0 to 20 mA, 4 to 20 mA, 0 to 1 mA, ± 20 mA): 0.3%
Input Offset Drift with Temperature	NI16V	Voltage input type: 90 $\mu\text{V}/^\circ\text{C}$ offset drift with temperature
	NI16I	Current input type: 360 nA/ $^\circ\text{C}$ offset drift with temperature
Gain Drift with Temperature	NI16V	15 ppm/ $^\circ\text{C}$
	NI16I	20 ppm/ $^\circ\text{C}$
Calibrated Accuracy at 25°C	NI16V	Better than 0.05% of range
	NI16I	Better than 0.15% of range