MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ALLEN-BRADLEY

1746-NO4I

ANALOG CURRENT OUTPUT MODULE

Used with the applicable SLC 500 Analog I/O configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Allen-Bradley 1746-NO4I; applicable product and connection sections.

Installation Instructions

SLC™ 500 4-Channel Analog I/O Modules

(Catalog Numbers 1746-NI4, -NIO4I, -NIO4V, -NO4I, -NO4V, -FIO4I, and -FIO4V)

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Determining Your Power Requirements for a Modular Controller

Analog modules require both 5V dc and 24V dc power from the backplane of the SLC 500 system. However, the NO4I and NO4V analog modules can use an external 24V dc power supply. This eliminates the 24V dc backplane power requirements, providing configuration flexibility if SLC power supply loading is critical. These two modules provide user-supplied external 24V dc power supply connections.

The following table shows the power requirements for each analog module using backplane power. Use this table to calculate the total load on the modular system power supply. For more information refer to the *SLC 500 Modular Hardware Style User Manual*, publication 1747-UM011.

IMPORTANT The analog modules do not supply loop power for the input device. You must supply the appropriate loop power for loop-powered input devices.

Catalog Number	5 Volt Current	24 Volt Current
1746-NI4	35 mA	85 mA
1746-NIO4I	55 mA	145 mA
1746-NIO4V	55 mA	115 mA
1746-NO4I	55 mA	195 mA(1) (2)
1746-NO4V	55 mA	145 mA(1) (2)
1746-FIO4I	55 mA	150 mA
1746-FIO4V	55 mA	120 mA

(1) The 24V dc user power connection on a fixed SLC 500 can power an NO4I or NO4V analog module. However, the regulation of the 24V dc user connection on a modular SLC 500 power supply, catalog number 1746-P1, -P2, and -P4 is outside of the requirements of the NO4I and NO4V analog modules and cannot be used.

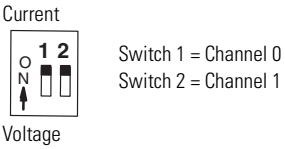
(2) Omit these values from your SLC power supply loading calculations if you decide to use an external power supply.

Determining Your Power Requirements for a Fixed Controller

IMPORTANT The 2-slot, SLC 500 fixed I/O expansion chassis (1746-A2) will support only specific combinations of modules. If you wish to use an I/O module in a 2-slot expansion chassis with another SLC I/O or communication module, refer to the *SLC 500 Analog I/O Modules User Manual*, publication 1746-UM005 for valid combinations of modules.

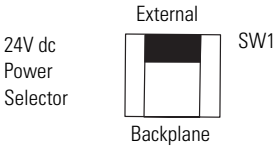
Switch Settings for the 1746-NIO4I, -NIO4V, -FIO4I, and -FIO4V

The NIO4I and NIO4V have 2 individual switches labeled 1 and 2. These switches control the input mode of channel 0 and 1. A switch in the ON position configures the channel for current input. A switch in the OFF position configures the channel for voltage input.



External Power Switch for the 1746-NO4I and -NO4V

The NO4I and NO4V analog output modules have an external 24V dc power switch, SW1, which gives you the option of using an external power supply. In the UP position, power is drawn from an external power source. In the DOWN position, power is drawn from the backplane of the module. The switch is located on the analog module board. Switch orientation is also provided on the nameplate of the module.



Choosing a Slot in the Chassis

Two factors determine where the analog module should be located in the chassis: ambient temperature and electrical noise. Consider the following conditions when selecting a slot for an analog module. Position the module:

- in a slot away from an ac or high voltage dc modules
- in the chassis closest to the bottom of the enclosure where the SLC 500 system is installed
- away from the chassis power supply if installed in a modular system

System Wiring Guidelines

Use the following guidelines in planning the system wiring for the analog modules:

- all analog common terminals (ANL COM) are electrically connected inside the module. ANL COM is *not* connected to earth ground inside the module.
- voltages on IN+ and IN- terminals must remain within ± 20 Volts with respect to ANL COM to ensure proper input channel operation. This is true for current and voltage input channel operation.
- voltage outputs (OUT 0 and OUT 1) of the NIO4V and NO4V are referenced to ANL COM. Load resistance (R1) for a voltage output channel must be greater than or equal to 1K ohms.
- current output channels (OUT 0 and OUT 1) of the NIO4I and NO4I source current that returns to ANL COM. Load resistance (R1) for a current output channel must remain between 0 and 500 ohms.

After the analog input module is properly installed in the chassis, follow the wiring procedure below using Belden 8761 cable.

ATTENTION



Care should be taken to avoid connecting a voltage source without a current transmitter, etc. to a channel configured for current input. Improper module operation or damage to the module can occur.

Grounding Your Cable

Belden cable #8761 has two signal wires (black and clear), one drain wire and a foil shield. Refer to illustration on page 14 for Belden cable #8761. The drain wire and foil shield must be grounded at one end of the cable. Do *not* earth ground the drain wire and foil shield at *both* ends of the cable.

Input Channel - Use a chassis mounting tab as a ground for the drain wire and foil shield.

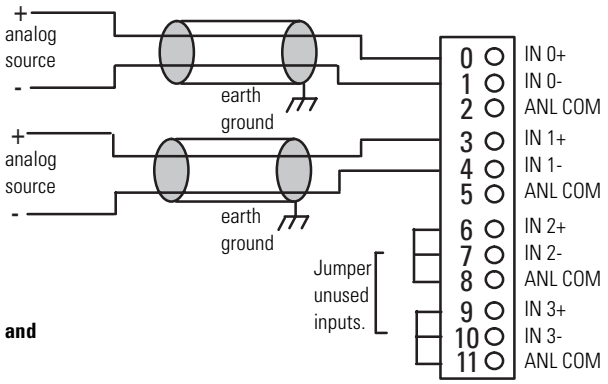
Output Channel - Ground the drain wire and foil shield at the analog load.

IMPORTANT

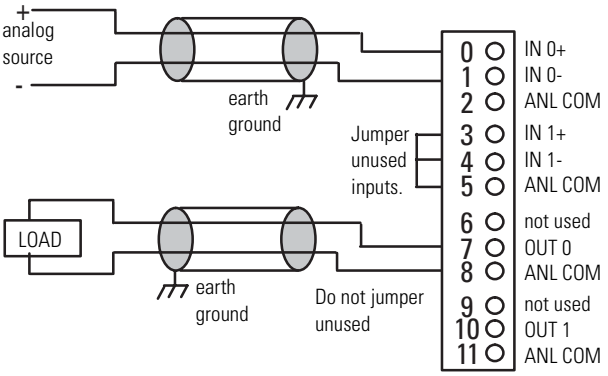
If you cannot ground the output channel at the load, ground the drain wire and foil shield at the chassis mounting tab. Do *not* connect the foil shield or drain wire to the analog terminal block. They *must be* connected to an earth ground, which is not provided at the analog module.

Wiring Diagram (showing differential inputs)

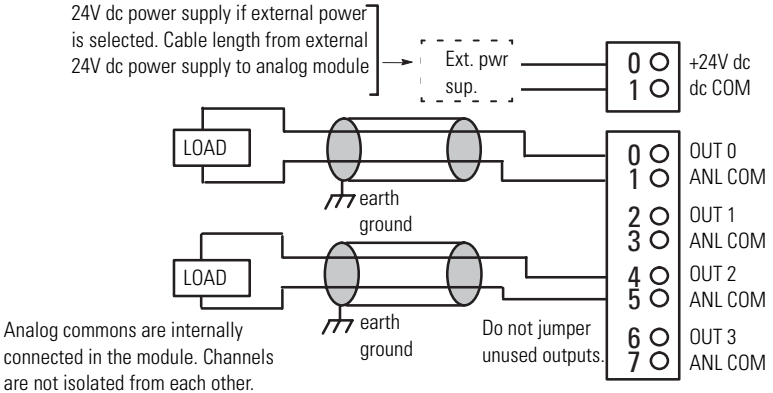
NI4



NIO4I, NIO4V, FIO4I, and FIO4V



NO4I and NO4V



Analog commons are internally connected in the module. Channels are not isolated from each other.

Specifications

General Specifications for NI4, NIO4I, NIO4V, NO4I, NO4V, FIO4I, FIO4V

Description	Specification
SLC Communication Format	16-Bit Two's Complement Binary
Field Wiring to Backplane Isolation	500V dc
Update Time	512 µs for all channels in parallel
Recommended Cable	Shielded Belden #8761
Maximum Wire Size	#14 AWG (maximum)
Terminal Block	Removable
Location	1746 chassis
Calibration	Factory Calibrated (1)
Noise Immunity	NEMA Standard ICS 2-230
Environmental Conditions	
Operating Temperature	0° to +60° C (+32° to +140° F)
Storage Temperature	-40° to +85° C (-40° to +185° F)
Relative Humidity	5 to 95% (non-condensing)
Agency Certification (when product or packaging is marked)	c UL us C-UL Listed Industrial Control Equipment CE Marked for all applicable directives C-Tick N223 Marked for all applicable acts TÜV Functional Safety 1oo2D (AK 1 to 6, SIL 1 to 3, according to DIN V 19250 and IEC 61508 respectively) Category 1 to 4, according to EN954-1

(1) For calibrating the 1746-FIO4I and 1746-FIO4V analog modules, refer to the customer calibration program and procedure in the *SLC 500 Fast Analog I/O Modules User Manual*, publication number 1746-6.9.

Backplane Current Specification for NI4, NIO4I, NIO4V, NO4I, NO4V, FIo4I, and FIO4V

Catalog 1746-	Input Channels per Module	Output Channels per Module	Backplane Current Draw		External 24V dc Power Supply Tolerance
			5V (max.)	24V (max.)	
NI4	4 differential, voltage or current selectable per channel, not individually isolated	NA	35 mA	85 mA	NA
NIO4I	2 differential, voltage or current selectable per channel, not individually isolated	2 current outputs, not individually isolated	55 mA	145 mA	NA
NIO4V	2 differential, voltage or current selectable per channel, not individually isolated	2 voltage outputs, not individually isolated	55 mA	115 mA	NA
NO4I	NA	4 current outputs, not individually isolated	55 mA	195 mA	24V dc ±10% at 195 mA max. (21.6 to 26.4V dc)(1)
NO4V	NA	4 voltage outputs, not individually isolated	55 mA	145 mA	24V dc ±10% at 145 mA max. (21.6 to 26.4V dc)(1)
FIO4I	2 differential, select V or I per channel, not individually isolated	2 current outputs, not individually isolated	55 mA	150 mA	NA
FIO4V	2 differential, select V or I per channel, not individually isolated	2 voltage outputs, not individually isolated	55 mA	120 mA	NA

(1) Required for some applications if sufficient power is not available from SLC power supply.

Current Output Specifications for NIO4I, NO4I, and FIO4I

Description	Specification	
	NIO4I, NO4I	**FIO4I**
Converter Resolution	14 bit	
Location of LSB in I/O image word	0000 0000 0000 01XX	
Non–linearity	0.05%	
Conversion Method	R-2R Ladder	
Step Response	2.5 ms (at 95%)	
Load Range	0 to 500 Ohms	
Maximum Load Reactance	100 µH	
Current Output Coding (0 to +21 mA - 1 LSB)	0 to +32764	
Output Range (Normal)	0 to +20 mA	0 to +20 mA -1 LSB
Overrange Capability	5% (0 to +21 mA - 1 LSB)	5% (0 to +20 mA - 1 LSB)
Resolution	2.56348 µA per LSB	
Full Scale	21 mA	
Overall Accuracy at +25° C (77° F) (max.)	±0.298% of full scale	
Overall Accuracy at 0° to +60° C (32° to 140° F) (max.)	±0.541% of full scale	
Overall Accuracy Drift (max.)	±70ppm/° C of full scale	
Gain Error at +25° C (77° F) (max.)	±0.298%	
Gain Error at 0° to +60° C (32° to 140° F) (max.)	±0.516%	
Gain Error Drift (max.)	±62ppm/° C	
Offset Error at +25° C (77° F) (max.)	±10 LSB	
Offset Error at 0° to +60° C (32° to 140° F) (max.)	±12 LSB	
Offset Error Drift (max.)	±0.06 LSB/° C	