

SLC 500 System Overview

The Allen-Bradley SLC 500 is a small chassis-based family of programmable controllers, discrete, analog, and specialty I/O, and peripheral devices. The SLC 500 family delivers power and flexibility with a wide range of communication configurations, features, and memory options. The RSLogix 500 ladder logic programming package provides flexible editors, point-and-click I/O configuration, and a powerful database editor, as well as diagnostic and troubleshooting tools to help you save project development time and maximize productivity.



Topic	Page
Select SLC 500 I/O Modules	2
Select Network Communications	2
Select an SLC 500 Processor	69
Select an SLC 500 Chassis	75
Select SLC 500 Power Supplies	79
Select Programming Software	91
Summary	101

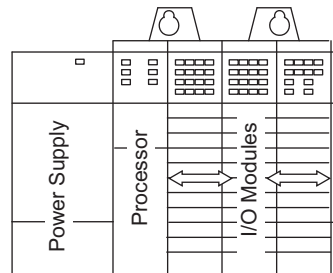
Typical Systems

With up to 64 K of configurable data/program memory available and over 60 types of I/O modules, as well as a choice of networking options, the SLC system provides a powerful solution for stand-alone or distributed industrial control.

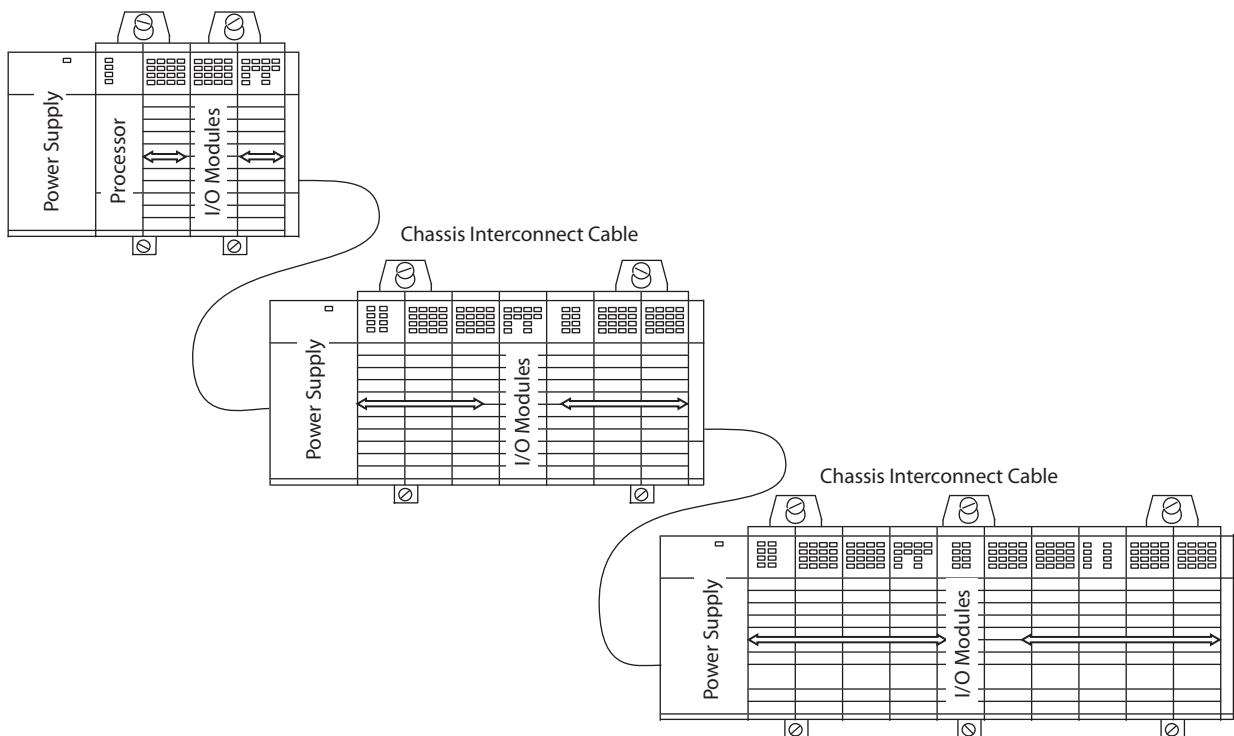
Allen-Bradley 1746-NIO4V

Local Systems

At minimum, a modular hardware SLC 500 control system consists of a processor module and I/O modules in a single 1746 chassis with a power supply.



You can configure a system with one, two, or three local chassis, for a maximum total of 30 local I/O or communication modules. You connect multiple local chassis together with chassis interconnect cables to extend the backplane signal lines from one chassis to another.



Distributed Systems

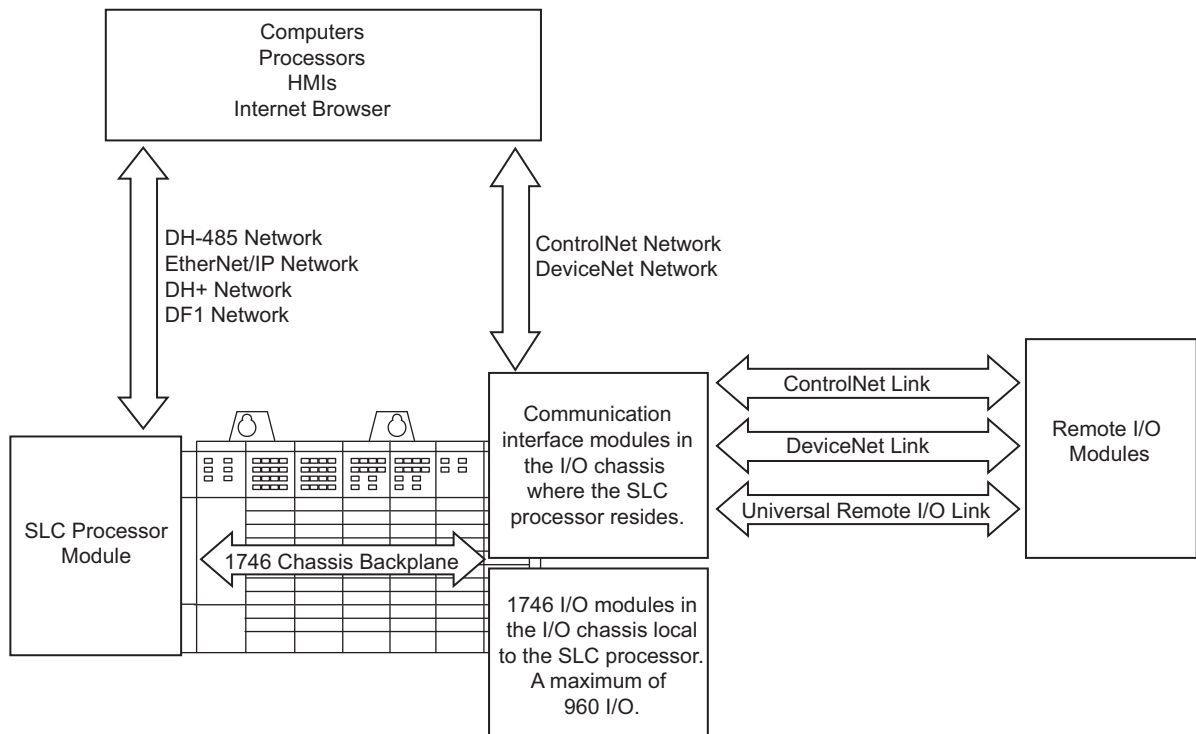
More complex systems can use:

- distributed I/O.

- multiple controllers joined across networks.
- I/O in multiple platforms that are distributed in many locations and connected over multiple I/O links.

Choose the processor module with the on-board communication ports you need. You optionally add modules to provide additional communication ports for the processor. For I/O in locations remote from the processor, you can choose between a ControlNet, DeviceNet, or Universal I/O link. A communication interface module is required in both the local and remote chassis.

Depending upon the communication ports available on your particular SLC control system, you can select operator interfaces that are compatible.



Laying Out the System

Lay out the system by determining the amount of I/O necessary, the network configurations, and the placement of components in each location. Decide at this time whether each chassis will have its own controller or a networked solution.

SLC 500 processors are available with a large range of memory sizes (1 K...64 K) and can control up to 4096 input and 4096 output signals. All modular processors except the SLC 5/01 processor are capable of controlling remotely located I/O. By adding an I/O scanner module, you can use these processors to control/monitor these remotely located I/O across ControlNet, DeviceNet, and Universal Remote I/O links.

Allen-Bradley 1746-NIO4V

SLC 500 processors are single-slot modules that you place into the left-most slot of a 1746 I/O chassis. For I/O in a location remote from the processor, the I/O adapter is a single-slot module that you place in the left-most slot of the I/O chassis. SLC 500 modular systems provide separate power supplies which must be mounted directly on the left end of the 1746 I/O chassis.

The 1746 I/O chassis are designed for back-panel mounting and available in sizes of 4, 7, 10, or 13 module slots. The 1746 I/O modules are available in densities up to a maximum of 32 channels per module.

Communications

Evaluate what communications need to occur. Knowing your communications requirements will help you determine which processor and which communications devices your application might require.

An SLC processor communicates across the 1746 backplane to 1746 I/O modules in the same chassis in which the processor resides. Various models of SLC processors have various on-board ports for communication with other processors or computers. Also, separate modules are available to provide additional communication ports for communication with other processors, computers, and remotely located I/O.

Each processor has one or two built-in ports for either EtherNet/IP, DH+, DH-485, or RS-232 (DF1, ASCII, or DH-485 protocol) communication.

In addition to the on-board ports available with SLC processors, you have the option of providing another communication port for an SLC processor by adding a communication module.

Adapter modules for 1746 I/O are available for ControlNet and Universal Remote I/O links. An I/O adapter module in a chassis with I/O modules interfaces the I/O modules with the I/O link for communication with a scanner port for a processor at another location.

SLC 500 Common Specifications

The following specifications apply to all SLC 500 modular components unless noted.

Environmental Specifications

Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): 0...60 °C (32...140 °F)
Temperature, nonoperating	IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock): -40...85 °C (-40...185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% without condensation

Environmental Specifications

Attribute	Value
Vibration, operating	IEC 60068-2-6 (Test Fc, Operating): 1 g @ 5...2000 Hz
Vibration, nonoperating	2.5 g @ 5...2000 Hz
Shock, operating	30 g (3 pulses, 11 ms) – for all modules except relay contact 10 g (3 pulses, 11 ms) – for relay contact modules 1746-OWx and 1746-IOx combo
Shock, nonoperating	50 g, 3 pulses, 11 ms
Free fall (drop test)	Portable, 2.268 kg (5 lb) or less @ 0.762 m (30 in.), six drops Portable, 2.268 kg (5 lb) or less @ 0.1016 m (4 in.), three flat drops
Isolation voltage	Isolation between communication circuits: 500V DC Isolation between backplane and I/O: 1500V AC

Certifications

Certifications when product is marked⁽¹⁾	Value
UL	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations. See UL File E10314.
c-UL	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for Canada. See UL File E10314.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3

(1) See the Product Certification link at <http://www.rockwellautomation.com/products/certification/> for Declarations of Conformity, Certificates, and other certification details.

Allen-Bradley 1746-NIO4V

SLC 500 System Checklist

Use the following Checklist as a guide to completing your own system specification.

✓	Step	See
	1 Select I/O Modules <ul style="list-style-type: none"> • consider using an interface module or pre-wired 1492 cables • use a spreadsheet to record your selections 	page 9
	2 Select Communication Modules/Devices <ul style="list-style-type: none"> • determine your network communication requirements and select the necessary communication modules/devices • include appropriate communication cables • record your module/device selections on the system spreadsheet 	page 51
	3 Select an SLC 500 Processor <ul style="list-style-type: none"> • choose a processor based on memory, I/O, performance, programming requirements, and communication options 	page 69
	4 Select an SLC 500 Chassis <ul style="list-style-type: none"> • determine the number of chassis and any interconnect cables required based on the physical configuration of your system 	page 75
	5 Select an SLC 500 Power Supply <ul style="list-style-type: none"> • use the power supply loading worksheet to ensure sufficient power for your system • consider future system expansion when selecting a power supply 	page 79
	6 Select Programming Software <ul style="list-style-type: none"> • select the appropriate package of RSLogix 500 Programming Software for your application 	page 91

Combination I/O Modules

Specifications	1746-I04	1746-I08	1746-I012	1746-I012DC
Number of inputs	2	4	6	6
Number of outputs	2	4	6	6
Points per common	2	4	6	6
Voltage category	120V AC (inputs) 100/120V AC (relay contact outputs)			10...30V DC (inputs) 5...265V AC @ 47...63 Hz / 5...125V DC (outputs)
Operating voltage range	85...132V AC @ 47...63 Hz (inputs) 5...265V AC @ 47...63 Hz / 5...125V DC (outputs)			10...30V DC (inputs) 5...265V AC @ 47...63 Hz / 5...125V DC (outputs)
Backplane current (mA) @ 5V	30 mA	60 mA	90 mA	80 mA
Backplane current (mA) @ 24V	25 mA	45 mA	70 mA	60 mA
Continuous current per point	See Relay Contact Ratings for 1746-OW4 on page 16		See Relay Contact Ratings for 1746-OW16 on page 16	
Continuous current per module	4 A	8 A	8 A	8 A

1746-SIM Input Simulator

The 1746-SIM Input Simulator is designed for use on 16-channel 24V DC sinking and sourcing modules with removable terminal blocks, including 1746-IB16, 1746-ITB16, 1746-IV16, 1746-ITV16, and 1746-IN16 modules. The input simulator provides 16 switches for simulating inputs to the SLC 500.

1746 Analog I/O Modules

Analog I/O modules feature user-selectable voltage or current inputs, backplane isolation, removable terminal blocks, and diagnostic feedback.

The 1746-NI4, 1746-NIO4I, and 1746-NIO4V input channels are filtered to reject high frequency noise and provide 14- to 16-bit (range-dependent) resolution.

All 4-channel analog output modules provide 14-bit resolution and a 2.5 ms conversion rate.

The 1746-FIO4I and 1746-FIO4V modules have less input filtering and can sense more rapidly changing inputs. However, their input resolution is only 12-bit. Because the input filter on the 1746-FIO4I or 1746-FIO4V module may pass more electrical noise, you should thoroughly ground and shield the input transducer, its power supply, and cables.

The 1746-NI8 module provides high accuracy and fast analog signal conversion. The 1746-NI8, 1746-NI16I and 1746-NI16V modules are high density analog input modules that are software configurable.

The 1746-NO8I (current output) and 1746-NO8V (voltage output) modules are high density, analog output modules that provide 8 individually configurable output channels with 16-bit resolution.

Allen-Bradley 1746-NIO4V

Analog I/O Module Overview

Catalog Number	Description	Voltage Category	For specifications, see
1746-NI4	High Resolution (4) Analog Input Module	-20...+20 mA (or) -10...+10V DC	page 19: General Input Specifications page 19: Current Loop Input Specifications page 20: Voltage Input Specifications
1746-NI8	High Resolution (8) Analog Input Module	-20...+20 mA (or) -10...+10V DC	page 22: General input specifications page 22: Input step response page 23: Current loop input specifications page 23: Voltage input specifications
1746-NI16 ⁽¹⁾	High Resolution (16) Analog Input Module	-20...+20 mA	page 25: General input specifications
1746-NI16V ⁽¹⁾	High Resolution (16) Analog Input Module	-10...+10V DC	page 26: Module update times
1746-NIO4I	High Resolution (2) Analog Input, (2) Analog Current Output Module	-20...+20 mA (or) -10...+10V DC (inputs) 0...20 mA (outputs)	page 19: General Input Specifications page 19: Current Loop Input Specifications
1746-NIO4V	High Resolution (2) Analog Input, (2) Analog Voltage Output Module	20...+20 mA (or) -10...+10V DC (inputs) -10...+10V DC (outputs)	page 20: Voltage Output Specifications
1746-FIO4I	(2) Fast Analog Input, (2) Analog Current Output Module	0...20 mA (or) 0...10V DC (inputs) 0...20 mA (outputs)	page 19: General Input Specifications page 19: Current Loop Input Specifications page 20: Voltage Input Specifications
1746-FIO4V	(2) Fast Analog Input, (2) Analog Voltage Output Module	0...20 mA	page 20: Output specifications
1746-NIO4I	(4) Analog Current Output Module	-10...+10V DC	page 20: Output specifications
1746-NIO4V	(4) Analog Voltage Output Module	0...20 mA	page 20: Output specifications
1746-NO8I	(8) Analog Current Output Module	-10...+10V DC	page 24: Output specifications
1746-NO8V	(8) Analog Voltage Output Module	-10...+10V DC	page 24: Output specifications

(1) Single-ended connections only.

4-Channel Analog I/O Modules**General Input Specifications for 4-Channel Modules**

Specification	1746-NI4	1746-NIO4I	1746-NIO4V	1746-FIO4I	1746-FIO4V
Backplane current (mA) @ 5V	25 mA	55 mA	55 mA	55 mA	55 mA
Backplane current (mA) @ 24V	85 mA	145 mA	115 mA	150 mA	120 mA
Number of inputs	4	2	2	2	2
Backplane isolation	500V AC and 710V DC withstand for 1 minute				
Step response	60 ms			100 μs	

General Input Specifications for 4-Channel Modules

Specification	1746-NI4	1746-NIO4I	1746-NIO4V	1746-FIO4I	1746-FIO4V
Conversion method	sigma-delta modulation			successive approximation	
Converter resolution	16 bit			12 bit	
Conversion time	N/A			7.5 μ s every 512 μ s (nominal)	
Module throughput delay	512 μ s (nominal)			1.10 ms (maximum) ⁽¹⁾ 512 μ s (typical)	

(1) Worst-case throughput occurs when the module just misses an event.

Current Loop Input Specifications for 4-Channel Modules

Specification	1746-NI4	1746-NIO4I	1746-NIO4V	1746-FIO4I	1746-FIO4V
Full scale	20 mA	20 mA	20 mA	20 mA	20 mA
Input range	\pm 20 mA (nominal) \pm 30 mA (maximum)			0...20 mA (nominal) for 0...30 mA (maximum)	
Current input coding	\pm 16,384 for \pm 20mA			0...2047 counts for 0...20 mA	
Absolute maximum input voltage	\pm 7.5V DC or 7.5V AC RMS				
Input Impedance	250 Ω (nominal)			250 Ω (nominal)	
Resolution	1.22070 μ A per LSB			9.7656 μ A per bit	
Overall accuracy @ 25 °C (77 °F)	\pm 0.365% of full scale			\pm 0.510% of full scale	
Overall accuracy, 0...60 °C (32...140 °F)	\pm 0.642% of full scale (maximum)			\pm 0.850% of full scale	
Overall accuracy drift	+79 ppm/°C of full scale			+98 ppm/°C of full scale (maximum)	
Gain error @ 25 °C (77 °F)	+0.323% (maximum)			+0.400% (maximum)	
Gain error, 0...60 °C (32...140 °F)	+0.556% (maximum)			+0.707% of full scale	
Gain error drift	\pm 67 ppm/°C			\pm 89 ppm/°C (maximum)	

Voltage Input Specifications for 4-Channel Modules

Specification	1746-NI4	1746-NIO4I	1746-NIO4V	1746-FIO4I	1746-FIO4V
Full Scale	10V DC	10V DC	10V DC	10V DC	10V DC
Input Range	\pm 10V DC -1 LSB			0...10V DC -1 LSB	
Input Impedance	1 M Ω				
Overvoltage Protection (IN+ to -IN)	220V DC or AC RMS continuously			220V dc or ac RMS continuously	
Resolution	305.176 μ V per LSB			2.4414 mV per LSB (nominal)	
Voltage input coding	-32,768...+32,767 for +10V DC			0...4095 counts for 0...10V DC	
Overall accuracy @ 25 °C (77 °F)	\pm 0.284% of full scale			\pm 0.440% of full scale	
Overall Accuracy, 0...60 °C (32...140 °F)	\pm 0.504% of full scale			\pm 0.750% of full scale	

Voltage Input Specifications for 4-Channel Modules

Specification	1746-NI4	1746-NIO4I	1746-NIO4V	1746-FIO4I	1746-FIO4V
Overall accuracy drift (maximum)	+63 ppm/°C of full scale (maximum)			+88 ppm/°C (maximum)	
Gain error @ 25 °C (77 °F)	+0.263% (maximum)			+0.323% of full scale	
Gain error, 0...60 °C (32...140 °F)	+0.461% (maximum)			+0.530% of full scale	
Gain error drift	±57 ppm/°C			±79 ppm/°C	

Output Specifications for 4-Channel Modules

Specification	1746-FIO4I	1746-NIO4I	1746-NO4I	1746-FIO4V	1746-NIO4V	1746-NO4V
Number of outputs	2	2	4	2	2	4
Backplane current (mA) @ 5V	55 mA	55 mA	55 mA	55 mA	55 mA	55 mA
Backplane current (mA) @ 24V	150 mA	145 mA	195 mA ⁽¹⁾	120 mA	115 mA	145 mA
Isolation voltage	Tested @ 500V AC and 710V DC for 60 seconds					
Full scale	21 mA			10V DC		
Output range (normal)	0...20 mA -1 LSB			±10V DC -1 LSB		
Output coding	0...32,764 for 0...21 mA			-32,768...+32,764 for ±10V DC		
Output resolution (per LSB)	2.56348 µA			1.22070 mV		
Converter resolution	14-bit			14-bit		
Conversion method	R-2R ladder			R-2R ladder		
Step response	2.5 ms (5...95%)			2.5 ms (normal)		
Load range	0...500 Ω			1K...? Ω		
Load current, max	N/A			10 mA		
Overrange capability	5% (0...21 mA -1 LSB)			N/A		
Overall accuracy @ 25 °C (77 °F)	±0.298% of full scale			±0.208% of full scale		
Overall Accuracy, 0...60 °C (32...140 °F)	±0.541% of full scale			±0.384% of full scale		
Overall accuracy drift, max	±70 ppm/°C of full scale			±0.384% of full scale		
Gain error @ 25 °C (77 °F)	±298% of full scale			±208% of full scale		
Gain Error, 0...60 °C (32...140 °F)	±516% of full scale			±374% of full scale		
Gain error drift, max	±62 ppm/°C of full scale			±47 ppm/°C of full scale		

(1) The 1746-NO4I and 1746-NO4V analog output modules have connections for user-supplied 24V dc power supplies. When external 24V DC power is used, the module only draws 5V DC current from the SLC backplane. If an external 24V DC power supply is required, the tolerance must be 24V ±10% (26.6...26.4V DC). The user power supplies for SLC 500 modular systems, 1746-P1, 1746-P2, 1746-P5, and 1746-P6 power supplies do not meet this specification.

40-terminal IFM. To use this table, you must first have selected an IFM from the preceding table.

Pre-Wired Cables for 1746 Analog I/O Modules

Cable Cat. No.	Standard Cable Lengths (m)	Build-to-Order Available	AIFM Connector	Mating I/O Module Catalog Number
1492-ACABLE ⁽¹⁾ A	0.5, 1.0, 2.5, 5.0 m	Yes	15-pin D-shell	1746-NI4
1492-ACABLE ⁽¹⁾ B	0.5, 1.0, 2.5, 5.0 m	Yes	15-pin D-shell	1746-NO4I, -NO4V
1492-ACABLE ⁽¹⁾ C	0.5, 1.0, 2.5, 5.0 m	Yes	25-pin D-shell	1746-NI8
1492-ACABLE ⁽¹⁾ D	0.5, 1.0, 2.5, 5.0 m	Yes	25-pin D-shell	1746-NR4
1492-ACABLE ⁽¹⁾ L	0.5, 1.0, 2.5, 5.0 m	Yes	15-pin D-shell	1746-NIO4I, -NIO4V, -FIO4I, -FIO4V
1492-ACABLE ⁽¹⁾ Q	0.5, 1.0, 2.5, 5.0 m	Yes	25-pin D-shell	1746-QS
1492-ACABLE ⁽¹⁾ A46	0.5, 1.0, 2.5, 5.0 m	Yes	25-pin D-shell	1746-NI16I, -NI16V

(1) .To order, insert the code for the desired cable length into the cat. no. (005 = 0.5 m, 010 = 1.0 m, 025 = 2.5 m, and 050 = 5.0 m). Example: Catalog Number 1492-ACABLE005A is for a 0.5 m cable that could be used to connect a Catalog Number 1492-AIFM4I-F-5 IFM to a Catalog Number 1746-NI4 I/O module.

Allen-Bradley 1746-NIO4V

Digital Combination Modules

Catalog Number	Backplane Current (mA) @ 5V	Backplane Current (mA) @ 24V	Watts per point	Thermal dissipation, min.	Thermal dissipation, max.
1746-I04	30 mA	25 mA	0.270 W per input point 0.133 W per output point	0.75 W	1.60 W
1746-I08	60 mA	45 mA	0.270 W per input point 0.133 W per output point	1.38 W	3.00 W
1746-I012	90 mA	70 mA	0.270 W per input point 0.133 W per output point	2.13 W	4.60 W
1746-I012DC	80 mA	60 mA	0.200 W per input point 0.133 W per output point	1.84 W	3.90 W

Analog Input Modules

Catalog Number	Backplane Current (mA) @ 5V	Backplane Current (mA) @ 24V	Watts per point	Thermal dissipation, min.	Thermal dissipation, max.
1746-NI4	25 mA	85 mA	N/A	2.17 W	2.20 W
1746-NI8	200 mA	100 mA	N/A	3.4 W	3.4 W
1746-NI16I	125 mA	75 mA	N/A	2.43 W	2.43 W
1746-NI16V	125 mA	75 mA	N/A	3.76 W	3.8 W

Analog Output Modules

Catalog Number	Backplane Current (mA) @ 5V	Backplane Current (mA) @ 24V	Watts per point	Thermal dissipation, min.	Thermal dissipation, max.
1746-NO4I	55 mA	195 mA	N/A	4.96 W	5.00 W
1746-NO4V	55 mA	145 mA	N/A	3.04 W	3.80 W
1746-NO8I	120 mA	250 mA ⁽¹⁾	N/A	3.76 W	6.6 W
1746-NO8V	120 mA	160 mA ⁽¹⁾	N/A	3.04 W	4.44 W

(1) With jumper set to RACK, otherwise 0.000.

Analog Combination Modules

Catalog Number	Backplane Current (mA) @ 5V	Backplane Current (mA) @ 24V	Watts per point	Thermal dissipation, min.	Thermal dissipation, max.
1746-FIO4I	55 mA	150 mA	N/A	3.76 W	3.80 W
1746-FIO4V	55 mA	120 mA	N/A	3.04 W	3.10 W
1746-NIO4I	55 mA	145 mA	N/A	3.76 W	3.80 W
1746-NIO4V	55 mA	115 mA	N/A	3.04 W	3.10 W