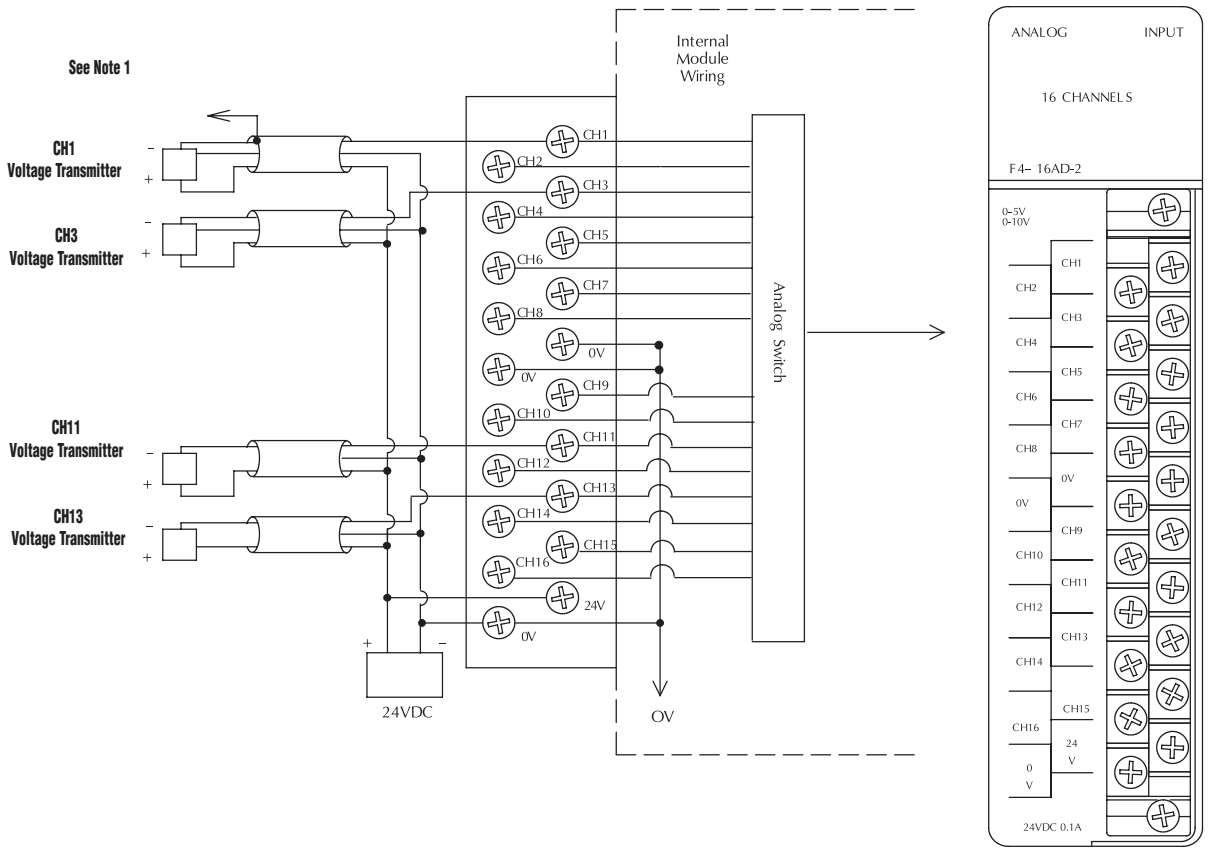
Analog Input Modules

F4-16AD-2 16-Channel Analog Voltage Input	
Number of Channels	16, single ended (one common)
Input Ranges	0–5 V, 0–10 V,
Channels Individually Configurable	No. Each channel can be configured for current or voltage but must be same range.
Resolution	12 bit (1 to 4,096)
Active Low-pass Filtering	-3dB at 20Hz, -12 dB per octave
Input Impedance	1MΩ minimum
Absolute Maximum Ratings	130VAC/100VDC,
Conversion Time	0.4 ms per channel (module conversion) 2ms per selected channel minimum (CPU)
Linearity Error (End to End)	± 2 count (0.050% of full scale) max.
Input Stability	± 1 count
Full Scale Calibration Error (Offset error not included)	± 12 counts voltage input
Offset Calibration Error	± 3 counts max., unipolar voltage input

PLC Update Rate	1 channel per scan min., 16 per scan, max.
Digital Input Points Required	16 (X) input points (12 binary data bits, 4 active channel bits,)
Base Power Required 5V	75mA
Terminal Type (included)	Removable
External Power Supply	21.6–26.4 VDC, 100mA, class2
Operating Temperature	32° to 140°F (0 to 60°C)
Accuracy vs Temperature	± 50 ppm/°C maximum full scale (including maximum offset change of 2 counts)
Storage Temperature	-4 to 158°F (-20 to 70° C)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).
NOTE 1: Shields should be grounded at the signal source.
More than one external power supply can be used (see channel 8)
If the power supply common of an external power supply is not connected to 0VDC on the module, then the output of the external transmitter must be isolated.

See Wiring Solutions for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.



Check the Power Budget

Verify your power budget requirements

Your I/O configuration choice can be affected by the power requirements of the I/O modules you choose. When determining the types and quantity of I/O modules you will be using, it is important to remember there is a limited amount of power available from the power supply.

The chart on the opposite page indicates the power supplied and used by each DL405 device. The adjacent chart shows an example of how to calculate the power used by your particular system. These two charts should make it easy for you to determine if the devices you have chosen fit within the power budget of your system configuration.

If the I/O you have chosen exceeds the maximum power available from the power supply, you can resolve the problem by shifting some of the modules to an expansion base or remote I/O base (if you are using remote I/O).

Warning: It is extremely important to calculate the power budget correctly. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

Use *ZIP*Links to reduce power requirements

If your application requires a lot of relay outputs, consider using the *ZIP*Link AC or DC relay output modules. These modules can switch high current (10A) loads without putting a load on your base power budget. Refer to Wiring System for DL405 PLCs later in this section for more information.

This logo is placed next to I/O modules that are supported by the *ZIP*Link connection systems.

See the I/O module specifications at the end of this section.

Calculating your power usage

The following example shows how to calculate the power budget for the DL405 system. The example is constructed around a single 8-slot base using the devices shown. It is recommended you construct a similar table for each base in your system.

A				
	Base Number 0	***Device Type***	***5 VDC (mA)***	***External 24 VDC Power (mA)***
B	**CURRENT SUPPLIED**			
	CPU/Expansion Unit /Remote Slave	D4-454 CPU	3700	400
C	**CURRENT REQUIRED**			
	SLOT 0	D4-16ND2	+150	+0
	SLOT 1	D4-16ND2	+150	+0
	SLOT 2	F4-04DA	+120	+100
	SLOT 3	D4-08NA	+100	+0
	SLOT 4	D4-08NA	+100	+0
	SLOT 5	D4-16TD2	+100	+0
	SLOT 6	D4-16TD2	+100	+0
	SLOT 7	D4-16TR	+1000	+0
D	**OTHER**			
	BASE	D4-08B-1	+80	+0
	Handheld Programmer	D4-HPP-1	+320	+0
E	**Maximum Current Required**		***2820***	***100***
F	**Remaining Current Available**		***3700-2820=880***	***400-100=300***

1. Using a chart similar to the one above, fill in column 2.
2. Using the tables on the opposite page, enter the current supplied and used by each device (columns 3 and 4). Pay special attention to the current supplied by the CPU, Expansion Unit, and Remote Slave since they differ. Devices which fall into the "Other" category (Row D) are devices such as the Base and the Handheld programmer, which also have power requirements, but do not plug directly into the base.
3. Add the current used by the system devices (columns 3 and 4) starting with Slot 0 and put the total in the row labeled "maximum current required" (Row E).
4. Subtract the row labeled "Maximum current required" (Row E), from the row labeled "Current Supplied" (Row B). Place the difference in the row labeled "Remaining Current Available" (Row F).
5. If "Maximum Current Required" is greater than "Current Supplied" in either column 3 or 4, the power budget will be exceeded. It will be unsafe to use this configuration and you will need to restructure your I/O configuration. Note the auxiliary 24VDC power supply does not need to supply all the external power. If you need more than the 400mA supplied, you can add an external 24VDC power supply. This will help keep you within your power budget for external power.

DL405 CPU power supply specifications and power requirements

Specification	AC Powered Units	24 VDC Powered Units
Part Numbers	D4-454, D4-EX (expansion base unit), D4-RS (remote slave unit)	D4-454DC-1, D4-EXDC (expansion base unit)
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay	
Insulation Resistance	> 10MΩ at 500VDC	
Input Voltage Range	85-132 VAC (110V range) 170-264 VAC (220V range)	20-28 VDC (24VDC) with less than 10% ripple
Maximum Inrush Current	20A	20A
Maximum Power	50VA	38W

Power Requirements

Power Supplied					
CPUs/Remote Units/ Expansion Units	***5 VDC Current Supplied in mA***	***24V Aux Power Supplied in mA***	***CPUs/Remote Units/ Expansion Units***	***5V Current Supplied in mA***	***24V Aux Power Supplied in mA***
D4-454 CPU	3100	400	D4-EX	4000	400
D4-454DC-1	3100	NONE	D4-EXDC	4000	NONE
			D4-RS	3700	400
			H4-EBC	3470	400

Power Consumed					
Power-consuming Device	***5V Current Consumed***	***External 24VDC Current Required***	***Power-consuming Device***	***5V Current Consumed***	***External 24VDC Current Required***
I/O Bases			***Analog Modules (continued)***		
D4-04B-1	80	NONE	F4-16AD-1	75	100
D4-06B-1	80	NONE	F4-16AD-2	75	100
D4-08B-1	80	NONE	F4-04DA-1	70	75+20 per circuit
DC Input Modules			F4-04DA-2	90	90
			F4-04DAS-1	60	60 per circuit
D4-16ND2	150	NONE	F4-08DA-1	90	100+20 per circuit
D4-16ND2F	150	NONE	F4-08DA-2	80	150
D4-32ND3-1	150	NONE	F4-16DA-1	90	100+20 per circuit
D4-64ND2	300 max.	NONE	F4-16DA-2	80	25 max.
			F4-08RTD	80	NONE
			F4-08THM-n	120	50
			F4-08THM	110	60
AC Input Modules			***Remote I/O***		
D4-08NA	100	NONE	H4-ERM100	320(300)	NONE
D4-16NA	150	NONE	H4-ERM-F	450	NONE
AC/DC Input Modules			D4-RM	300	NONE
D4-16NE3	150	NONE	***Communications and Networking***		
DC Output Modules			H4-ECOM100	300	NONE
			D4-DCM	500	NONE
D4-16TD1	200	125	F4-MAS-MB	235	NONE
D4-16TD2	400	NONE	***CoProcessors***		
D4-32TD1	250	140			
D4-32TD2	350	120 (4A max including loads)	F4-CP128-1	305	NONE
D4-64TD1	800	NONE	***Specialty Modules***		
AC Output Modules					
D4-08TA	250	NONE	H4-CTRIO	400	NONE
D4-16TA	450	NONE	D4-16SIM	150	NONE
Relay Output Modules			F4-4LTC	280	75
D4-08TR	550	NONE	***Programming***		
F4-08TRS-1	575	NONE	D4-HPP-1 (Handheld Prog.)	320	NONE
F4-08TRS-2	575	NONE	***Operator Interface***		
D4-16TR	1000	NONE	DV-1000	150	NONE
Analog Modules			C-more Micro-Graphic	210	NONE
F4-04AD	150	100			
F4-04ADS	370	120			
F4-08AD	75	90			

Wiring Solutions

Wiring Solutions using the *ZIP*Link Wiring System

*ZIP*Links eliminate the normally tedious process of wiring between devices by utilizing prewired cables and DIN rail mount connector modules. It's as simple as plugging in a cable connector at either end or terminating wires at only one end. Prewired cables keep installation clean and efficient, using half the space at a fraction of the cost of standard terminal blocks. There are several wiring solutions available when using the *ZIP*Link System ranging from PLC I/O-to-*ZIP*Link Connector Modules that are ready for field termination, options for connecting to third party devices, GS, DuraPulse and SureServo Drives, and specialty relay, transorb and communications modules. Pre-printed I/O-specific adhesive label strips for quick marking of *ZIP*Link modules are provided with *ZIP*Link cables. See the following solutions to help determine the best *ZIP*Link system for your application.

Solution 1: DirectLOGIC I/O Modules to *ZIP*Link Connector Modules

When looking for quick and easy I/O-to-field termination, a *ZIP*Link connector module used in conjunction with a prewired *ZIP*Link cable, consisting of an I/O terminal block at one end and a multi-pin connector at the other end, is the best solution.

Using the PLC I/O Modules to *ZIP*Link Connector Modules selector tables located in this section,

1. Locate your I/O module/PLC.
2. Select a *ZIP*Link Module.
3. Select a corresponding *ZIP*Link Cable.

Solution 2: *Direct*LOGICI/O Modules to 3rd Party Devices

When wanting to connect I/O to another device within close proximity of the I/O modules, no extra terminal blocks are necessary when using the *ZIP*Link Pigtail Cables. *ZIP*Link Pigtail Cables are prewired to an I/O terminal block with color-coded pigtail with soldered-tip wires on the other end.

Using the I/O Modules to 3rd Party Devices selector tables located in this section,

1. Locate your PLC I/O module.
2. Select a *ZIP*Link Pigtail Cable that is compatible with your 3rd party device.

Solution 3: GS Series and DuraPulse Drives Communication Cables

Need to communicate via Modbus RTU to a drive or a network of drives?

*ZIP*Link cables are available in a wide range of configurations for connecting to PLCs and *Sure*Servo, *Sure*Step, Stellar Soft Starter and AC drives. Add a *ZIP*Link communications module to quickly and easily set up a multi-device network.

Using the Drives Communication selector tables located in this section,

1. Locate your Drive and type of communications.
2. Select a *ZIP*Link cable and other associated hardware.

Solution 4: Serial Communications Cables

*ZIP*Link offers communications cables for use with *Direct*LOGIC, CLICK, and Productivity3000 CPUs, that can also be used with other communications devices. Connections include a 6-pin RJ12 or 9-pin, 15-pin and 25-pin D-sub connectors which can be used in conjunction with the RJ12 or D-Sub Feedthrough modules.

Using the Serial Communications Cables selector table located in this section,

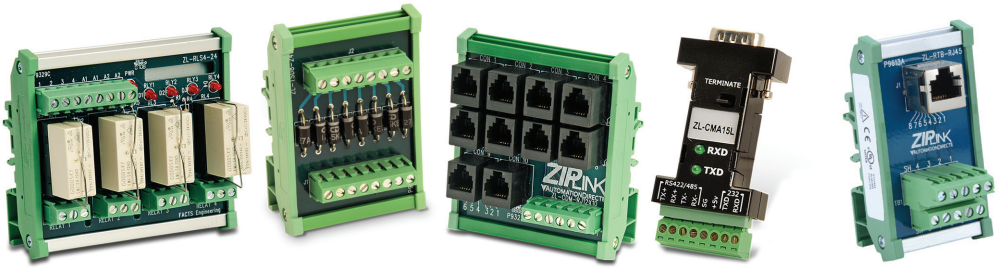
1. Locate your connector type
2. Select a cable.

Solution 5: Specialty *ZIP*Link Modules

For additional application solutions, *ZIP*Link modules are available in a variety of configurations including stand-alone relays, 24VDC and 120VAC transorb modules, D-sub, RJ12 and RJ45 feedthrough modules, communication port adapter and distribution modules, and *Sure*Servo 50-pin I/O interface connection.

Using the *ZIP*Link Specialty Modules selector table located in this section,

1. Locate the type of application.
2. Select a ZIPLink module.



Solution 6: *ZIP*Link Connector Modules to 3rd Party Devices

If you need a way to connect your device to terminal blocks without all that wiring time, then our pigtail cables with color-coded soldered-tip wires are a good solution. Used in conjunction with any compatible *ZIP*Link Connector Modules, a pigtail cable keeps wiring clean and easy and reduces troubleshooting time.

Using the Universal Connector Modules and Pigtail Cables table located in this section,

1. Select module type.
2. Select the number of pins.
3. Select cable.

PLC I/O Modules to *ZIP*Link Connector Modules - DL405

DL405 PLC Input Module *ZIP*Link Selector				
PLC	***ZIP*Link**			
Input Module	***# of Terms***	***Component***	***Module Part No.***	***Cable Part No.***
D4-16ND2	20	**See Note 3**		
D4-16ND2F				
D4-32ND3-1 [2]	40	Feedthrough	**ZL-RTB40 (-1)**	straight conn: **ZL-D24-CBL40 ZL-D24-CBL40-1 ZL-D24-CBL40-2** 45 deg conn: **ZL-D24-CBL40-X ZL-D24-CBL40-1X ZL-D24-CBL40-2X**
		Sensor	**ZL-LTB32-24-1**	
D4-32ND3-2 [2]		Feedthrough	**ZL-RTB40 (-1)**	
		Sensor	**ZL-LTB32-24-1**	
D4-64ND2 [1,2]		Feedthrough	**ZL-RTB40 (-1)**	
		Sensor	**ZL-LTB32-24-1**	
D4-08NA	11	**See Note 3**		
D4-16NA	20			
D4-16NA-1				
D4-16NE3				

DL405 PLC Output Module *ZIP*Link Selector				
PLC	***ZIP*Link**			
Output Module	***# of Terms***	***Component***	***Module Part No.***	***Cable Part No.***
D4-08TD1	11	**See Note 3**		
D4-16TD1	20			
D4-16TD2				
D4-32TD1 [2]	40	Feedthrough	Feedthrough **ZL-RTB40 (-1)**	straight conn: **ZL-D24-CBL40 ZL-D24-CBL40-1 ZL-D24-CBL40-2** 45 deg conn: **ZL-D24-CBL40-X ZL-D24-CBL40-1X ZL-D24-CBL40-2X**
		Fuse	Fused **ZL-RFU40** [4]	
D4-32TD2 [2]		Feedthrough	Feedthrough **ZL-RTB40 (-1)**	
		Fuse	Fused **ZL-RFU40** [4]	
D4-64TD1 [1,2]		Feedthrough	Feedthrough **ZL-RTB40 (-1)**	
		Fuse	Fused **ZL-RFU40** [4]	
D4-08TA	11	**See Note 3**		
D4-16TA	20			
D4-08TR	11			
F4-08TRS-1	20			
F4-08TRS-2				
D4-16TR				

DL405 PLC Analog Module *ZIP*Link Selector				
PLC	***ZIP*Link**			
Analog Module	***# of Terms***	***Component***	***Module***	***Cable***
F4-04AD	20	**See Note 3**		
F4-04ADS				
F4-08AD				
F4-16AD-1				
F4-16AD-2				
F4-04DA-1				
F4-04DA-2				
F4-08DA-1				
F4-16DA-1				
F4-08DA-2				
F4-16DA-2				
F4-04DAS-1				
F4-08THM	T/C Wire Only			
F4-08THM-n				
F4-08RTD	Matched Only			

Tables Footnotes:

1 *The D4-64ND2 and D4-64TD1 modules have two 32-point connectors and require two ZIPLink cables and two ZIPLink connector modules.*

2 *To make a custom cable for the 32 or 64-point modules, use: Ribbon-style Connector ZL-D24-CON-R, Solder-style 180° connector ZL-D24-CON or Solder-style 45° connector ZL-D24-CON-X*

3 *These modules are not supported by the ZIPLink wiring system.*

4 *Note: Fuses (5 x 20 mm) are not included. See Edison Electronic Fuse section for (5 x 20 mm) fuse. S500 and GMA electronic circuit protection for fast-acting maximum protection. S506 and GMC electronic circuit protection for time-delay performance. Ideal for inductive circuits. To ensure proper operation, do not exceed the voltage and current rating of ZIPLink module. ZL-RFU20 = 2A per circuit; ZL-RFU40 = 400 mA per circuit.*

NOTE: ZIPLINK CONNECTOR MODULE SPECIFICATIONS FOLLOW THE COMPATIBILITY MATRIX TABLES IN THE ZIPLINK SECTION.