

## PLC Selection

### Section 1



## DL05/06 PLC

### Section 2



## DL105 PLC

### Section 3



## DL205 PLC

### Section 4



## DL305 PLC

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## DL405 PLC

### Section 6



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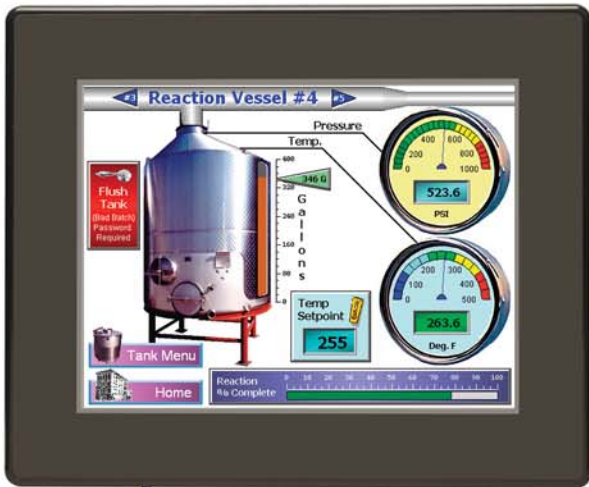
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# PLCS

# The DL405: The Biggest Small PLC You Could Ever Want



**Operator interface** connects to serial port on CPU



**F4-08RTD**  
8 channels of RTD inputs

**D4-64ND2**  
64-point DC inputs for high density

**H4-CTRIO**  
High-speed counter module for position control applications

**D4-DCM**  
RS232C/422 comm port

**H4-ECOM**  
10MB Ethernet connection

**D4-16TD2**  
16-point DC output

**F4-04DAS-1**  
Four channels of 16-bit current analog outputs

**D4-32TD2**  
32-point DC output

**Remote I/O**  
Up to seven additional bases of I/O connect to the bottom serial port on the D4-450 CPU

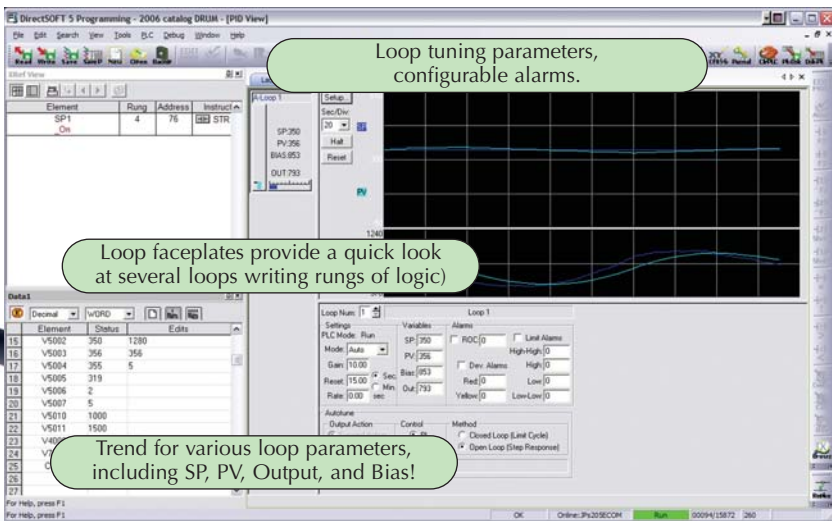
**Remote I/O**



**Discrete devices**  
Choose from a wide variety of discrete I/O modules, all the way up to high density 32- and 64-point modules. Use our **ZIPLink** easy wiring system to save yourself time and money.

**High-speed counting**  
The H4-CTRIO module offers both high-speed counting functions (up to 100 kHz max.) and pulse output functions (up to 25 kHz max.), making it ideal for position speed monitoring and stepper control. It also includes four independently configurable high-speed isolated discrete outputs. An easy-to-use graphical configuration software allows you to configure the module for all of these capabilities.

Program with DirectSOFT5 through a serial port or over Ethernet



Loop tuning parameters, configurable alarms.

Loop faceplates provide a quick look at several loops writing rungs of logic

Trend for various loop parameters, including SP, PV, Output, and Bias!



## What is it?

The DL405 product line packs a lot of power for its size and price. It has the widest variety of I/O modules and configurations of all our PLCs.

## What's it got?

The DL405 has three CPUs from 6.5K memory with 1,152 I/O to 30.8K memory with 3,584 possible I/O.

It also offers three base sizes with built-in power supply, including 12/24 VDC, 110/220 VAC and 125 VDC power.

The DL405 also features flexible I/O and communication modules, such as:

- AC/DC in/out, up to 64 points
- 10A relay out
- 12-bit and 16-bit analog inputs and outputs
- Thermocouple and RTD inputs
- Data communications, including serial and Ethernet modules
- High-speed counter input and pulse output
- Serial remote I/O master and slave modules
- Ethernet remote I/O master and slave base controllers
- Slice I/O master and slave modules

The D4-450, the most advanced CPU, offers over 200 instructions, including drum sequencers, ASCII output, floating point math, trig functions, bit of word, timed and hardware-triggered subroutines, For/Next loops, immediate I/O, and more.

## Fill-in-the-blank PID

Many hard-to-use PLCs need a separate ladder program for each PID loop and functions such as ramp/soak, alarms, and loop scheduling. The D4-450 CPU makes it easy with:

- 16 table-configurable PID loops
- Automatic loop scheduling
- Charts for alarms and ramp/soak
- Programming software includes a loop tune screen with trending
- Auto-tuning allows the CPU to automatically determine the near-optimum loop settings

A real-time clock, calendar and historical error logging are also included with the D4-450 CPU.

## What can I do with it?

- Build a control system with local/distributed I/O of up to 3,500 points
- Use the built-in PID instruction or specialty modules to perform cost-effective process control

<http://www.automationdirect.com/dl405>

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- DL105 PLC
- DL205 PLC
- DL305 PLC
- DL405 PLC**
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- C-more HMI's
- Other HMI
- AC Drives
- Motors
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- Photo Sensors
- Limit Switches
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# Flexible I/O Options

One of the largest I/O selections available

I/O modules are typically the largest part of the cost of a PLC system. But we've got good news - the more I/O you use, the bigger your savings with **AUTOMATIONDIRECT**. For example, check out our 8-channel F4-08AD analog input module. It offers eight channels of analog inputs and supports 4-20 mA, 0-20 mA, 0-5V, 0-10V, 1-5V,  $\pm 5V$ , and  $\pm 10V$  (seven ranges) for a low price.



Isn't that special?

The DL405 family's powerful instruction set covers most industrial applications, but there are times when a specialty module can make the programmer's job a lot easier. Check out our PID or temperature control modules for no-brainer process control, or the magnetic pulse module for flow and volume calculations. The BASIC CoProcessors let you create a custom program or communications interface in an easy-to-use language.

Put I/O where you need it with flexible serial or Ethernet-based remote capabilities

The DL405 series has the widest range of choices for remote I/O of all our PLCs. So what are the possibilities? Actually, they're endless, but here are a few:

For high-speed easy-to-use remote I/O, use the Ethernet I/O option with the H4-ERM Ethernet Remote Master module.

- H4-ERM Ethernet Remote Master module can connect up to four fully expanded DL405 Ethernet Slave bases (H4-EBC), 16 DL205 Ethernet Slave bases (H2-EBC) or 16 Terminator I/O Slave bases (T1H-EBC). These products allow you to use commercially available Ethernet Category 5 cables, hubs and switches at up to 100 meters per segment, for an easy-to-implement Ethernet remote I/O system.
- Use the fiber-optic Ethernet Remote Master and Slave bases for noise immunity in harsh environments.
- Use our Ethernet Drive card (GS-EDRV) with an H4-ERM Ethernet Remote Master module to control and monitor all your drive parameters over Ethernet.

For a low-cost remote I/O solution, use one of our serial remote I/O options. It's even available from the bottom port of the D4-450 at no additional cost.

- D4-RM Remote I/O Master module connects to up to seven remote slave units located in DL405 or DL205 I/O bases, or Terminator I/O stations.
- Communication port on the D4-450 CPU connects to up to seven remote slave units located in DL405 or DL205 I/O bases, or Terminator I/O stations.



# High-speed Counter Has Advanced Features



**Two 25 kHz pulse outputs for stepper or servo drives**

**Two 100 kHz up/down counters or quadrature inputs**

**OR** **Four 100 kHz counters**

**OR** **Four built-in discrete isolated outputs to respond to counter presets**

**Pulse out**

Fill-in-the-blank configuration of counters and pulse outputs saves time.

The DL405 high-speed counter module offers both high-speed counting functions and pulse output functions in a single module. This module comes with a software utility that makes configuring the module as simple as clicking on features and filling in the blanks. No ladder logic is needed to operate this module for counting, although you may use some ladder logic to coordinate your PLC program with your application's high-speed requirements.

### Key features include:

- Two quadrature encoder inputs or four 100 kHz high-speed counters (32-bit count range for +/-2.1 billion counts)
- Two programmable pulse outputs support Trapezoid, Velocity S-curve, or program controlled Dynamic Positioning, or four discrete isolated outputs for responding to counter presets (128 presets)
- Pulse catch feature allows the module to read four inputs, each having a pulse width as small as 0.1 ms
- Programmable filters for reading up to four input signals to ensure input signal integrity
- Can use multiple modules in local DL405 base!

Limitations: All input functions or all output functions can not be done simultaneously. Counting and pulse out can be done simultaneously, however the module does not internally support closed loop control.

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DL05/06 PLC

DL105 PLC

DL205 PLC

DL305 PLC

**DL405 PLC**

Field I/O

Software

C-more HMI

Other HMI

AC Drives

Motors

Steppers/Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Pushbuttons/Lights

Process

Relays/Timers

Comm.

TB's & Wiring

Power

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# DL405 Connects to Operator Interfaces and Networks

## Flexible operator interface communications

Local or remote communications, multi-drop, multi-panel, even multiple Ethernet networks are all available in the DL405 family. The D4-430 and D4-440 CPUs come with two built-in serial ports. The D4-450 CPU gives you four ports to play with, two of which are configurable for RS-422 to accommodate long distance communications or operator panels at baud rates up to 38.4K baud. If you need more serial I/O, put a bunch of our D4-DCM modules in any local I/O base. Most of our serial ports support many protocols, including Modbus RTU (both Master and slave mode), *DirectNET* and K-sequence.



**D4-16ND2**  
16-point DC sink/source input module

**F4-08THM**  
Eight channels of configurable temperature inputs

**D4-16TD1**  
16-point DC sinking output module

**D4-32TD2**  
32-point high density DC sourcing outputs

**D4-16TD2**  
16-point DC sourcing output module

## With Ethernet, talk is cheap!

Think about it. Would you really want to write and debug a 64K or 128K program with thousands of I/O? Just because memory's cheap doesn't mean you have to feel obligated to use it. Our Ethernet networking modules have made it easy and inexpensive to create a "virtual PLC", communicating between smaller and more manageable applications running on multiple DL205 and DL405 systems.

## Off-the-shelf specifications

The H4-ECOM is a fully Ethernet-compatible device. It is available in standard 10BaseT or fiber optic connections and supports standard IP and IPX protocols. It's fully compatible with low-cost, off-the-shelf Ethernet PC cards, hubs and other devices that you can buy from your favorite computer store or discount catalog!



## Here's what you can do:

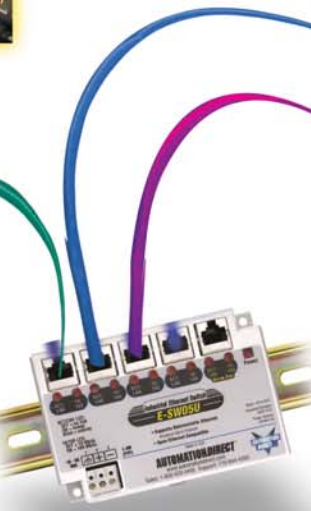
The H4-ECOM module can perform the following functions simultaneously:

### Super-flexible distributed control system

Since each PLC and PC can run independently and asynchronously, you can truly build low-cost, high-speed distributed control systems. DL205 and DL405 PLCs can be doing their own thing in addition to PCs on the network!



Business Systems



**H4-ECOM**  
Fast programming and operator interface on Ethernet

**H4-ECOM**  
Ethernet connection to your business systems

**D4-DCM**  
Extra serial port if the CPU doesn't have enough!

### Flexible built-in serial communication

The D4-450 CPU includes four integrated serial ports allowing for a variety of communication to other equipment. The bottom port of the D4-450 supports both RS-232, RS-422 and our own Remote I/O protocol, all in one 25-pin connection. Use this port for communication to our new GS line of drives via Modbus RTU at up to 38.4K baud. (GS2 drives allow for a direct RS-232 wiring connection as shown. For RS-485 and/or GS1 connection, an FA-ISOCOM RS-232/422/485 converter, or equivalent, is required and sold separately.) Use the other available ports to connect an additional operator interface or a PC for online programming all at the same time.



### Super high-speed programming across a network of DL405 and DL205 PLCs

Imagine jumping out of a Windows application on your PC and into our *DirectSoft* Windows programming package. Now you can perform high-speed program uploads, downloads and monitoring of edits across a network of PLCs!

### High-speed DDE/OPC network of DL405s and DL205s

Your PC-based application with DDE or OPC linking can be reading and writing high-speed data across an Ethernet network.

### High-speed peer-to-peer communications

Now you can implement an incredibly easy high-speed peer-to-peer network since the H4-ECOM can act as a master and/or a slave.



### Starter kit makes it easy

Give Ethernet communications a try with our ECOM starter kit (H4-ECOM-START). The kit includes a PC Ethernet adapter module, 10 feet of cable, an H4-ECOM module, and a software demo CD.



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C-more HMIs

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# DL405 Family of Products

This page provides an overview of the variety of products found in the DL405 family.

## CPUs

- D4-450** – 110/220 VAC P/S
- D4-450DC-1** – 24 VDC P/S
- D4-450DC-2** – 125 VDC P/S  
30.8K total memory  
(7.5K built-in flash program memory or use optional memory cartridge)
- 16 PID loops with auto-tune
- D4-440** – 110/220 VAC P/S  
22.5K total memory  
(memory cartridge required)
- D4-440DC-1** – 24 VDC P/S  
22.5K total memory  
(memory cartridge required)
- D4-440DC-2** – 125 VDC P/S  
22.5K total memory  
(memory cartridge required)
- D4-430** – 110/220 VAC P/S  
6.5K total memory

## Memory cartridges

- CMOS RAM - 7.5K (D4-RAM-1)
- CMOS RAM - 15.5K (D4-RAM-2)
- UV PROM - 7.5K (D4-UV-1)
- UV PROM - 15.5K (D4-UV-2)
- EEPROM - 15.5K (D4-EE-2)

## Programming

- Handheld programmer (D4-HPP-1)
- DirectSOFT** Programming for Windows (PC-DSOFT5)

## Bases

- 4-slot base (D4-04B-1)
- 6-slot base (D4-06B-1)
- 8-slot base (D4-08B-1)

## Local expansion base power supplies

- 110/220 VAC P/S (D4-EX)
- 24 VDC P/S (D4-EXDC)
- 125 VDC P/S (D4-EXDC-2)

## Discrete input modules

- DC input**
- 8-point 24-48 VDC (D4-08ND3S)
- 16-point 12-24 VDC (D4-16ND2)
- 16-point 12-24 VDC (1 ms response) (D4-16ND2F)
- 32-point 24 VDC (D4-32ND3-1)
- 32-point 5-12 VDC (D4-32ND3-2)

- 64-point 24 VDC (D4-64ND2)
- AC input modules**
- 8-point 110/220 VAC (D4-08NA)
- 16-point 110 VAC (D4-16NA)
- 16-pt 220 VAC (D4-16NA-1)
- AC/DC input modules**
- 8-pt 90-150 VAC/DC (isolated) (F4-08NE3S)
- 16-pt 12-24 VAC/DC (D4-16NE3)

## Discrete output modules

- DC output modules**
- 8-point 12-24 VDC (D4-08TD1)
- 8-point 24-150 VDC (F4-08TD1S)
- 16-point 5-24 VDC (D4-16TD1)
- 16-point 12-24 VDC (D4-16TD2)
- 32-point 5-15 VDC (D4-32TD1-1)
- 32-point 5-24 VDC (D4-32TD1)
- 32-point 12-24 VDC (D4-32TD2)
- 64-point 5-24 VDC (D4-64TD1)
- AC output modules**
- 8-point 18-220 VAC (D4-08TA)
- 16-point 18-220 VAC (D4-16TA)
- Relay output modules**
- 8-point 2A (D4-08TR)
- 8-point 5A/pt (isolated) (F4-08TRS-2)
- 8-point 10A/pt (isolated) (F4-08TRS-1)
- 16-point 1A/pt (D4-16TR)

## Analog modules (12-bit)

- Analog input**
- 4-channel in, current/voltage (F4-04AD)
- 4-channel in, current/voltage (isolated) (F4-04ADS)
- 8-channel in, current/voltage (F4-08AD)
- 16-channel in, current (F4-16AD-1)
- 16-channel in, voltage (F4-16AD-2)
- Analog output**
- 4-channel out, current (F4-04DA-1)
- 4-channel out, voltage (F4-04DA-2)
- 8-channel out, current (F4-08DA-1)
- 8-channel out, voltage (F4-08DA-2)
- 16-channel out, current (F4-16DA-1)
- 16-channel out, voltage (F4-16DA-2)

## Analog modules (16-bit)

- Temperature input**
- 8-channel in, RTD (F4-08RTD)

- 8-channel in, thermocouple (F4-08THM)
- Analog output**
- 4-channel out, current (isolated) (F4-04DAS-1)
- 4-channel out, voltage (isolated) (F4-04DAS-2)

## Communications/networking modules

- Ethernet communications [H4-ECOM(-F) and H4-ECOM100]
- Data communications (D4-DCM)
- Modbus master (F4-MAS-MB(R))

## Specialty modules

- 8-point interrupt input (D4-INT)
- High-speed counter I/O (H4-CTRIO)
- High-speed counter (D4-HSC)
- 8-point magnetic pulse input (F4-8MPI)
- 16-loop PID (w/ software) (F4-16PID)
- 8/16channel input simulator (D4-16SIM)
- 4-loop temperature controller (F4-4LTC)
- BASIC CoProcessor modules**
- 128K triple port (F4-CP128-1)
- 128K telephone modem (F4-CP128-T)

## CPU-Slot slave controllers

- Ethernet base controller (H4-EBC(-F))

## Remote I/O modules

- Ethernet**
- Ethernet remote Master Module (H4-ERM(-F))
- Ethernet base Controller (Slave) (H4-EBC(-F))
- Remote I/O protocol (serial)**
- Remote I/O Master Module (D4-RM)
- Remote I/O Slave 110/220VAC (D4-RS)
- Remote I/O Slave 24VDC (D4-RSDC)

## Operator interface

See the Operator Interface section in this catalog for a complete line of text and touch panels and configuration software to connect to DL405 system.

## Connection systems

See the Terminal Blocks & Wiring Systems section in this catalog for information on **DINector** terminal blocks and **ZIPLink** connection systems.

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# DL405 CPUs

## System capacity

System capacity is the ability of the CPU to accommodate a variety of applications. Here are a few key considerations when determining system capacity:

### How much memory do you need?

Consider both ladder memory and data registers (V-memory). For ladder memory, most boolean instructions require one word. Some other instructions, such as timers, counters, etc. require two or more words. Our V-memory locations are 16-bit words and are useful for data storage, etc.

**What type of memory do you need?** The D4-430 only has built-in EEPROM memory for the ladder program. The D4-440 requires a memory cartridge, and you have a choice of several sizes and memory types. The D4-450 has 7.5K of built-in flash ladder memory, but you can also use a memory cartridge instead of the built-in memory.

**How many I/O points are required?** You will need to know how many field devices are required. Each CPU supports a different amount of local, expansion, and remote I/O. Check the Specifications tables on the next page to determine which CPU meets your application requirements.

**Are there any remote I/O points?** In many applications, the wiring cost of bringing the individual control wiring back to the PLC control panel can be reduced by the use of remote I/O. All DL405 CPUs can support remote I/O. The D4-450 CPU has built-in serial remote I/O connections on the bottom 25-pin port; or use Ethernet Remote I/O for fast and easy set-up and communications.

## Performance

If you have a time-critical application where every millisecond is important, then choose the CPU with the fastest overall scan time. For applications that only require boolean instructions (contacts and coils), the D4-440 is the fastest. However, if you use a few simple math or data instructions, then choose the D4-450. The D4-450 is considerably faster at performing even the most basic of math or data instructions and will provide a faster overall scan time.

## Programming and diagnostics

Our CPUs offer a wide array of instructions and diagnostic features that can save you many hours of program and debug time. From basic boolean contact logic to PID and floating point math, we have it covered! The chart on the next page covers some of the basic instruction categories, but for more details, see our complete list of instructions at the end of this section.

## Built-in CPU communications

Every DL405 CPU provides at least two built-in communications ports. Each DL405 CPU supports our **DirectNET** protocol on the bottom port for easy, economical networking. Need Modbus? Then, check our D4-450 CPU, which has built-in Modbus RTU Master and Slave capability. Of course, we also offer a wide array of communications, such as our Ethernet Communications Module, Data Communications Module and Modbus Master module.

## Specialty I/O modules

In addition to our cost-effective discrete and analog I/O, we also offer specialty modules to solve the really tough applications. Our D4-430 and D4-440 only support specialty modules in the local base (CPU base). Our D4-450 CPU supports specialty modules in the local CPU base, but it can also support selected specialty modules in expansion bases if you use our D4-xxB-1 bases (xx is the number of slots). If you are considering a D4-450 CPU, there may be some restrictions on using speciality modules. See the chart on page 6-26 for complete information.