



THE DL405: A GREAT FIT FOR DISCRETE OR PROCESS APPLICATIONS

Operator interface
connects to serial
port on CPU



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 new H4-CTRIO module offers both high-speed counting functions (up to 100Khz 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.

Process control with the DL405

The DL405 has plenty of capability to perform process control, with 16 built-in PID loops and a wide variety of analog and specialty modules for field interface.

An inline blending control system based on a DL405 PLC controls the proportioning of gas oil into a stream of marine fuel oil, not to exceed 380 centistokes in viscosity at a reference temperature of 50°C to the product. The operator can enter and view the following parameters via the operator interface:

Preset total batch quantity

Percentage of gas oil to be blended into marine oil

Flow rate required of the blended thin fuel oil

Flow rate indication

Blended quantity indication (totalizer)

Temperature indication

During the blending process, the pulse output from the master flowmeter is read by the high-speed counter module, then corrected by a temperature compensator (programmed in the PLC logic) which uses an RTD input as a reference. This results in a modified pulse value that represents the product volume at base temperatures. A ratio controller (programmed in the PLC logic) scales down the modified pulses, then compares the result with the flow pulses from the slave line. The built-in PID function detects any deviation between the two, then produces a 4-20mA signal which adjusts the slave flow via the slave control valve.

Solution provided by Syscom, Dubai, UAE

Program with
DirectSOFT32
through a serial port
or over Ethernet

D4-32TD2
32-point
DC output

Ethernet to Industrial PC running
LookoutDirect™ HMI for fast operator
graphics, trending and alarming

Full
Size
PC



I/O, I/O It's Off To REMOTE LOCATIONS We Go

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, try our new Ethernet I/O option with the new H4-ERM Ethernet Remote Master module.

- New 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.
- Try the H4-ERM-F fiber-optic Ethernet Remote Master module and connect to DL405 fiber-optic Ethernet Slave bases (H4-EBC-F) or DL205 fiber-optic Ethernet Slave bases (H2-EBC-F). The fiber-optic Ethernet I/O products allow you to span up to 2000 meters per segment and are completely noise immune for harsh environment installations.
- Try our new Ethernet Drive card (GS-EDRV) with an H4-ERM Ethernet Remote Master module to control and monitor all your drive parameters over Ethernet. Add any of the three Ethernet Slave I/O products (H4-EBC, H2-EBC or T1H-EBC) along with the Ethernet Drive card to provide a complete distributed motor control system on a common Ethernet network. The card is great for MCC (Motor Control Centers) installations or other remote stations that require drive and I/O control.

For a low-cost remote I/O solution, try 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.
- D4-SM Slice I/O Master module connects to up to 15 slice I/O slaves (fixed I/O blocks of 8, 10, or 16-point DC I/O), remote slave units located in DL205 I/O bases or Terminator I/O stations.



NEW HIGH-SPEED COUNTER HAS ADVANCED FEATURES

Check for availability



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

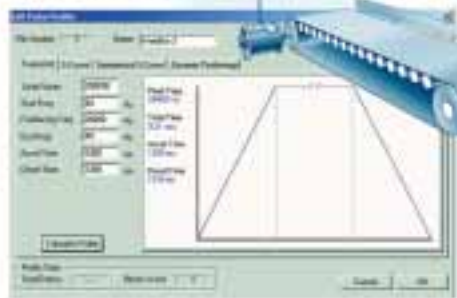
**Two 25kHz pulse
outputs for
stepper or
servo drives**

OR

four 100kHz counters

OR

**four built-in
discrete isolated
outputs to respond
to counter presets**



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

The DL405 high-speed counter module (H4-CTRIO) is new this catalog and 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, 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 100kHz 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 0.1ms)
- 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. Check page 412 in the DL205 section for specific details.



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.



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 uses 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 !

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

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!



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

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 38.4 Kbaud. (GS2 drives allow for a direct RS-232 wiring connection as shown. For RS-485 and/or GS1 connection, an FA-ISONET 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 on-line programming all at the same time.



Imagine jumping out of a Windows application on your PC and into our DirectSoft32 Windows programming package. Now you can perform high-speed program uploads, downloads and monitoring of edits across a network of PLCs!

Attach as many as 90 EZTouch panels to the network using its Ethernet card option. Just define your address and go!

Your PC-based application with DDE or OPC linking can be reading and writing high-speed data across an Ethernet network. Spreadsheets, HMI screens and other PC packages will flat-out scream.

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.

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



DL405 FAMILY OF PRODUCTS

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

CPU's

- D4-450** – 110/220VAC P/S
- D4-450DC-1** – 24VDC P/S
- D4-450DC-2** – 125VDC 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** – 110/220VAC P/S
- 22.5K total memory
- (memory cartridge required)
- D4-440DC-1** – 24VDC P/S
- 22.5K total memory
- (memory cartridge required)
- D4-440DC-2** – 125VDC P/S
- 22.5K total memory
- (memory cartridge required)
- D4-430** – 110/220VAC 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)
- DirectSOFT32** Programming for Windows (PC-PGM-SW)

Bases

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

Local expansion base power supplies

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

Discrete input modules

- DC input**
- 8pt. 24-48VDC (D4-08ND3S)
- 16pt. 12-24VDC (D4-16ND2)
- 16pt. 12-24VDC (1 ms response) (D4-16ND2F)
- 32pt. 24VDC (D4-32ND3-1)
- 32pt. 5-12VDC (D4-32ND3-2)
- 64pt. 24VDC (D4-64ND2)

AC input modules

- 8pt. 110/220VAC (D4-08NA)
- 16pt. 110VAC (D4-16NA)
- 16pt. 220VAC (D4-16NA-1)

AC/DC input modules

- 8pt. 90-150VAC/DC (isolated) (F4-08NE3S)
- 16pt. 12-24VAC/DC (D4-16NE3)

Discrete output modules

DC output modules

- 8pt. 12-24VDC (D4-08TD1)
- 8pt. 24-150VDC (F4-08TD1S)
- 16pt. 5-24VDC (D4-16TD1)
- 16pt. 12-24VDC (D4-16TD2)
- 32pt. 5-15VDC (D4-32TD1-1)
- 32pt. 5-24VDC (D4-32TD1)
- 32pt. 12-24VDC (D4-32TD2)
- 64pt. 5-24 VDC (D4-64TD1)

AC output modules

- 8pt. 18-220VAC (D4-08TA)
- 16pt. 18-220VAC (D4-16TA)

Relay output modules

- 8pt. 2A (D4-08TR)
- 8pt. 5A/pt (isolated) (D4-08TRS-2)
- 8pt. 10A/pt (isolated) (D4-08TRS-1)
- 16pt. 1A/pt (D4-16TR)

Analog modules (12-bit)

Analog input

- 4 ch in, current/voltage (F4-04AD)
- 4 ch in, current/voltage (isolated) (F4-04ADS)
- 8 ch in, current/voltage (F4-08AD)
- 16 ch in, current (F4-16AD-1)
- 16 ch in, voltage (F4-16AD-2)

Analog output

- 2 ch out, current/voltage (D4-02DA)
- 4 ch out, current/voltage (F4-04DA)
- 4 ch out, current (F4-04DA-1)
- 4 ch out, voltage (F4-04DA-2)
- 8 ch out, current (F4-08DA-1)
- 8 ch out, voltage (F4-08DA-2)
- 16 ch out, current (F4-16DA-1)
- 16 ch out, voltage (F4-16DA-2)

Analog modules (16-bit)

Temperature input

- 8 ch in, RTD (F4-08RTD)
- 8 ch in, thermocouple (F4-08THM)

Analog output

- 4 ch out, current (isolated) (F4-04DAS-1)
- 4 ch out, voltage (isolated) (F4-04DAS-2)

Communications/networking modules

- Ethernet communications (H4-ECOM(-F))
- Data communications (D4-DCM)
- MODBUS master (F4-MAS-MB(R))
- MODBUS slave (F4-SLV-MB(R))
- Shared data network (F4-SDN)

Specialty modules

- 8pt. interrupt input (D4-INT)
- High-speed counter I/O (H4-CTRIO)
- High-speed counter (D4-HSC)
- 8pt. magnetic pulse input (F4-8MPI)
- 16 loop PID (w/ software) (F4-16PID)
- 8/16pt. input simulator (D4-16SIM)
- 4-loop temperature controller (F4-4LTC)
- Smart distributed system™ I/O (F4-SDS)

BASIC CoProcessor modules

- 128K triple port (F4-CP128-1)
- 512K triple port (F4-CP512-1)
- 128K telephone modem (F4-CP128-T)
- 128K radio modem (F4-CP128-R)

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)

Slice I/O protocol (serial)

- Slice I/O Master Module (D4-SM)
- Slice I/O Slaves
- 8 in 12-24VDC and 8 OUT5-24VDC (D4-SS-88)
- 10 in 12-24VDC and 6 OUT5-24VDC (D4-SS-106)
- 16 in 5-24VDC (D4-SS-16N)
- 16 out 5-24VDC (D4-SS-16T)

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 Connection Systems section in this catalog for information on **DIN** connector terminal blocks and **ZIPLink** connection systems.



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 remote I/O connections on the bottom 25-pin port!

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 an incredible array of instructions and diagnostic features which 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, MODBUS Master and MODBUS Slave Modules.

Specialty I/O modules

In addition to our cost-effective discrete and analog I/O, we also offer a wide array of 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 as well, 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 specialty modules. See the note in the D4-450 section for complete information.

DL405 CPU COMPARISONS

DL405 CPU Specifications			
	D4-430	D4-440	D4-450
System Capacity			
Total memory available (words)	6.5K	22.5K	30.8K
Ladder memory (words)			
built-in memory	3.5 EEPROM	None, requires MC	7.5K flash
with memory cartridge	N/A	up to 15.5K	up to 15.5K
V-memory (words)	3.0K	7.0K	15.3K
Battery backup	Yes	Yes	Yes
Total CPU memory I/O pts. available (<i>actual I/O points depend on I/O configuration selected</i>)	1664 (X+Y+CR+GX)	2688 (X+Y+CR+GX)	8192 (X+Y+GX+GY)
I/O module point density	2/4/8/16/32/64	2/4/8/16/32/64	2/4/8/16/32/64
I/O module slots per base	4/6/8	4/6/8	4/6/8
Local/local expansion	320 in/320 out	320 in/320 out	1024 in/1024 out
Serial remote I/O (including local & exp. I/O)	1664 max.	1664 max.	4224 max.
Remote I/O Channels	2	2	3
I/O pts. per remote module channel	512	512	512; 2048 (port 3)
Ethernet Remote I/O (including local/exp. I/O)	Yes	Yes	Yes
discrete I/O pts.	1664 max. (Including local and exp. I/O)	2688 max. (Including local and exp. I/O)	8192 max. (Including local and exp. I/O)
Analog I/O channels	map into V-memory	map into V-memory	map into V-memory
Remote I/O channels	Limited by power budget	Limited by power budget	Limited by power budget
I/O per remote channel	16,384 (limited to 1664)	16,384 (limited to 2688)	16,384 (16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions)
Performance			
Contact execution (boolean)	3.0µs	0.33µs	0.96µs
Typical scan (1K boolean) ¹	8-10ms	2-3ms	4-5ms
Programming and Diagnostics			
RLL ladder style	Yes	Yes	Yes
RLL ^{PLUS} /flowchart style (Stages)	Yes/384	Yes/1024	Yes/1024
Run time editing	No	Yes	Yes
Variable/fixed scan	Variable	Variable	Fixed or variable
Instructions	113	170	210
Control relays	480	1024	2048
Timers	128	256	256
Counters	128	128	256
Immediate I/O	Yes	Yes	Yes
Subroutines	No	Yes	Yes
For/next loops	No	Yes	Yes
Timed interrupt	No	Yes	Yes
Integer math	Yes	Yes	Yes
Floating-point math	No	No	Yes
Trigonometric functions	No	No	Yes
Table instructions	No	Yes	Yes
PID	No	No	Yes
Drum sequencers	No	No	Yes
Bit of word	No	No	Yes
Real-time clock/calendar	No	Yes	Yes
Internal diagnostics	Yes	Yes	Yes
Password security	No	Yes	Multi-level
System and User error log	No	Yes	Yes
CPU Ports Communications			
Built-in ports	2 ports	2 ports	4 ports
K-sequence (proprietary protocol)	Yes	Yes	Yes
DirectNET	Yes	Yes	Yes
MODBUS master/slave	No	No	Yes
ASCII out (Print)	No	No	Yes
Maximum baud rate	19.2K	19.2K	38.4K



D4-450 KEY FEATURES

DL450 CPU

D4-450



D4-450 CPU

The D4-450 provides all the capabilities of the D4-430 and D4-440 CPUs, plus several additional features. It offers an incredible array of features for a CPU that costs so little.

Built-in CPU communications ports

The D4-450 offers four built-in ports for extra convenience. The 15-pin port offers our proprietary K-sequence protocol and is primarily used for programming connections to a D4-HPP-1 handheld programmer or to a PC running *DirectSOFT32* software. It can also be used to connect to an EZText/Touch panel or other operator interfaces. The 6-pin phone jack also supports K-sequence, plus it can be a *DirectNET* slave port or an ASCII output port. The bottom 25-pin port contains two logical ports with different pins for each port. It is primarily a networking port that supports *DirectNET* master/slave or MODBUS master/slave protocols. The bottom port can also be used as an ASCII output port for connections to printers or other devices that can accept ASCII input. The Communications Ports table on the next page has a complete description of each port.

16-PID loops

The D4-450 CPU can process up to 16 PID loops directly in the CPU. You can select from various control modes including automatic control, manual control, and cascade control. There are a wide variety of alarms including Process Variable, Rate of Change, and Deviation. The various loop operation parameters are stored in V-memory, which allows easy access from operator interfaces. Setup is accomplished with our *DirectSOFT32* Programming Software. An overview of the various loop specifications and features is on the next page.

Floating-point math

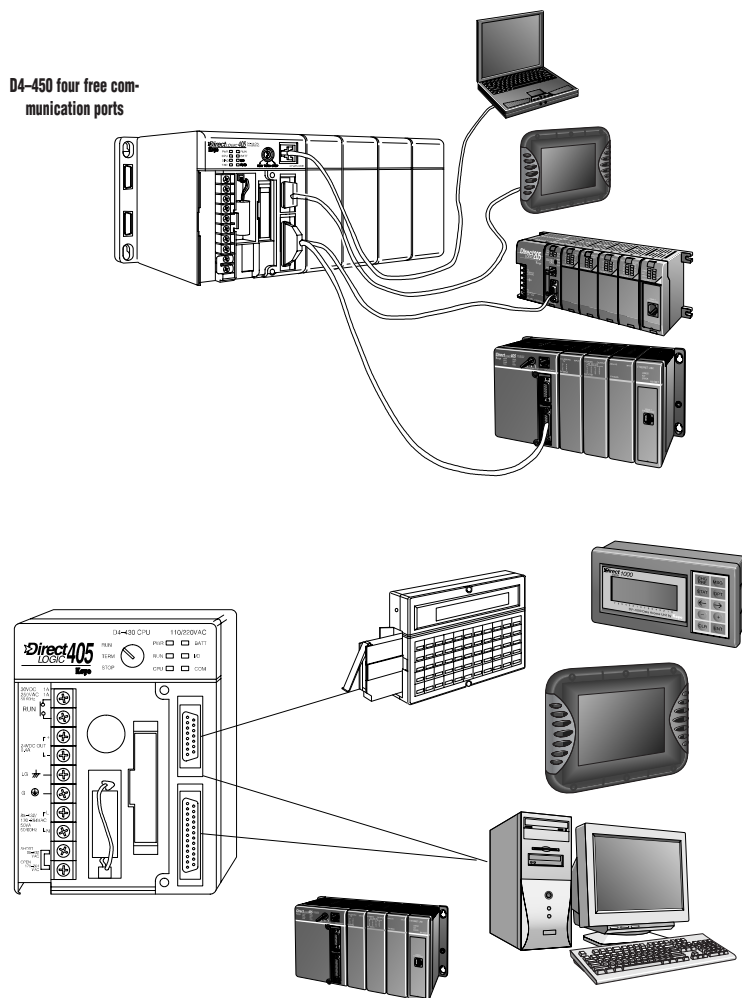
The D4-450 CPU supports IEEE format floating-point math calculations. This feature means the D4-450 includes full trigonometric functions and various forms of integer/floating point number conversions.

Power supplies

We offer a choice of three power supplies for the DL450 CPU. The power supplies are built into in the CPU. Available power supplies are:

- 110/220VAC version - D4-450
- 24VDC version - D4-450DC-1
- 125VDC version - D4-450DC-2

D4-450 four free communication ports

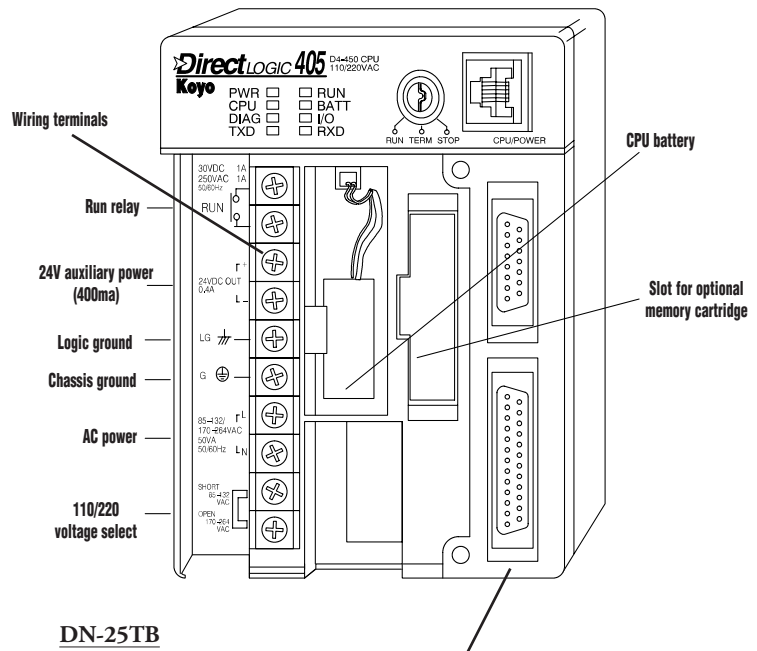


Note: if you are considering a D4-450 CPU to replace a CPU in an existing system, and the system uses specialty modules with an F4 prefix, then these modules may require an upgrade to operate with the D4-450. Contact our Technical Services group prior to placing your order for more information. (This note does not apply to Analog modules.)

D4-450 FEATURES

The diagrams on this page show the various hardware features found on the D4-450 CPU.

CPU Keyswitch		
RUN	Forces CPU to RUN mode. Locks Comm port - will not receive incoming data.	
TERM	Allows peripherals (HPP, DCM, <i>Direct</i> SOFT32, etc.) to select operating mode	
STOP	Forces CPU out of RUN	
CPU Status Indicators		
PWR	ON OFF	CPU power good CPU power failure
RUN	ON OFF	CPU is in RUN mode CPU is in STOP mode
CPU	ON OFF	CPU self-diagnostics error CPU self-diagnostics good
BATT	ON OFF	CPU battery is low CPU battery is good or disabled
DIAG	ON OFF	CPU diagnostics or local bus error CPU diagnostics or local bus good
I/O	ON OFF	I/O self-diagnostics error I/O self-diagnostics good
TXD	ON OFF	Data is being transmitted No data is being transmitted
RXD	ON OFF	Data is being received No data is being received
Communications Ports		
Phone Jack Port 2	Programming Port, RS232C, baud rate selectable up to 38.4Kb. Connects to <i>Direct</i> SOFT32 DV-1000, EZTouch/EZText panels, network, etc. K-sequence protocol <i>Direct</i> NET protocol (slave only). ASCII out	
15-pin Port 0	Programming port, RS232C, 9600 baud, connects to HPP, <i>Direct</i> SOFT32, DV-1000, EZTouch/EZText panels, etc. K-sequence protocol (fixed station address=1)	
25-pin Ports 1 and 3	General purpose port, RS232C, RS422, RS485 Remote I/O only. Baud rate selectable via software up to 38.4K baud. Connects to <i>Direct</i> SOFT32, EZTouch/EZText panels, network, etc. Two logical ports (separate pins on connector). Software selectable protocol includes:	
	Protocol	Port 1 Port 3
	K-sequence	✓ ✓
	DirectNETMaster/Slave	✓ ✓
	MODBUS Master/Slave	✓ ✓
	MODBUS Master/Slave	✓ ✓
	Remote I/O	X ✓
	ASCII Out	✓ ✓



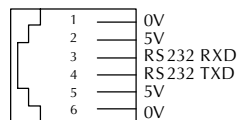
DN-25TB



ZIPLink cables and communications adapter modules offer fast and convenient screw terminal connections for the D4-450 lower port. RS232/422 DIP switch selectable. See the Connection Systems section in this desk reference for part numbers and descriptions.

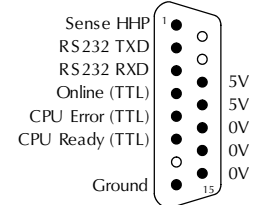
D4-450 communications ports pin-out

Phone jack



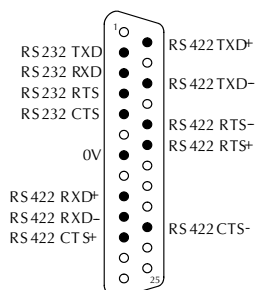
Port 2

15-pin connector



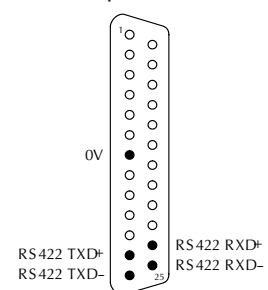
Port 0

25-pin connector



Port 1

25-pin connector



Port 3



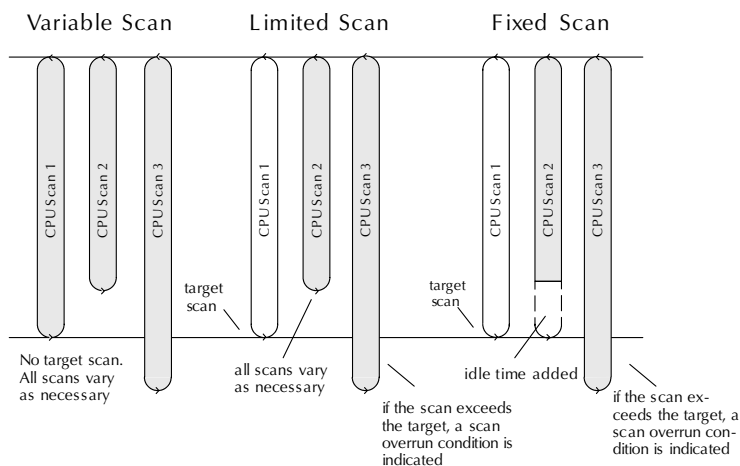
D4-450 FIXED OR VARIABLE SCAN

The D4-450 CPU provides several scan control options, which are useful in some high-speed machine control applications.

Variable — The scan varies as necessary from scan to scan. The actual scan time depends on the instructions being executed.

Limited — This is similar to a variable scan in that the scan varies as necessary. However, if the actual scan time exceeds a specified target scan time, then a scan overrun condition is indicated.

Fixed — If the scan is finished before the time specified, idle time is added to ensure a fixed scan period. If the scan exceeds the time specified, the scan is extended to ensure all instructions are executed. A scan overrun condition is also reported.



Memory

The D4-450 has 7.5K of flash memory on board. Upgrade to 15.5K by choosing an optional memory cartridge. The memory cartridge is recommended since it is removable in the event of problems.

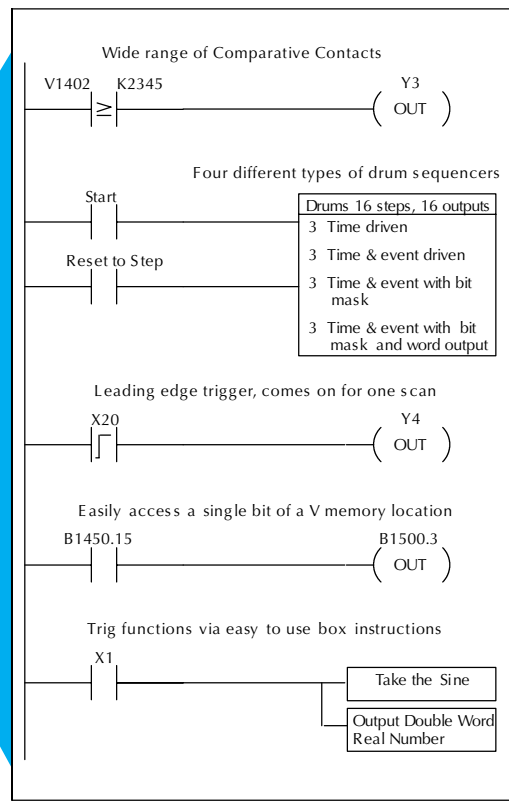
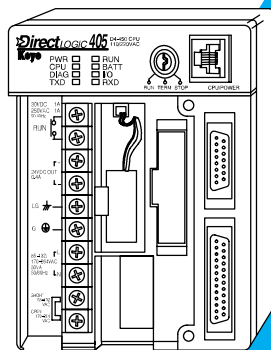
Full array of instructions

Imagine if someone asked you to write a book, but then told you that you could only use 50 different words? That would be a tough job! The same is true for writing a PLC program. The right instruction can greatly simplify your control program.

The D4-450 supports over 200 powerful instructions. These include:

- Four types of drum sequencers, each with 16 steps and up to 16 outputs
- Leading and trailing edge triggered one-shots
- Bit of word manipulation (bit set, reset, etc.)
- Trigonometric functions
- Floating point conversions

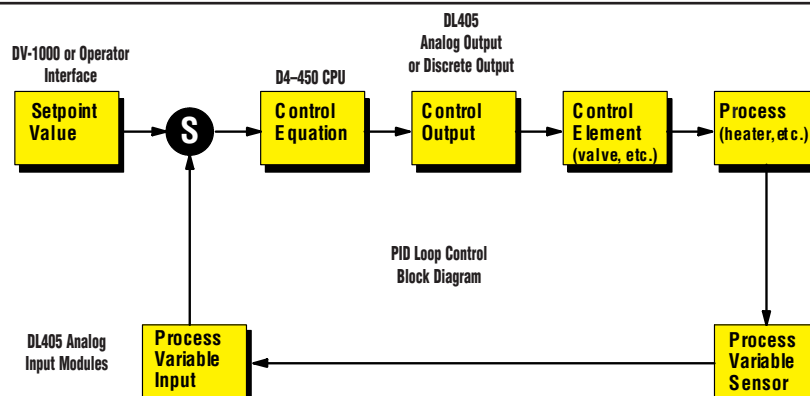
Rel. 2.1 of DirectSOFT, is required to program the D4-450.



Note: if you are considering a D4-450 CPU to replace a CPU in an existing system, and the system uses specialty modules with an F4 prefix, then these modules may require an upgrade to operate with the D4-450. Contact our Technical Services group prior to placing your order for more information. (This note does not apply to Analog modules.)

D4-450 PID LOOPS

PID Loop Specifications and Key Features	
Number of Loops	Selectable, 16 maximum
CPU V Memory Required	32 V locations per loop selected (An additional 32 V locations per loop required if using Ramp/Soak)
PID Algorithm	Position or velocity form of the PID equation. Optionally specify direct or reverse acting, square root of the error and error squared control.
Auto Tuning	Open loop step response method and closed loop limit cycle method.
Sample Rate	Specify the time interval between PV samples, 0.05 to 99.99 in units of seconds or minutes. If using all 16 loops, the smallest sample rate is limited to either 0.2 seconds or (PLC scan time x number of loops).
Loop Operation Modes	Loop can be in automatic control, manual (operator) control, or cascade control. PV alarm monitoring continues when loops are in manual mode.
Ramp/Soak	Up to 16 steps (8 ramp, 8 soak) per loop, with indication of Ramp/Soak step.
Square Root PV	Specify a square root of the PV for a flow control application.
Limit SP	Specify a maximum and minimum value for allowable setpoint changes.
Limit OUT	Specify a maximum and minimum value for the output range.
Gain	Specify proportional gain of 0.01 to 99.99.
Reset	Specify integral time of 0.1 to 99.98 in units of seconds or minutes.
Rate	Specify the derivative time, 0.00 to 99.99 seconds.
Rate Limiting	Specify a derivative gain limiting coefficient to filter the PV used in calculating the derivative term (0 to 20).
Bumpless Transfer I	Bias and setpoint are initialized automatically when the loop is switched from manual to automatic. This provides for a bumpless transfer, which reduces the chance of sharp changes in the output as a result of entering automatic mode.
Bumpless Transfer II	Bias is set equal to the Output when the module is switched from manual to automatic. This allows switching in and out of automatic mode without having to re-enter the setpoint.
Step Bias	Provides proportional bias adjustment for large setpoint changes. This may stabilize the loop faster and reduce the chance of the output going out of range. Step bias should be used in conjunction with the normal adjusted bias operation.
Anti-windup	If the position form of the PID equation is specified, the reset action is stopped when the PID output reaches 0 or 100%. Select adjusted bias or freeze bias operation.
Error Deadband	Specify an incremental value above and below the setpoint in which no change in output is made.
Error Squared	Squaring the error minimizes the effect a small error has on the Loop output, however, both Error Squared and Error Deadband control may be enabled.
Alarm Specifications	
Deadband	Specify 0.1% to 5% alarm deadband on all alarms except Rate of Change.
PV Alarm Points	Specify PV alarm settings for low-low, low, high, and high-high conditions. You can also specify a deadband to minimize the alarm cycles when the PV approaches alarm limits.
PV Deviation	Specify alarms to indicate two ranges of PV deviation from the setpoint value (yellow and red deviation).
Rate of Change	Specify a rate-of-change limit for the PV.
Need Temperature Control? If you're only interested in controlling temperature, then there may be a better solution than the D4-450 CPU. Check out the F4-4LTC module. This module has the capabilities of our single loop controllers built into one economical module! Detailed specifications can be found later in this section. This module can directly control up to four loops and it even includes built-in relay outputs for heater or chiller control! If you use the built-in PID capability of the D4-450 CPU, you still have to purchase the analog input modules and the output modules (either discrete or analog) in order to complete the loop. This can result in a much higher overall cost when compared to the F4-4LTC.	





D4-440/430 KEY FEATURES

DL440 CPU

D4-440



D4-440 CPU

The D4-440 provides a subset of the D4-450's capabilities. If you need fast boolean execution, good communications, and complex math or PID isn't required, this is the CPU for you!

Instruction set

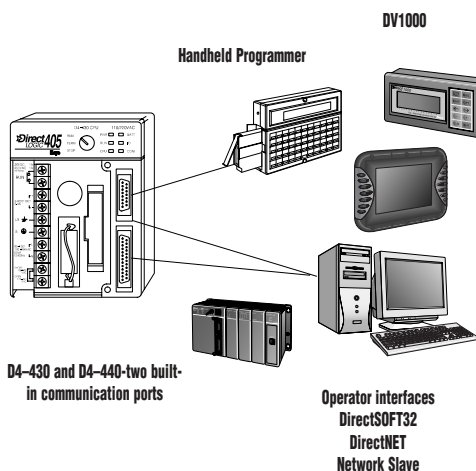
The D4-440 instruction set includes most of the capabilities of the D4-450. The D4-440 does not support some of the more advanced instructions such as PID, floating point math, drum sequencers, trig. functions, etc.

Two built-in communication ports

D4-440 offers two communication ports. The top port can be used for a direct connection to a personal computer for programming, to our handheld programmer, or to our DV-1000, operator interfaces or touch panels. The bottom port is a slave-only port and supports our *DirectNET* or K-sequence protocol at speeds up to 19.2K baud.

Range of power supplies

The D4-440 provides a wide range of power supply options. A 110/220VAC version, a 24 VDC version, and a 125VDC version are available.



DL430 CPU

D4-430



D4-430 CPU

The D4-430 is the most economical CPU in the DL405 product family. If you are primarily looking at the DL405 because of I/O form factor or reasons that don't require tons of CPU horsepower, try the D4-430.

Two built-in communication ports

The D4-430 also offers two communication ports. The top port can be used for a direct connection to a personal computer for programming, to our handheld programmer, or to the DV-1000, operator interfaces or touch panels. The bottom port is a slave only port and supports *DirectNET* protocol at speeds up to 19.2K.

Built-in EEPROM memory

One advantage for the D4-430 is 3.5K of built-in EEPROM program memory. A memory cartridge is not required.

Memory cartridges

The table below shows the memory cartridges available for the D4-440 and D4-450. The D4-440 requires a memory cartridge for program storage. The D4-450 has 7.5K of built-in FLASH program memory. However, you can use a memory cartridge instead of the built-in memory if you need more program space. (The D4-430 has built-in program memory and cannot use a memory cartridge.)

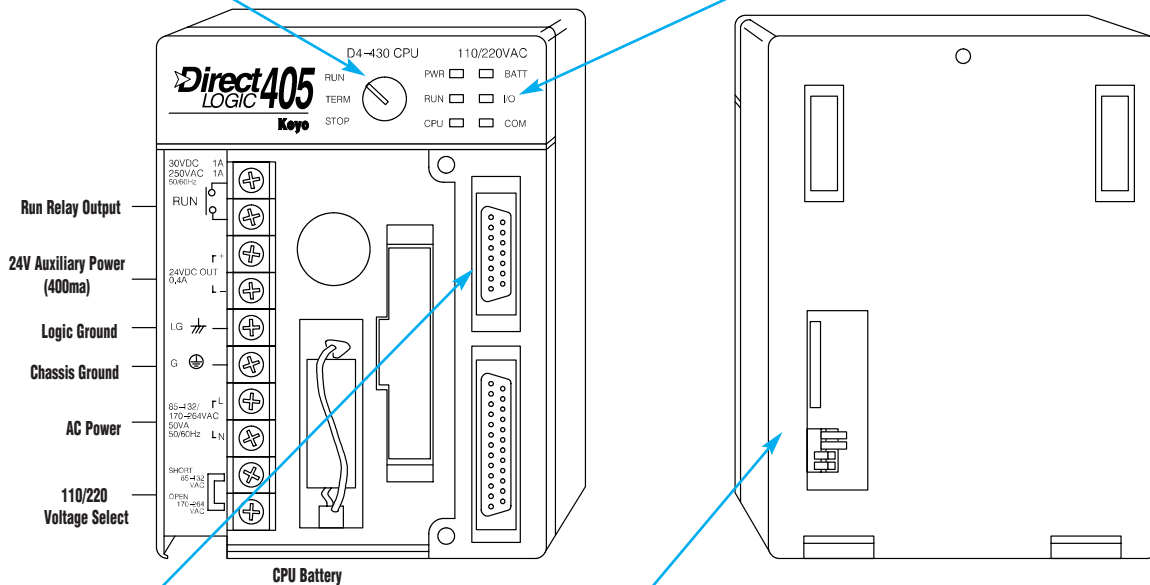
	D4-RAM-1	D4-RAM-2	D4-UV-1	D4-UV-2	D4-EE-2
Program Storage Capacity	7.5K	15.5K	7.5K	15.5K	15.5K
Cartridge Battery Type	Lithium	Lithium	None	None	None
Writing Cycle Life	N/A	N/A	1,000	1,000	>10,000
Write Inhibit	Internal jumper	Internal jumper	N/A	N/A	Internal jumper
Memory Clear Method	Electrical	Electrical	Ultraviolet light	Ultraviolet light	Electrical

D4-440/430 FEATURES

The following diagram shows the various hardware features found on the D4-430 CPU. The D4-430 looks the same, except that the memory cartridge slot can not be used.

CPU Keyswitch	
RUN	Forces CPU to RUN mode
TERM	Allows peripherals (HPP, DCM, DirectSOFT32, etc.) to select operating and TEST modes.
STOP	Forces CPU to STOP mode

CPU Status Indicators					
PWR	ON	CPU power good	BATT	ON	CPU battery low
	OFF	CPU power failure		OFF	CPU battery good
RUN	ON	CPU in RUN mode	I/O	ON	I/O diagnostics error
	OFF	CPU in STOP mode		OFF	I/O diagnostics OK
CPU	ON	CPU diagnostic error	COM	ON	Communication error
	OFF	CPU diagnostics OK		OFF	Communication OK

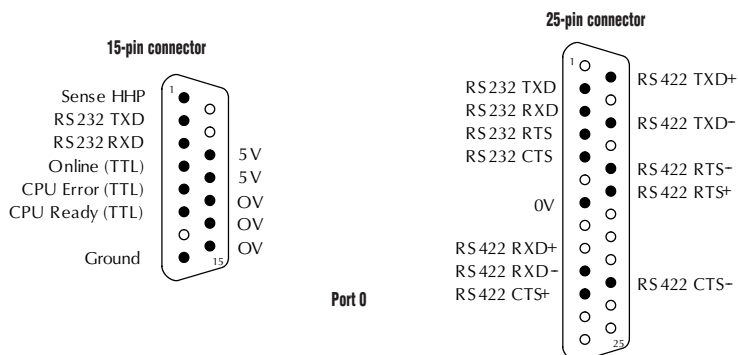


Communication Ports	
15 Pin	Programming port, RS232C, 9600 Baud, K-sequence protocol, connects to HPP, DirectSOFT32, DV-1000 and some operator interfaces
25 Pin	Auxiliary port, R232C or RS422, Baud rate selectable via CPU dipswitch, K-sequence protocol, DirectNET protocol (slave only) connects to DirectNET, DirectSOFT32, and other operator interfaces

CPU Dipswitch		
SW1	ON	CPU battery disabled
	OFF	CPU battery enabled
SW2	ON	Station address is 1
	OFF	Station address set by HPP

SW3	SW4	Baud
OFF	OFF	300
OFF	ON	1,200
ON	OFF	9,600
ON	ON	19,200

D4-430/D4-440 communications ports pin-outs



ZL-CMDB25

D-Sub connectors provide a fast, convenient field wiring through the use of screw terminals. They are available in male and female, 9, 15 or 25-pin versions. See the Connection Systems section of this desk reference for more information on the D-Sub connectors.



DL405 PROGRAMMING TOOLS AND CABLES

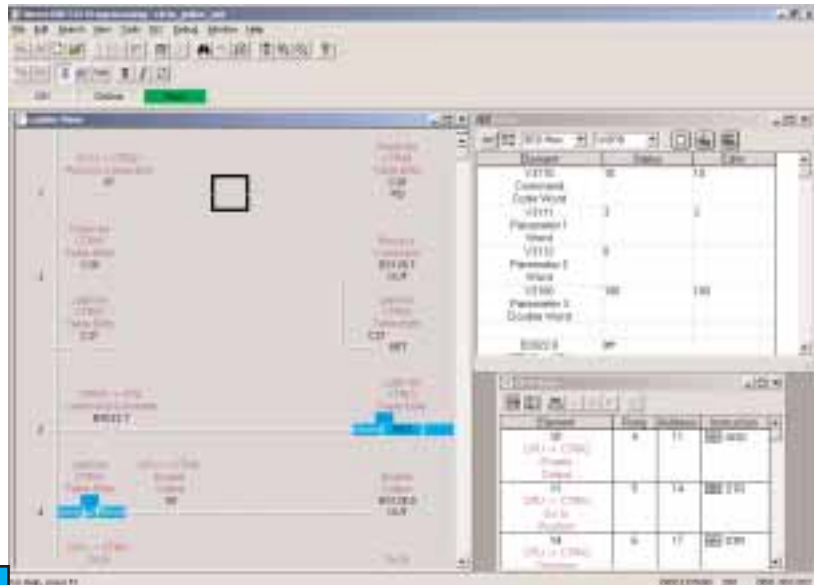
Select a programming device

There are two tools for programming the DL205 CPUs: *DirectSoft32* PC-based programming software and the D4-HPP-1 handheld programmer.

DirectSoft32 programming software

Our powerful Windows-based programming packages make it easy for you to program and monitor your DL405 PLC system. The version of the software that supports the DL405 CPUs is described in the table below. See the Software section in the desk reference for detailed information on *DirectSoft32*.

DirectSoft32 Part Number	Price	Description
PC-PGMSW	check	Programs all PLC families DL05/06/105/205/305/405

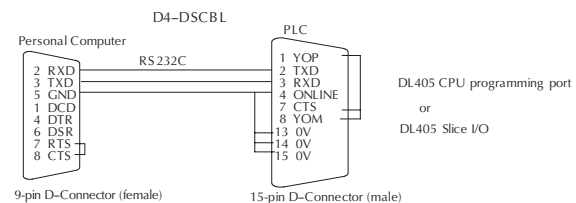
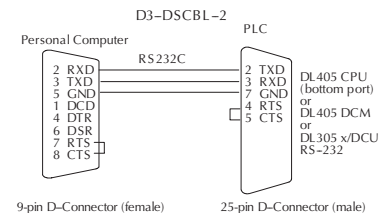
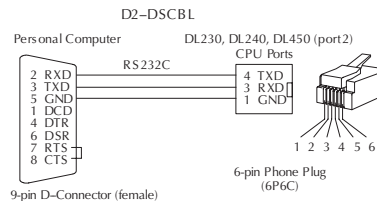


DL405 programming cables

Choose the proper cable to connect the DL405 CPU to your PC running *DirectSoft32*.

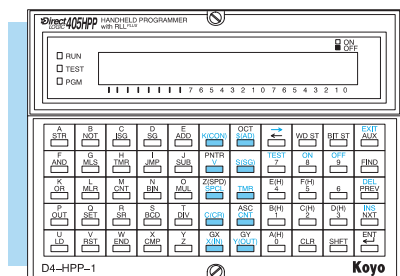
CPU	Price	Port	Cable	Price
D4-430/ D4-440	check	Top port (15 pin)	D4-DSCBL	check
	check	Lower port (25 pin)	D3-DSCBL-2	check
D4-450	check	Top port (15 pin)	D4-DSCBL	check
		Lower port (25pin)	D3-DSCBL-2	check
		Phone jack (RJ12)	D2-DSCBL	check

Pin labeling conforms to IBM DTE and DCE standards



Handheld programmer

The D4-HPP-1 handheld programmer connects to the 15-pin port on any of the DL405 CPUs. A memory cartridge is located on the side of the handheld programmer. This slot allows you to copy memory cartridges (including UV PROMs) and transfer data/programs between the CPU and a memory cartridge.



There are three optional connecting cables available for use with the D4-HPP-1 programmer:

- D4-HPCBL-1: 3m cable
- D4-HPCBL-2: 1.5m cable
- D4-CASCBL: cassette cable

NEED ADDITIONAL COMMUNICATIONS PORTS?

Do you need communications ports in addition to the built-in CPU communications ports to connect to an operator interface or HMI? Would you like to connect to a network of other *AutomationDirect* products, or a MODBUS RTU or Ethernet network? If yes, then choose between the H4-ECOM Ethernet communications module or the D4-DCM serial data communications module. Both modules' specifications and communications details are covered later in this section.

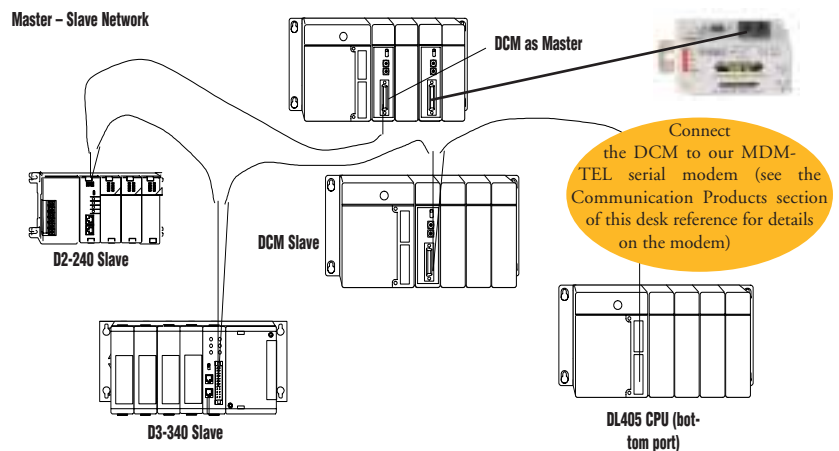
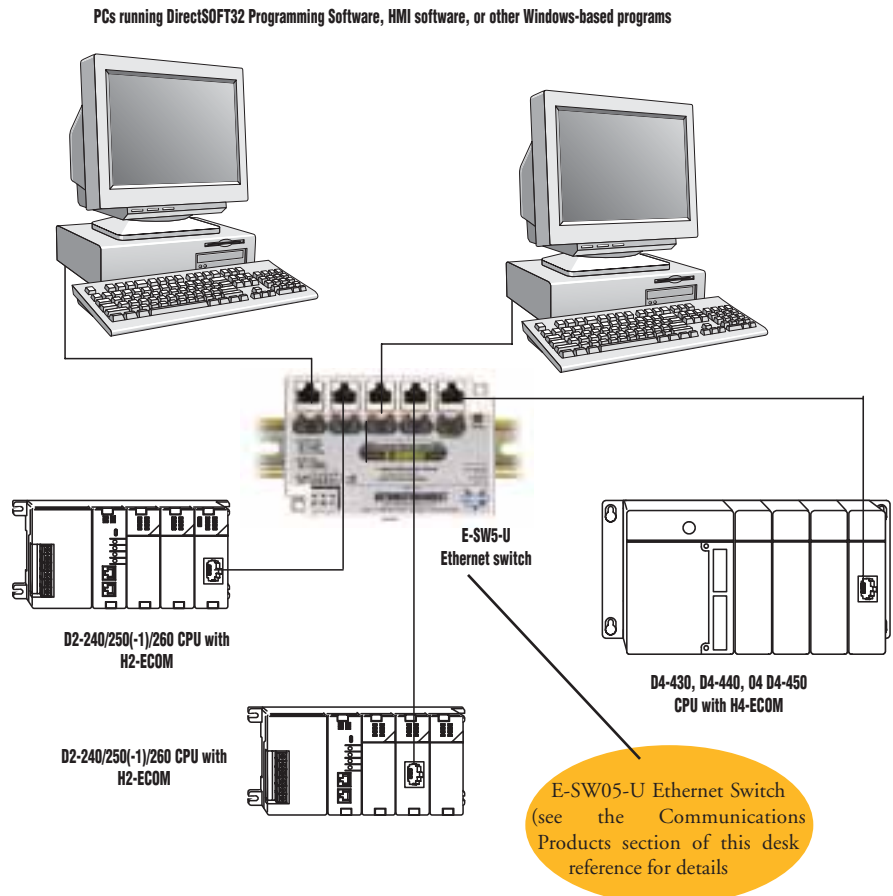
Ethernet networking with the H4-ECOM

All DL405 CPUs support the H4-ECOM module, which makes Ethernet networking a snap. The H4-ECOM module supports industry-standard 10BaseT networking with an RJ45 port. The H4-ECOM-F has ST-style bayonet connectors for 10BaseFL fiber optic connections. The ECOM modules use standard cables, hubs and repeaters, which are available from a large number of suppliers. A virtually unlimited number of PLCs can be connected to an Ethernet network using ECOM modules. This is the fastest data transfer rate we offer for your HMI or other Windows-based software. Use *DirectSOFT32* to program any PLC on the network, and when monitoring your operating PLC, you will see much faster updates with Ethernet and the ECOM module.

Serial networking with the D4-DCM

All DL405 CPUs support the H4-DCM Data Communications Module that can serve as a *DirectNet* master/slave, *DirectNet* peer, or a MODBUS RTU slave. The D4-DCM supports RS-232C and RS-422 communications. You can program the CPU through the DCM locally, or if a PC is the RS-422 master, you can use *DirectSoft32* to program any PLC on the network.

Note: The DL405 CPUs also support a MODBUS RTU master and slave module for connection to a MODBUS RTU network. These modules are listed later in this section.





SELECT THE I/O MODULES

There are several factors you should consider when choosing an I/O module.

1. **Environmental specifications:** What environmental conditions will the I/O modules be subjected to?
2. **Hardware specifications:** Does this product have the right features, performance, and capacity to adequately serve your application?
3. **Field termination:** How does this module connect to your field devices? For DC modules, do you need a sinking or sourcing module?
4. **Power budget:** It is very important that your module selections operate within the base power budget. Refer to the power budget description later in this section.

Check the environmental specifications

The following table lists environmental specifications that globally apply to the DL405 system (CPU, Expansion Unit, Bases, and I/O modules). Be sure the modules you choose are operated within these environmental specifications.

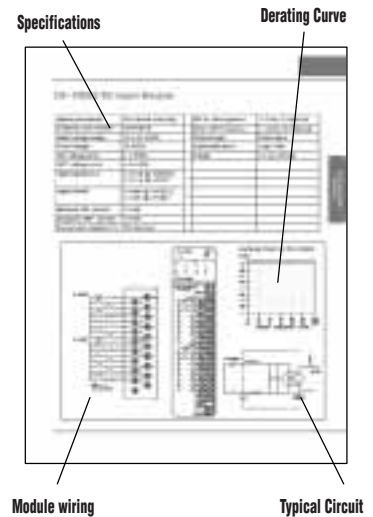
Specification	Rating
Storage Temperature	-4°F - 158°F (-20°C to 70°C)*
Ambient Operating Temperature	32°F - 140°F (0° to 60°C)*
Ambient Humidity	5% - 95% relative humidity (non-condensing)**
Vibration Resistance	MIL STD810C, Method 514.2
Shock Resistance	MIL STD810C, Method 516.2
Noise Immunity	NEMA(ICS3-304)
Atmosphere	No corrosive gases
*Storage temperature for the Handheld Programmer is 14° to 149° F (-10° to 65° C) Storage temperature for the DV-1000 is -4 to 158° F (-20 to 70° C) Operating temperature for the DV-1000 is 32 to 122° F (0 to 50° C) **Ambient humidity for the Handheld Programmer is 20% to 90% non-condensing Ambient humidity for the DV-1000 is 30% to 95% non-condensing	

Review hardware specifications

The hardware specifications for every DL405 module are described later in this section. Discrete module specifications are in a format similar to the example shown. Take time to understand the specification chart, the derating curve, and the wiring diagram. The specialty modules specifications are shown in a format relevant for each module. All of these module specifications should help you determine if the module is right for your application.

Understand the factors affecting field termination

Physical wire terminations: In general, DL405 modules use four types of field terminations. They include: removable terminal blocks (included on all 8 and 16 point modules), specialty D-sub connectors (used on 32 and 64 point modules), standard D-sub connectors (used on most specialty intelligent modules), and phone jack style (used on some specialty modules and included in the universal cable kit). High-density modules do not come with connectors. To create a custom cable, solder or ribbon-style connectors are sold two per pack, and must be ordered separately. See the individual I/O specification sheets for the part numbers. The easiest way to wire high-density modules is with pre-wired **ZIPLink** cables and connector modules.



Sinking and sourcing for DC field devices: If you are using a DC-type of field device, you should determine whether the device is a sinking or sourcing configuration. This may affect your module selection since it determines the manner in which the device must be wired to the module. *AutomationDirect* offers both sinking and sourcing modules.) Refer to the Appendix for a complete explanation on sinking and sourcing and how this could affect your system.

I/O MODULES

New H4-CTRIO high-speed counter module vs. D4-HSC high speed counter module

Select the H4-CTRIO instead of the D4-HSC if your application requires:

- More than one quadrature encoder
- More than two single up counters
- Pulse outputs
- Output operations on the module based on counts, without interaction with the CPU scan

The CTRIO is configured using a Windows-based “Wizard” utility, eliminating the need for ladder logic programming to configure the module. Multiple CTRIO modules can be used in a base to support additional input/output pulse trains.

Analog module selection tips

If you’re going to control the speed of an AC inverter or drive with the DL405 analog module, make sure you select either the current sourcing F4-04DAS-1 or voltage sourcing F4-04DAS-2 isolated analog output module. Complete module specifications are listed later in this section.

ZIPLink connection systems

ZIPLinks consist of PLC interface cables and connector modules that offer “plug and play” capability by plugging one end of the ZIPLink cable into an I/O module and the other end into the ZIPLink connector module. This eliminates the tedious process of wiring PLC I/O to terminal blocks. For more information, refer to the Connection Systems section of this desk reference catalog to determine compatibility among PLCs, cables and I/O modules.

DINnectors terminal blocks

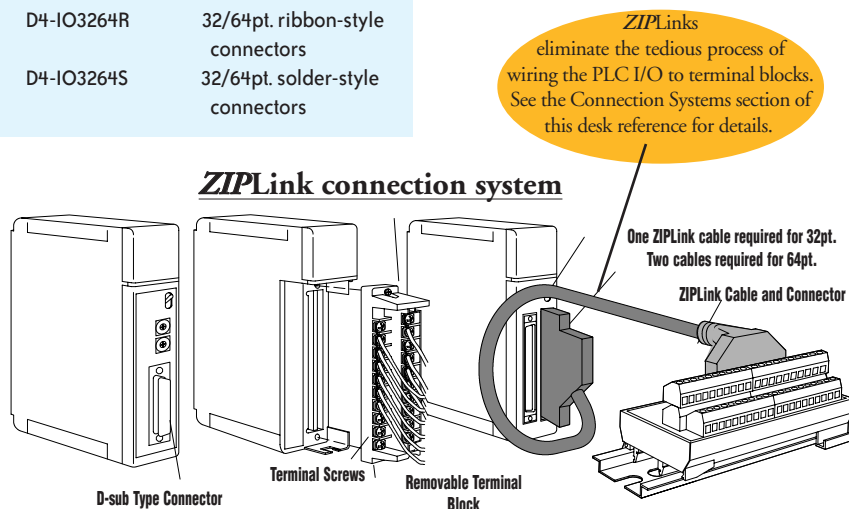
DINnectors are DIN rail mounted connectors or terminal blocks. All DINnectors are UL, CSA, VDE, SEV, RINA and IEC approved. Refer to the Connection Systems section of this desk reference for details.

Need spare parts?

Sometimes it is helpful to have extra I/O module connectors or spare fuses. The DL405 spare parts and accessories are listed below:

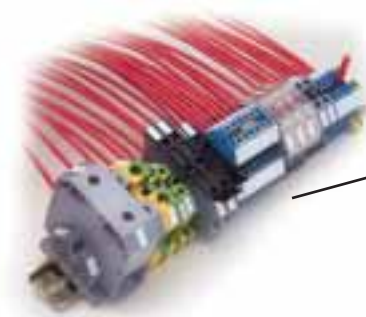
D4-FUSE-1	Fuses for D4-16TA
D4-FUSE-2	Fuses for F4-08TRS-2
D4-ACC-1	CPU spare kit (covers and screws)
D4-ACC-2	screws for 8pt. I/O module terminals
D4-ACC-3	screws for 16pt. I/O module terminals
D4-FILL	filler module to cover empty I/O slots
D4-8IOCON	8pt. module terminal blocks
D4-16IOCON	16pt. module terminal blocks
D4-IOCVR	replacement terminal block covers
D4-IO3264R	32/64pt. ribbon-style connectors
D4-IO3264S	32/64pt. solder-style connectors

Now that you understand the factors affecting your choice of I/O modules, it’s time to choose the ones that best fulfill your needs. Review the module specifications later in this section. (See the DL405 Price List for a complete list of part numbers.) If you have any questions, give us a call. When you have selected the modules you need, proceed to the next section to choose an I/O configuration scheme that best suits your application.



This logo is placed by each I/O module that supports ZIPLink connection systems. (The I/O modules are listed at the end of this section). See the Connection Systems sections of this desk reference for complete information on ZIPLinks.

DINnectors terminal blocks



DINnectors provide a means of connecting and identifying two or more wires within the demands of an industrial environment. See the Connection Systems section of this desk reference for details.



SELECT AN I/O CONFIGURATION

Five configurations for system flexibility

The DL405 system offers five major configurations of I/O. The choices are described on the following two pages. Keep these choices in mind as you plan your I/O system.

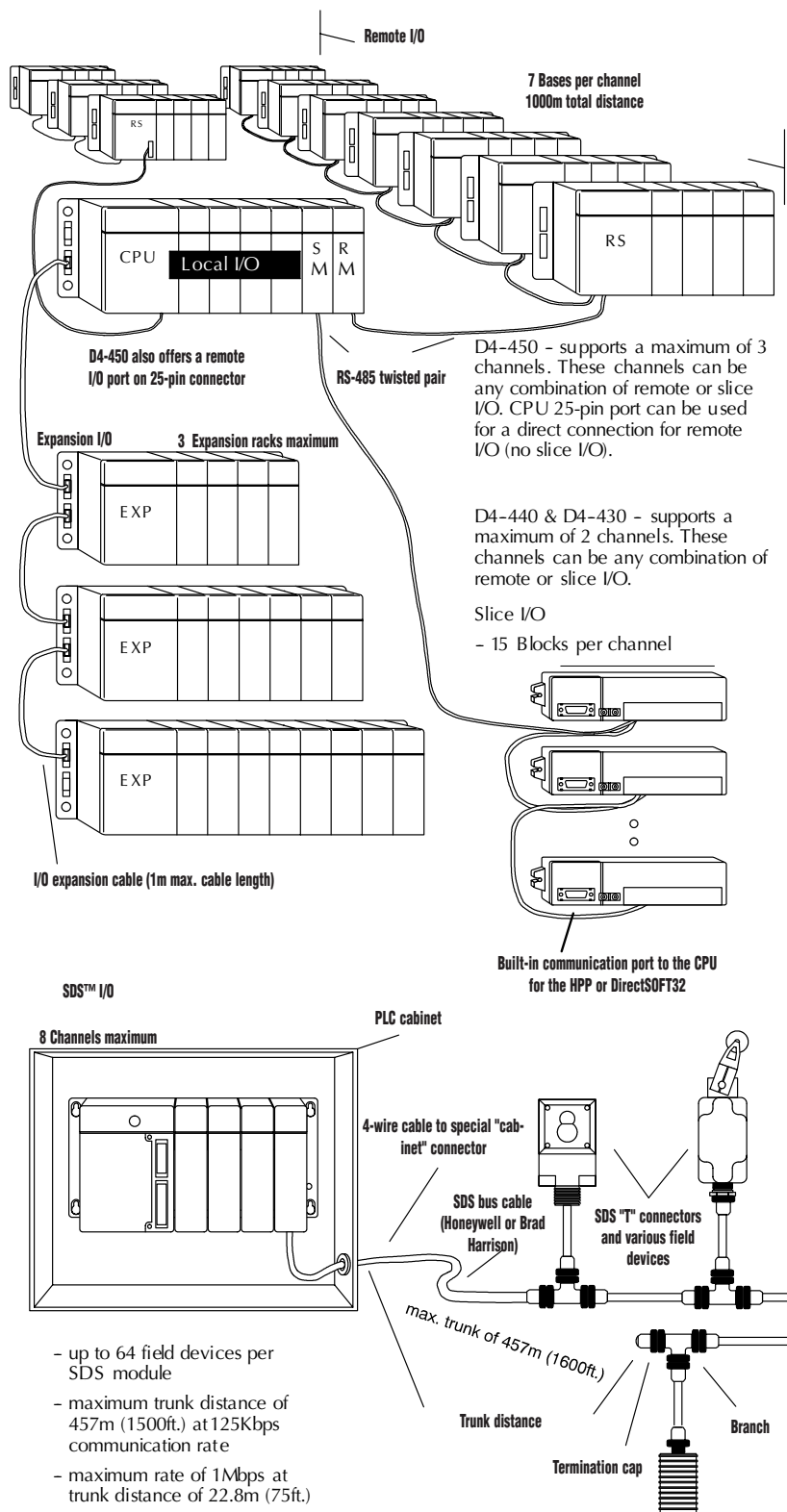
Local I/O

The local base is the base that holds the CPU. The term "local I/O" refers to the modules that reside in the base with the CPU. Each local I/O point is updated on every CPU scan. Up to 512 points are available in the local base by using 64-point modules (requires a D4-440 or D4-450).

Expansion I/O

Expansion bases are commonly used when there are not enough I/O slots available in the local base, or when the power budget for the base will be exceeded with the addition of I/O. This configuration requires additional base(s), each of which require a D4-EX Local Expansion Unit in place of the CPU, and a cable to connect the expansion bases to the local CPU base. Up to three expansion bases can be connected to a local CPU base, for a total of four bases. The CPU updates expansion I/O points on every scan. The total number of local and expansion I/O points for the D4-450 is 2048 points. The total for the D4-430 and D4-440 is 640 I/O.

Example of I/O system configurations



I/O CONFIGURATIONS

Ethernet remote I/O

The DL405 Ethernet Remote I/O system allows you to locate I/O bases at a remote distance from the CPU. For many applications, this can reduce wiring costs by allowing I/O points to be located near the devices they are controlling.

The Ethernet Remote Master module (H4-ERM) is placed in an I/O slot of the local CPU base. Ethernet Base Controller (EBC) modules serve as the Remote Slave Units and are placed in the CPU slot of one or more remote bases. You can use standard DL405 modules in the remote bases. The Remote Slaves are connected to the Master using Category 5 UTP cables for cable runs up to 100 meters. Use repeaters to extend distances and hubs to expand the number of nodes. Our fiber optic version uses industry standard 62.5/125 ST-style fiber optic cables and can be run up to 2,000 meters.

Each H4-ERM module can support up to 16 slaves: 16 H2-EBC systems, 16 Terminator I/O EBC systems, or 16 fully expanded H4-EBC systems.

The PLC, ERM and EBC slave modules work together to update the remote I/O points. These three scan cycles are occurring at the same time, but asynchronously. It is recommended that critical I/O points that must be monitored every scan be placed in the CPU base.

ERM Workbench is an easy-to-use Windows-based software utility that is used to configure the ERM and its remote slaves.

It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its slaves. While Ethernet networks can handle a very large number of data transactions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the I/O network. Keep ERM networks, multiple ERM networks and ECOM/office networks isolated from one another.

		D4-450	D4-440	D4-430
Total Channels Available	Total number of Remote/Slice channels available	3	2	2
	Out of total, number available for Remote I/O	3	2	2
	Out of total, number available for Slice I/O	2	2	2
Remote I/O	Maximum number of D4-RM per system	2	2	2
	Number of masters built into CPU port	1	0	0
	Maximum I/O points supported per channel	512	512	512
	Maximum I/O points supported	1536	1024	512
	Maximum number of remote I/O bases per channel	7	7	7
Slice I/O	Maximum number of D4-SM per system	2	2	2
	Maximum Slice Slaves supported by 1 Slice Master	15	15	15
	Maximum number of Slice Slaves	30	30	30
SDS I/O	Maximum number of SDS modules per system	8	8	8
	Maximum Field Devices supported by one SDS Module	64	64	64
	Maximum number of field devices possible	512	512	512

Serial remote I/O and slice I/O

There are two types of remote I/O solutions in the DL405 family: remote I/O and Slice I/O. Each of these solutions allow you to place I/O points at some remote distance from the CPU. In either case, the remote I/O points are updated asynchronously to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the I/O points to be updated on every scan. You can use Remote I/O and slice I/O at the same time. Even though you can mix the types, you cannot exceed the total number of channels available.

Remote I/O — Remote I/O requires a remote master to control the remote I/O channel. This master can be a module (D4-RM) in the local CPU base, or the D4-450 CPU (through the 25-pin port). For the D4-RM solution, the CPU updates the remote master, then the remote master handles all communication to and from the remote I/O base by communicating to the remote slave module (D4-RS) installed in each remote base. If you use the D4-450 CPU, then it communicates directly with the D4-RS. (Note: the D4-450 only works with Remote I/O. It does not work with Slice I/O.)

The maximum distance between a Remote Master and a Remote Slave is 3300 feet (1000 m).

Slice I/O — This is similar to remote I/O since it also requires a special Slice Master (D4-SM) in the local CPU base to control the Slice Slave(s). The Slice Slave (D4-SS-xxx) is a self-contained unit that has a block of fixed I/O and a communication port in one package.

The maximum distance between a Slice master and the last Slice I/O is 990 feet (300m).

SDS I/O

SDS I/O is quite different from all of the other I/O approaches. You still have an SDS I/O interface card in the local base, but the field devices are connected directly to the SDS interface via a simple 4-wire communication cable. There is no I/O module between the field device and the SDS interface module. This reduces costs because you can connect directly to the field device.

The maximum distance between an SDS module and the final intelligent field device is 487m (1600ft.). This distance is for 125 Kbaud and decreases as the communications speed increases. Additional information is provided later in this desk reference.



MODULE PLACEMENT AND I/O USAGE TABLES

I/O module placement restrictions

The most commonly used I/O modules for the DL405 system (AC, DC, AC/DC, Relay, and Analog) can usually be used in any base you have in your local, expansion or remote system. However, some specialty modules (and the 64pt. discrete I/O modules) are limited to the CPU base, or our D4-xxB-1 bases. This table lists by category the valid locations for all modules/units in a DL405 system. Keep in mind the power budget may limit where some modules can be placed, since the necessary power may have been consumed.

I/O point usage table for modules

The bottom tables indicate the number of I/O points consumed by each module. Use this information to ensure you stay within the I/O count of the I/O configuration you have chosen. Remember, each CPU supports a different amount of I/O. Check the specifications to determine the I/O limits.

Module/Unit	Local CPU Base	Expansion Base	Remote Base
CPU's	Only		
Expansion Units		CPU slot only	
8/16/32pt DC Input	✓	✓	✓
64pt DC Input	✓ ¹		
AC Input	✓	✓	✓
AC/DC Input	✓	✓	✓
8/16/32pt DC Input	✓	✓	✓
64pt DC Output	✓ ¹		
DC Input	✓	✓	✓
Relay Output	✓	✓	✓
Analog Input and Output	✓	✓	✓
Thermocouple Input	✓	✓	✓
Remote I/O			CPU slot
Remote Masters (serial / Ethernet)	✓	✓ ²	
Remote Slave Unit			
Slice Master	✓	✓ ²	
SDS™	✓		
Communications and Networking Modules	✓	✓ ²	
CoProcessor Modules	✓		
Specialty Modules			
Interrupt			
with D4-430	Slot 0 only		
with D4-440/D4-450	Slot 0 and 1		
PID	✓		
4-Loop Temp. Controller	✓	✓	
High-speed Counter	✓	✓	
Simulator	✓	✓	✓

1 - If you are using 64pt. modules, you cannot install any specialty modules in slots 5, 6, or 7 of the local CPU base.
2 - Modules are only allowed in expansion bases if you are using the D4-450 CPU and ALL bases in the system are D4-xxB-1 bases.

I/O points required per module

DC Input	I/O pt.
D4-08ND3S	8 in
D4-16ND2	16 in
D4-16ND2F	16 in
D4-32ND3-1	32 in
D4-32ND3-2	32 in
D4-64ND2	64 in
AC Input	
D4-08NA	8 in
D4-16NA	16 in
AC/DC Input	
D4-16NE3	16 in
F4-08NE3S	8 in

DC Output	I/O pt.
D4-08TD1	8 out
D4-16TD1	16 out
D4-16TD2	16 out
D4-32TD1, (-1)	32 out
D4-32TD2	32 out
D4-64TD1	64 out
AC Output	
D4-08TA	8 out
D4-16TA	16 out
Relay Output	
D4-08TR	8 out
F4-08TRS-1	8 out
F4-08TRS-2	8 out
D4-16TR	16 out

Analog	I/O pt.
F4-04AD	16 or 32 in
F4-04ADS	16 in
F4-08AD	16 in
D4-02DA	32 out
F4-04DA-1, (-2)	16 out
F4-08DA-1	16 out
F4-16DA-1	32 out
F4-08RTD	32 in
F4-08THM-n	16 in
Communications/Networking	
All modules	0
CoProcessors	
All modules	0

Remote I/O	I/O pt.
H4-ERM	0
D4-RM	0
D4-RS	0
D4-RSDC	0
D4-SM	0
D4-SS-88	8 in/8 out
D4-SS-106	16 in/6 out
D4-SS-16T	16 out
D4-SS-16N	16 in
F4-SDS	0
Specialty Modules	
D4-INT	16 in
H4-CTRIO	0
D4-HSC	16 in/32 out
F4-16PID	0
F4-8MPI	0
D4-16SIM	8 or 16 in
F4-4LTC	0

DL405 I/O ADDRESSING

Many of our customers were familiar with other PLC systems prior to trying *DirectLogic* products. One of the key differences between various PLC systems is how they treat the I/O module addressing. This section will describe how we address the individual I/O points in a DL405 system.

Octal addressing

The DL405 uses octal addressing. That is, the I/O point addresses do not include any "8s" or "9s". The I/O points start at 0 and continue in increments of 8, 16, 32, or 64 points, depending on the modules being used. We use the designator "X" for inputs and "Y" for outputs.

Automatic addressing

The DL405 CPUs automatically examine any I/O modules in the local CPU and expansion bases to establish the correct I/O configuration and addressing on power-up. The modules don't have to be grouped by type and the discrete input and output modules can typically be mixed in any order. However, there may be restrictions placed on some specialty modules or combinations of modules (Check the Module Placement restrictions.) The following diagram shows sample addresses for a simple system containing discrete I/O modules.

For most applications, you never have to change or adjust the configuration. However, if you use automatic addressing and you add modules in between existing modules, the I/O addresses may be subject to renumbering. If you want to add modules in the future, add them to the right of any existing modules to avoid any re-addressing of your I/O points, or use manual addressing.

Manual addressing

The D4-440 and D4-450 CPUs allow you to manually assign I/O addresses for any or all I/O slots on the local or expansion bases. This feature is useful if you have a standard configuration that you must sometimes change slightly to accommodate special requests. It is also useful if you have to leave empty slots in between I/O modules and you do not want an added module to cause addressing problems. In automatic configuration, the addresses are assigned on 8-point boundaries. Manual configuration assumes that all modules are at least 16 points, so you can only assign addresses that are a multiple of 20 (octal). This does not mean you can only use 16, 32, or 64-point modules with manual configuration. You can use 8-point modules, but 16 addresses will be assigned and 8 are unused.

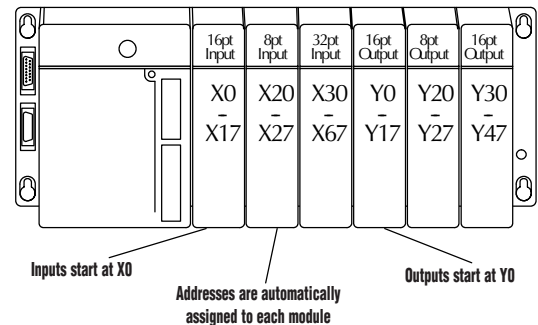
Remote I/O and Slice I/O addressing

Remote I/O and Slice I/O are both very flexible when it comes to I/O addressing. For example, you specify the starting addresses, number of total points, etc. when you set up the system.

Manual addressing and choice of data type designators

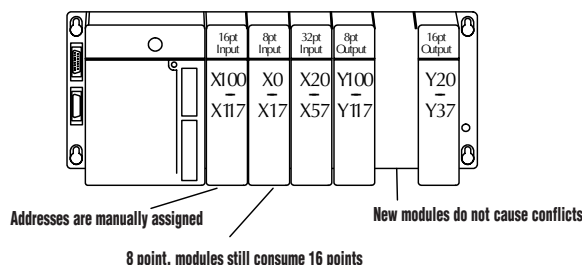
With Remote I/O or Slice I/O, you can choose the designator type that is used for the addresses. For example, you could choose to map the remote points into GX data types or GY data types or even

into control relays. This can be very helpful in those situations where the local and expansion I/O have consumed all of the X inputs or Y outputs. You make these various choices when you define the setup logic for the remote I/O or Slice I/O.



Automatic addressing available for Slice I/O

Slice I/O also allows you to use a form of automatic addressing. If you choose this method, the addresses are automatically assigned starting at X200 (for inputs) and Y200 (for outputs). If you use this method, each Slice I/O unit consumes 16 input points and 16 output points. Any points that aren't on the unit are consumed, but are unused.





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.

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 DL405 system.

A				
	Base Number 0	Device Type	5 VDC (mA)	External 24VDC Power (mA)
B	CURRENT SUPPLIED			
	CPU/Expansion Unit /Remote Slave	D4-440 CPU	3700	400
C	CURRENT REQUIRED			
	SLOT 0	D4-16ND2	+150	+0
	SLOT 1	D4-16ND2	+150	+0
	SLOT 2	D4-02DA	+250	+300
	SLOT 3	D4-08ND3S	+100	+0
	SLOT 4	D4-08ND3S	+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	+80	+0
	Handheld Programmer	D4-HPP	+320	+0
E	Maximum Current Required		2950	300
F	Remaining Current Available		3700-2950=750	400-300=100
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 24 VDC 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	24VDC Powered Units	125VDC Powered Units
Part Numbers	D4-450, D4-440, D4-430, D4-EX (expansion unit)	D4-440DC-1, D4-EXDC (expansion unit) D4-450DC-1	D4-440DC-2 D4-450DC-2
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10Mohm at 500VDC		
Input Voltage Range	85-132 VAC (110 range) 170-264 VAC (220 range)	20-28VDC (24 VDC) with less than 10% ripple	90-146 VDC (125 VDC) with less than 10% ripple
Maximum Inrush Current	20 A	20A	20A
Maximum Power	50VA	38W	30W

Power Requirements

Power Supplied					
<i>CPUs/Remote Units/ Expansion Units</i>	<i>5V Current Supplied in mA</i>	<i>24V Aux Power Supplied in mA</i>	<i>CPUs/Remote Units/Expansion Units</i>	<i>5V Current Supplied in mA</i>	<i>24V Aux. Power Supplied in mA</i>
D4-430 CPU	3700	400	D4-EX	4000	400
D4-440 CPU	3700	400	D4-EXDC	4000	NONE
D4-440DC-1 CPU	3700	NONE	D4-EXDC-2	3700	NONE
D4-440DC-2 CPU	3700	NONE	D4-RS	3700	400
D4-450 CPU	3100	400	D4-RSDC	3700	NONE
D4-450DC-1 CPU	3100	NONE	H4-EBC	3680	400
D4-450DC-2 CPU	3100	NONE	H4-EBC-F	3550	400
Power Consumed					
<i>Power-consuming Device</i>	<i>5V Current Consumed</i>	<i>External 24VD Current Required</i>	<i>Power-consuming Device</i>	<i>5V Current Consumed</i>	<i>External 24VDC Current Required</i>
I/O Bases			Analog Modules (continued)		
D4-04B, D4-04B-1	80	NONE	D4-02DA	250	300
D4-06B, D4-06B-1	80	NONE	F4-04DA	120	100
D4-08B, D4-08B-1	80	NONE	F4-04DA-1	70	75+20per circuit
			F4-04DA-2	90	90
			F4-04DAS-1	60	60 per circuit
			F4-04DAS-2	60	60 per circuit
			F4-08DA-1	90	100+20 per circuit
			F4-08DA-2	80	150
			F4-16DA-1	90	100+20 per circuit
			F4-16DA-2	80	25 max.
			F4-16AD-1	75	100
			F4-16AD-2	75	100
			F4-8RTD	80	NONE
			F4-08THM-n	120	50
			F4-08THM	110	60
DC Input Modules			Remote I/O		
D4-08ND3S	100	NONE	H4-ERM	320	NONE
D4-16ND2	150	NONE	H4-ERM-F	450	NONE
D4-16ND2F	150	NONE	D4-RM	300	NONE
D4-32ND3-1	150	NONE	D4-SM	300	NONE
D4-32ND3-2	150	NONE	D4-SS-88	NONE	100, (250 w/HPP)
D4-64ND2	300 max.	NONE	D4-SS-106	NONE	100, (250 w/HPP)
			D4-SS-16T	NONE	100, (250 w/HPP)
			D4-SS-16N	NONE	100, (250 w/HPP)
			F4-SDS	110	NONE
AC Input Modules			Communications and Networking		
D4-08NA	100	NONE	H4-ECOM	320	NONE
D4-16NA	150	NONE	H4-ECOM-F	450	NONE
			D4-DCM	500	NONE
			F4-MAS-MB	235	NONE
			F4-SLV-MB	235	NONE
			F4-SLV-TW	250	NONE
			F4-SDN	235	NONE
			FA-UNICON	NONE	65
AC/DC Input Modules			CoProcessors		
D4-16NE3	150	NONE	F4-CP128-1	305	NONE
F4-08NE3S	90	NONE	F4-CP512-1	235	NONE
			F4-CP128-T	350	NONE
DC Output Modules			Specialty Modules		
D4-08TD1	150	35	H4-CTRIO	400	NONE
F4-08TD1S	295	NONE	D4-INT	100	NONE
D4-16TD1	200	125	D4-HSC	300	NONE
D4-16TD2	400	NONE	F4-16PID	160	NONE
D4-32TD1	250	140	F4-08MPI	225	170
D4-32TD1-1	250	140 (15V)	D4-16SIM	150	NONE
D4-32TD2	350	120 (4A max including loads)	F4-SDS	110	NONE
D4-64TD1	800 max.	NONE	F4-4LTC	280	75
AC Output Modules			Programming		
D4-08TA	250	NONE	D4-HPP-1 (Handheld Prog.)	320	NONE
D4-16TA	450	NONE			
Relay Output Modules			Operator Interface		
D4-08TR	550	NONE	DV-1000	150	NONE
F4-08TRS-1	575	NONE			
F4-08TRS	575	NONE			
D4-16TR	1000	NONE			
Analog Modules					
D4-04AD	200	200			
F4-04AD	85	100			
F4-04ADS	270	120			
F4-08AD	75	90			



DIMENSIONS AND INSTALLATION

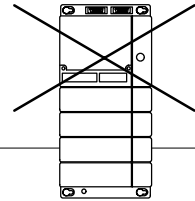
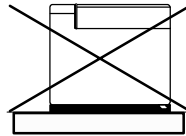
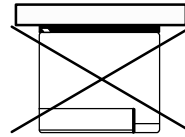
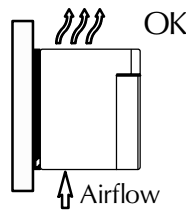
It is important to understand the installation requirements for your DL405 system. This will help ensure that the DL405 products operate within their environmental and electrical limits.

Plan for safety

This catalog should never be used as a replacement for the user manual. The user manual, D4-USER-M, contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Base dimensions and mounting orientation

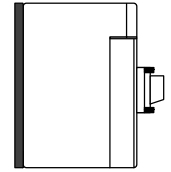
Use the diagrams to the right to make sure the DL405 system can be installed in your application. To ensure proper airflow for cooling purposes, DL405 bases must be mounted horizontally. It is important to check these dimensions against the conditions required for your application. For example, it is recommended that you leave 1.5" depth for ease of access and cable clearance. However, your distance may be greater or less. Also, check the installation guidelines for the recommended cabinet clearances.



With 32-pt. or 64-pt. solder → 6.375" 162mm

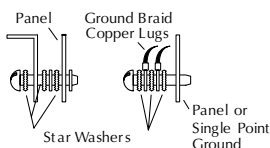
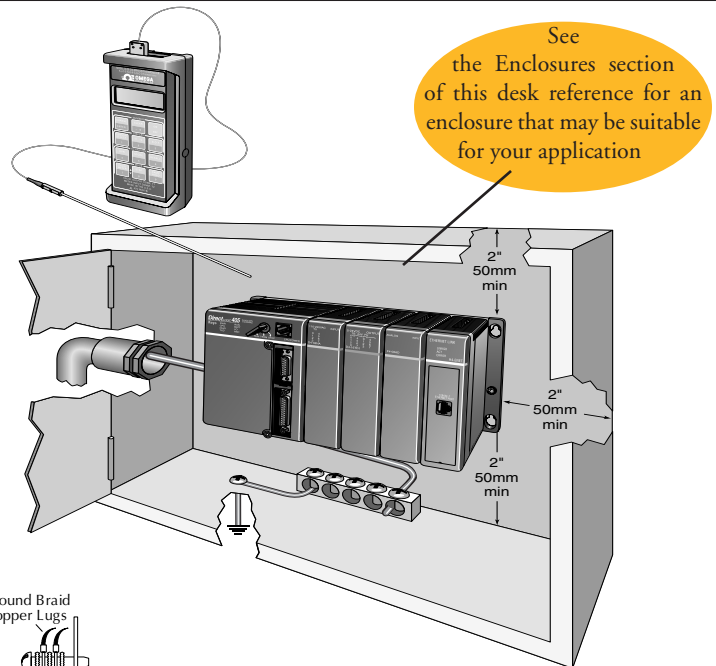
With 32 pt. or 64-pt. ribbon → 5.5" 140mm

With programming or I/O cable With 8 or 16 I/O → 5.5" 140mm

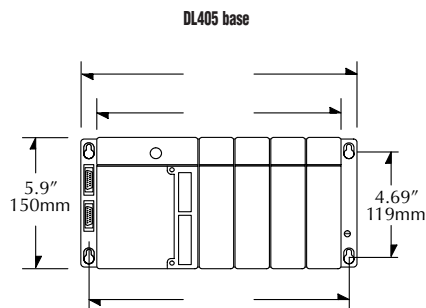


With 8 or 16 I/O → 4.375" 111mm

Specification	Rating
Storage temperature	-4°F - 158°F (-20°C to 70°C)
Ambient operating temperature	32°F - 140°F (0° to 60°C)
Ambient humidity	30% - 95% relative humidity (non-condensing)
Vibration resistance	MIL STD 810C, Method 514.2
Shock resistance	MIL STD 810C, Method 516.2
Noise immunity	NEMA(ICS3-304)
Atmosphere	No corrosive gases



Note: there is a minimum of 2" (50mm) clearance required between the panel door or any devices mounted in the panel door and the nearest DL405 component.



BASE	A		B		C	
D4-04B-1	11.53"	293mm	10.82"	275mm	10.50"	267mm
D4-06B-1	14.44"	367mm	13.74"	349mm	13.42"	341mm
D4-08B-1	17.36"	441mm	16.65"	423m	16.32"	423mm

BASE CONFIGURATIONS

Four, six, and eight-slot bases

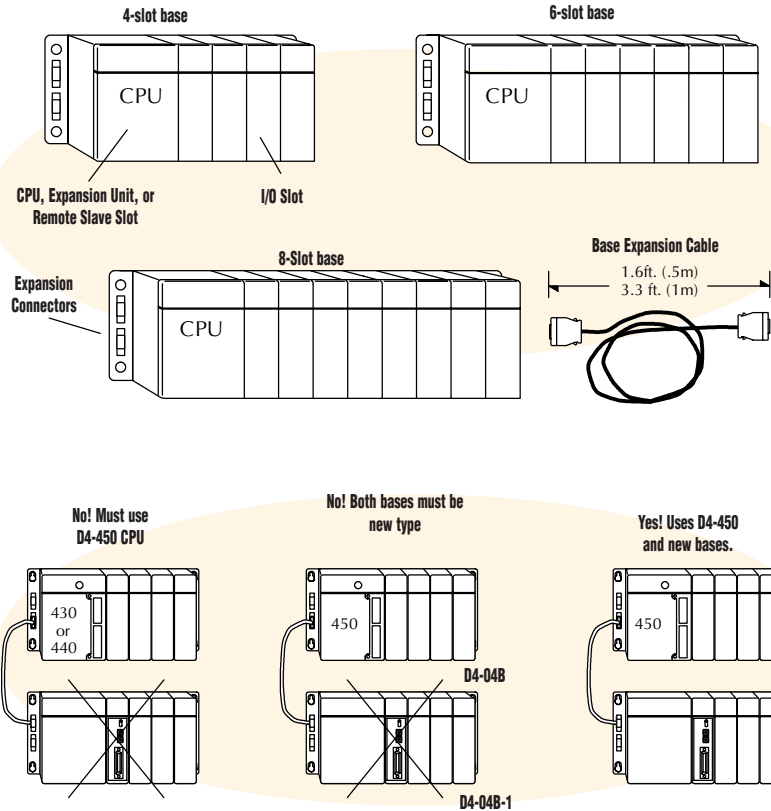
The DL405 product family offers four, six, and eight-slot I/O bases.

Expansion units

The expansion units are only necessary when you want to use local expansion. They are installed in the CPU slot of the expansion bases. They appear very similar to CPUs, but they only contain a power supply. One of the most often asked questions for the DL405 family is, "Does the CPU consume an I/O slot?" The answer is no. The CPU has a special slot in the base and does not consume any of the available I/O slots. The same is true for Expansion Units (D4-EX, D4-EXDC and D4-EXDC-2) and the Remote Slave Units (D4-RS). An expansion cable is required to connect each of the expansion bases to the CPU base (D4-EXCBL).

D4-450 and -1 bases

In the past, a DL405 system has been limited to only accepting specialty modules in the local CPU base. The -1 bases must be used with the D4-450 CPU to remove this limitation. The part numbers for the new bases are D4-04B-1, D4-06B-1, and D4-08B-1. (Note: you cannot simply add a -1 base to an existing system to gain specialty modules in expansion bases. Instead, you must replace the CPU and all other expansion bases as well.) You can add the -1 bases in an existing system, but they are subject to the limitations of the regular bases.





SERIAL DATA COMMUNICATIONS MODULE

Data Communications Module

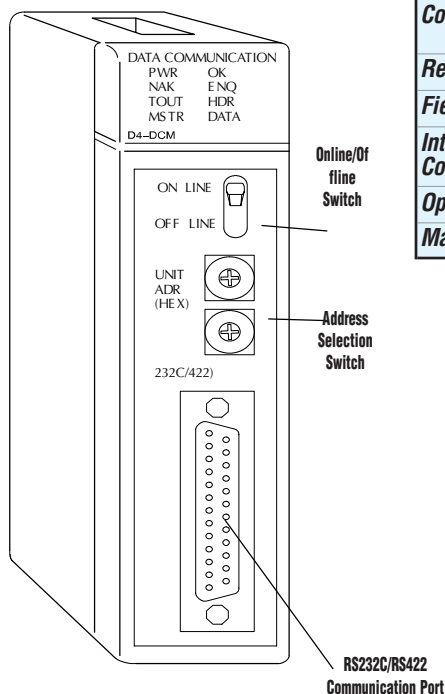
D4-DCM



Overview

The DL405 Data Communication Module (DCM) is a general purpose communications interface for the DL405 family of PLCs. This module is primarily used for three reasons:

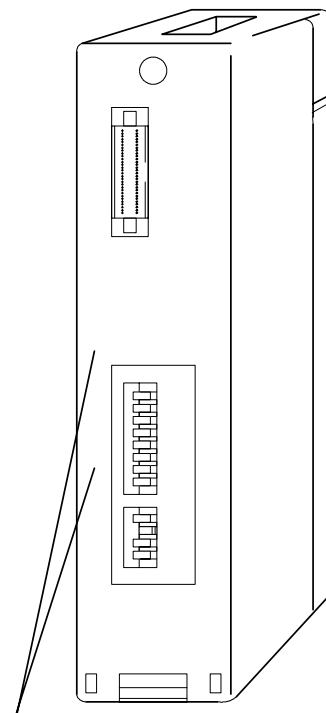
- Extra general purpose communications port to connect a personal computer, operator interface, etc.
- Network interface to a **DirectNET** network
- Network interface to a MODBUS network using the RTU protocol



Mode 1:

Extra communications port

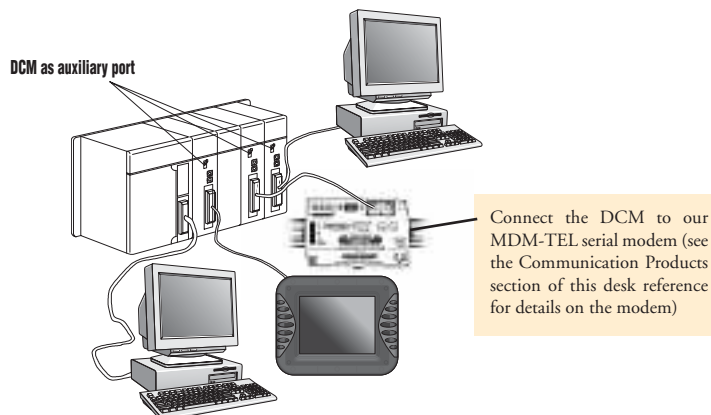
All DL405 CPUs offer at least two built-in communication ports. (The D4-450 even has four ports.) However, if even more communication ports are needed, additional Data Communication Modules can be added. As an extra communication port, the DCM has specifications identical to port 1 on the DL405 PLCs. (Plus, it offers a higher baud rate.) Whatever can be connected to port 1 of the DL405 CPU can be connected to the DCM, just make sure the device has a DL405 compatible driver. This allows additional connections of devices, such as operator interfaces, personal computers, etc. Since the DCM does not require any programming, you can set the DCM communication parameters, connect the cables, and start transferring data.



DIP Switches for communications and Protocol Parameters

Specifications

Module Type	Intelligent
Modules per CPU	7 Maximum, any slot in CPU Base
Communications	RS232C/422, DirectNET , SIMATIC®TI405™, or MODBUS (slave only) RTU protocol. Baud rate selectable from 300 to 38.4K baud. Odd or no parity. HEX or ASCII mode
Recommended Cable	Belden 9729 or equivalent (for RS422)
Field Wiring Connector	25 Pin D-shell connector
Internal Power Consumption	500 mA maximum at 5VDC, (supplied by base power supply)
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Manufacturer	Koyo Electronics





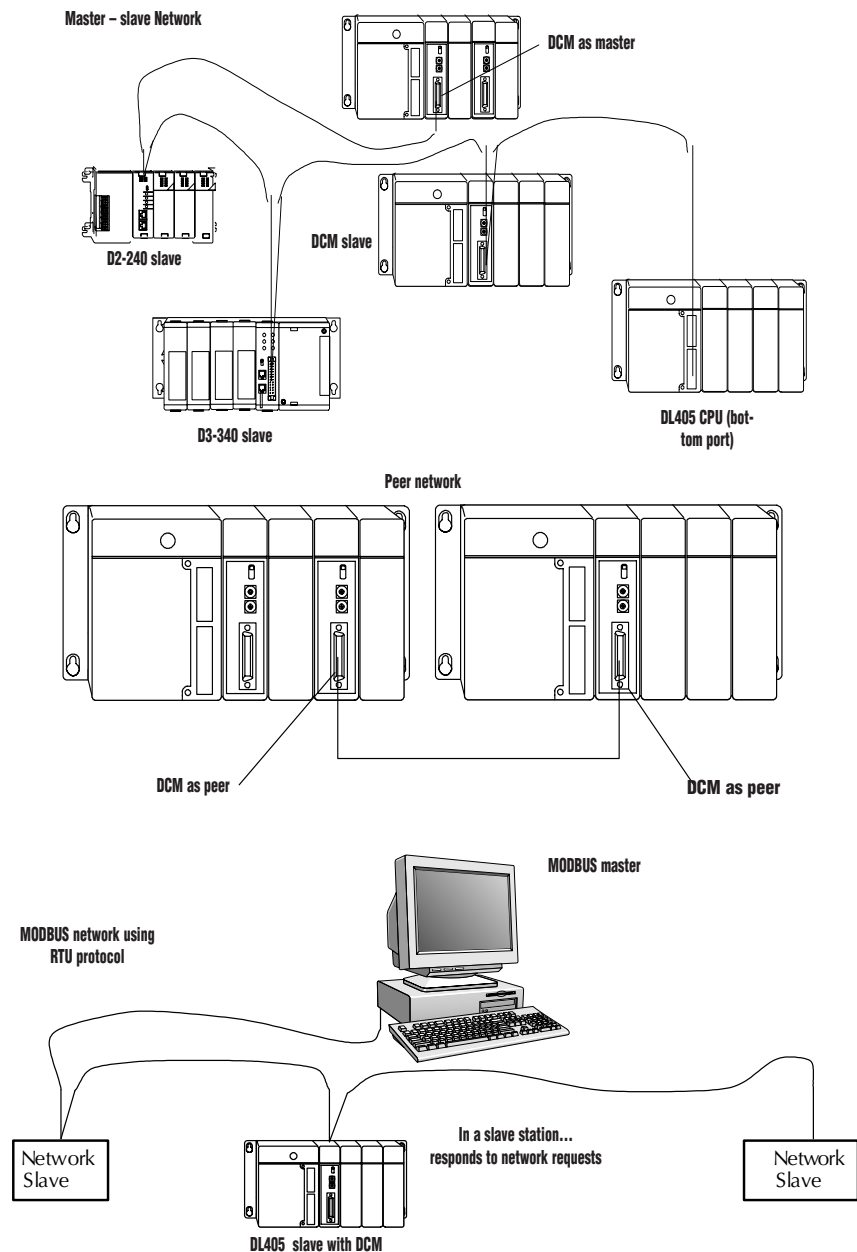
DCM - Mode 2/3

Mode 2 : DirectNET network interface

The DCM can be used as a network interface for applications requiring data to be shared between PLCs, or between PLCs and an intelligent device such as a host computer. The DCM connects easily to *DirectNET*. This network allows you to upload or download virtually any type of system data including Timer/Counter data, I/O information, and V-memory information from any of our PLCs or compatible PLC. The DCM allows the DL405 PLC to function as a master or a slave of *DirectNET*.

Network Master - The DCM allows the DL405 to serve as a master of a *DirectNET* Network. The DCM takes communication requests issued from the PLC program (the network part of the program can be very simple, as few as seven words) and automatically converts these requests into network commands to read data from or write data to another PLC on the network. This capability also allows a peer to peer configuration of two DL405 systems with DCMs. For other options, consider the H4-ECOM module.

Network Slave - All DL405 CPUs have a built-in network slave port. If this port is occupied, a DCM can be added to provide an additional network slave port. In this case, the DCM "listens" to the network for any messages containing the DCMs address. The DCM deciphers the network commands, carries out the request to read or write data, and sends confirmation and/or information to the master station. Since the DCM does not require any programming, you can set the DCM communication parameters, connect the cables and start transferring data.



Mode 3: MODBUS interface

The DCM can be used as a slave station interface to connect your DL405 system to the MODBUS network using the MODBUS RTU protocol. The host system must be capable of issuing the MODBUS commands to read or write the appropriate data. We also offer higher performance and higher featured MODBUS slave modules. See specialty modules F4-SLV-MB and F4-SLV-MBR.



ETHERNET COMMUNICATION MODULES

Ethernet Communications Module

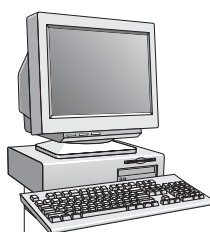
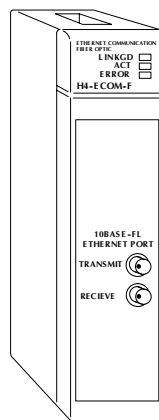
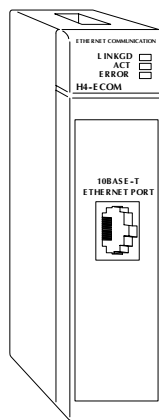
H4-ECOM
H4-ECOM-F



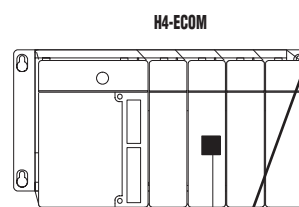
Ethernet speed at an incredible price

- High-speed peer-to-peer networking of PLCs
- Ultrafast updates when using DirectSOFT32 Programming Software
- High-performance access for Human Machine Interface (HMI) or other Windows-based software when using our DSDData Server
- Free SDK for custom driver development
- Virtually unlimited number of network nodes are possible
- Simple set-up using DIP switches or NetEdit software

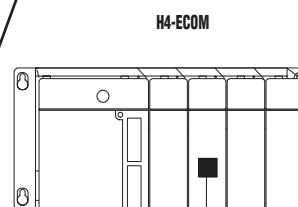
The Ethernet Communication Modules (ECOM) represent a price breakthrough for high-speed peer-to-peer networking of PLCs. No longer are you forced to designate a single PLC to be the network master. Any PLC can initiate communications with any other PLC. Link your PLCs with PCs using industry standard cables, hubs, and repeaters. A simple Windows-based spreadsheet program can be linked to your networked PLCs using our *DirectSOFT32* DSDData Server. Or, use our DSDData Server to link Human Machine Interface (HMI) software to *DirectLOGIC* PLCs. Our *DirectSOFT32* Programming Software can be used to monitor or update the RLL program in any *DirectLOGIC* PLC on the network. Walk to each PLC to make programming changes, or do it all from one PC.



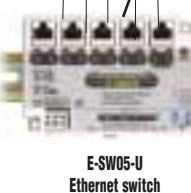
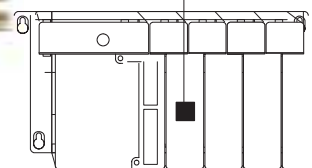
H2-ECOM



H4-ECOM



H4-ECOM

E-SW05-U
Ethernet switch

H4-ECOM

Simple connections

Use Category 5, UTP cables or 62.5/125 fiber optic cables depending on the requirements of your application. UTP cables can be run 100 meters between nodes and fiber optic cables can be run 2,000 meters.

Use repeaters to extend distances and expand the number of nodes. UTP cables are inexpensive, and fiber optic cables virtually eliminate electrical noise problems. We let you choose the connection that fits your needs!

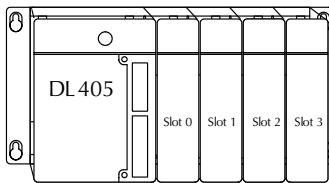
E-SW05-U Ethernet Switch
(see the Communications Products section of this desk reference for details)

Specifications	H4-ECOM	H4-ECOM-F
Communications	10Base T Ethernet	10BaseFL Ethernet
Data Transfer Rate	10Mbps	10Mbps
Link Distance	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	TCP/IP, IPX
Power Consumption	320mA	450mA
Manufacturer	Host Automation Products	Host Automation Products

ETHERNET COMMUNICATION MODULES

The H4-ECOM (-F) modules plug into any I/O slot of any local DL405 I/O base, including expansion bases*. The module maintains the identification data, descriptive information, and communication parameters for PLC-to-PLC communications in flash memory. Disconnect power before installing or removing any PLC module.

**Note: All DL405 series (and compatible) CPUs support the H4-ECOM (-F) modules.*



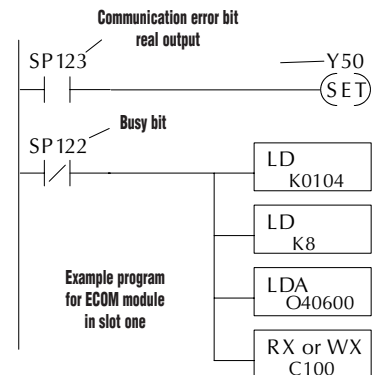
**Use of expansion bases requires D4-450 CPU and "1" bases for all bases in system.*

NetEdit software

Free NetEdit software ships with the ECOM User Manual. Use NetEdit to set up the ECOM modules for your network. Flexible addressing allows you to use your choice of protocols and identifying methods. Assign each module a number or a name or both. You don't have to use an IP address, but you can if it's necessary for your network. Two protocols are available for PC-to-PLC communications: IPX and TCP/IP. Select the one you want to use, or use them both. The NetEdit screen displays all identifiers and troubleshooting information for each module on the network. You can use NetEdit to adjust parameters for PLC-to-PLC communications by clicking on Advanced Settings. The network identifiers can also be changed from *DirectSOFT32* Programming Software.

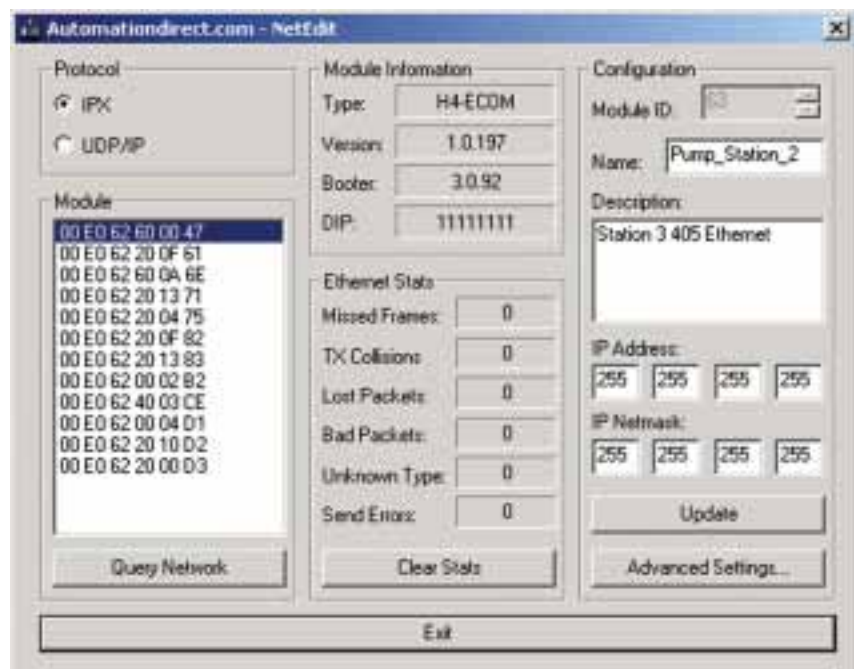
PLC-to-PLC communications

PLC-to-PLC communications are accomplished using Read from Network (RX) and Write to Network (WX) instructions. Build the RX and/or WX instructions into a routine as shown. One SP relay (the busy bit) is used for sequencing of multiple instructions or to prevent a single RX or WX instruction from being overwritten. The other SP relay can be used to annunciate a communication error. The first Load (LD) instruction contains the base and slot number of the initiating ECOM and the Module ID of the responding ECOM. The second LD instruction contains the number of bytes being transferred. You can transfer up to 256 bytes with one RX or WX instruction. The Load Address (LDA) instruction contains the beginning address in the initiating PLC's memory regardless of whether it is an RX or WX instruction that is being executed. The RX or WX instruction contains the beginning address in the responding PLC.



ECOM Starter Kit

The H4-ECOM-START gives you everything you need to make your first Ethernet network simple to build. It contains an ECOM module and instruction manual, a network adapter card for your PC, a crossover cable, and a *DirectSOFT32* Showcase Demo CD. See our Web site for more details.





SERIAL REMOTE I/O MASTER/SLAVE MODULES

Remote I/O Master Module

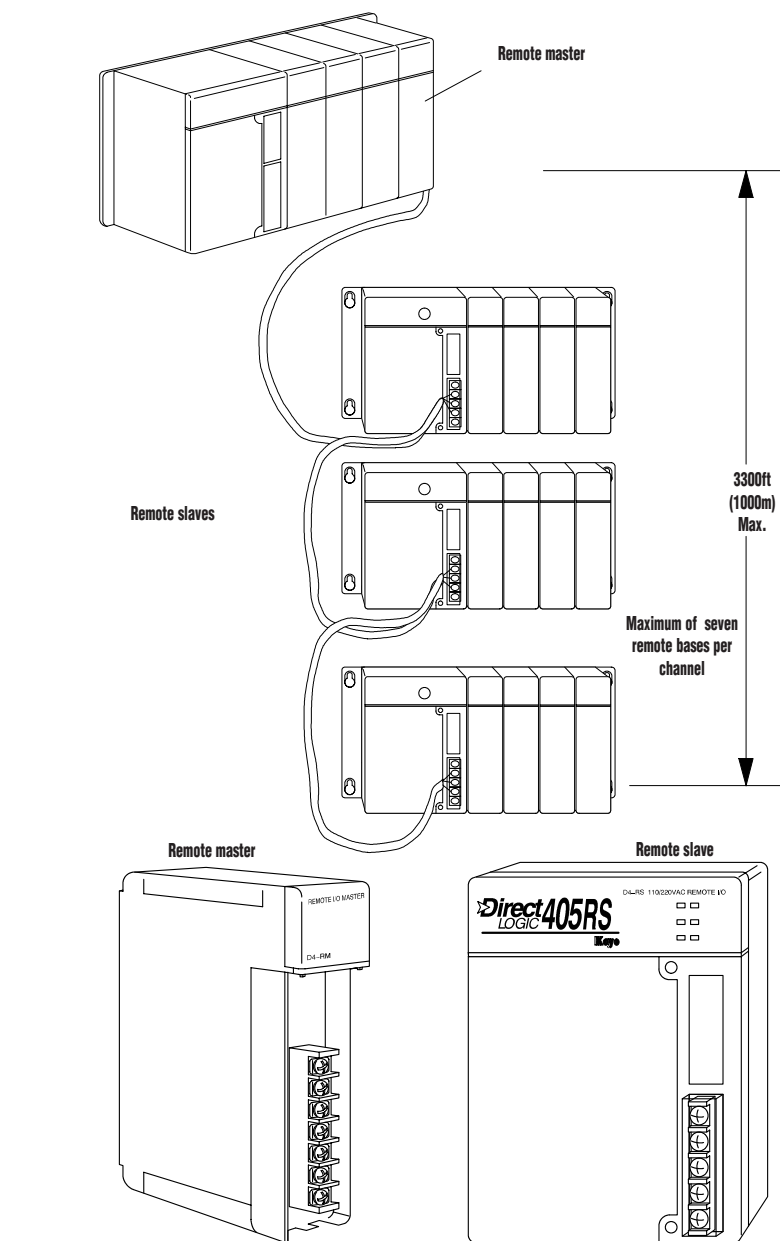
D4-RM

Remote I/O Slave Module

D4-RS**D4-RSDC**

Overview

The DL405 offers full-size remote I/O. The goal of remote I/O is to reduce wiring costs, by allowing I/O points to be located near the devices they are controlling. The chart at the bottom of this page shows the capacity for each CPU. The D4-450 has the D4-RM functionality built into the 25-pin port directly on the CPU. However, you can also choose to use the D4-RM discussed here. Here's how it works: A special module called the Remote Master is placed in the CPU base. This Master module controls up to seven Remote Slaves. The Remote Slaves are connected to the Master in a daisy-chain manner over a twisted pair communication cable (maximum length of 3300 feet or 1000m). Each Remote Slave attaches to a DL405 base (any size). Standard DL405



	D4-450	D4-440	D4-430
Maximum number of remote masters supported	3*	2	2
Maximum I/O points supported	1536	1024	512
Maximum I/O points supported per channel	512	512	512
Maximum number of remote I/O bases per channel	7	7	7

*max. of 2 D4-RM, 1 channel is via 25-pin CPU port

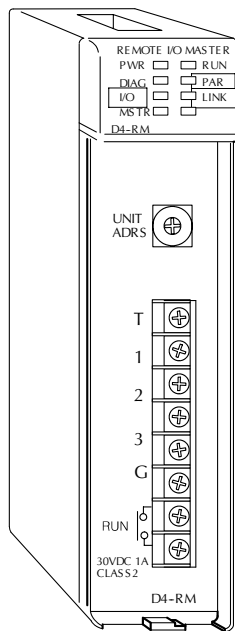
modules populate the remote bases.

You can assign normal input and output addresses to the remote points, or you can assign special remote I/O addresses. The Remote Master sends the remote I/O information to the CPU. The communication between the Remote Master and

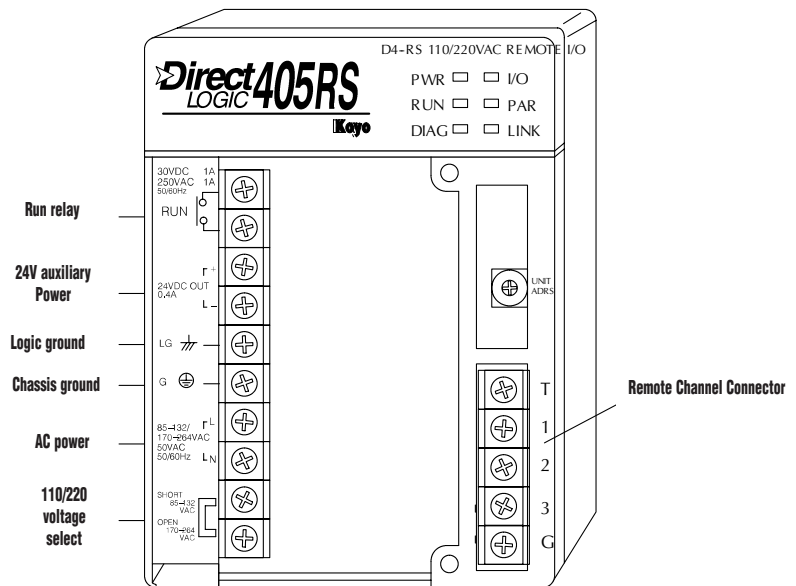
the CPU is asynchronous to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the remote I/O points to be updated with every CPU scan.

SERIAL REMOTE I/O

Remote Master



Remote Slave



Remote Master Specifications	
Module Type	Intelligent device
Number of Master per CPU	Two maximum for D4-430 and D4-440 Three maximum for D4-450 (max. number must include both Remote Master modules and Slice Master modules)
Maximum Slaves Supported	Seven slaves per channel
Communication to Slaves	RS485 via twisted pair with shield @ 38.4K baud
Recommended Cable	Belden 9841 or equivalent
Transmission Distance	3,300 ft. maximum
Terminal Type	Fixed
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Internal Power Consumption	300 mA maximum
Manufacturer	Koyo Electronics

Remote Slave Specifications	
Maximum Slave Points per CPU	512 for D4-430 1024 for D4-440 1536 for D4-450
I/O Addresses Used	I/O modules in slave bases do not automatically consume any standard input and output points. They consume remote I/O points at a rate equal to the number of I/O points in each base. However, you can choose to use standard I/O addresses as an option
Terminal Type	Fixed
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Power required	110 VAC/220 VAC (D4-RS) 24VDC (D4-RSDC)
Manufacturer	Koyo Electronics



Slice I/O MASTER/Slice Slave (SERIAL)

Slice I/O Master Module

D4-SM



Slice I/O Slave Modules

D4-SS-88

D4-SS-16T

D4-SS-16N

D4-SS-106

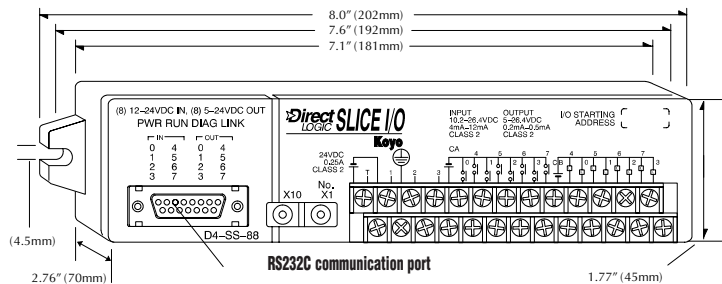
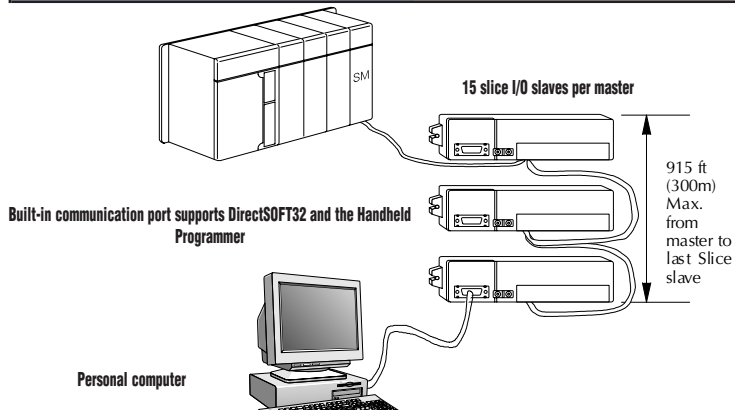


Overview

Slice I/O is a form of remote I/O which also allows the I/O points to be located a long distance away from the CPU. However, Slice I/O is very different from regular remote I/O. With regular remote I/O, you still need a remote I/O base, a remote slave unit (D4-RS), and individual DL405 I/O modules. With Slice I/O, these pieces are all combined into one small "block". This design is especially cost-effective when you need to use a small number of I/O points spread over several remote locations. The chart above shows the capacity for each CPU. The Slice Master module is placed in the CPU base. This Master controls up to 15 Slice Slaves, which are connected to the master in a daisy chain manner over an

	D4-450	D4-440	D4-430
Maximum Number of Slice Masters Supported	2	2	2
Maximum Number of Slice Slaves per Channel	15	15	15
Maximum Number of Slice Slaves per System	30	30	30
Total I/O available (16 pts. per Slice Slave)	480	480	480

Specifications	
Maximum Slave Points per CPU	480 (2 channels, 15 Slice slaves per channel) I/O Addresses Used: Slice I/O modules do not automatically consume any standard input and output points. They consume remote I/O points at a rate equal to the number I/O points in each base. However, you can choose to use standard I/O addresses as an option.
Slave Communication Port	Auxiliary RS232C communication port. Primarily used for programming or monitoring the CPU with a Handheld Programmer or personal computer running <i>DirectSOFT32</i> . Accepts any device that can be connected to the top port of the DL405 CPU.
Master to Slave Communications	RS485 via twisted pair @ 600K baud
Recommended Cable	Belden 9841 or equivalent
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing).
Power Consumption	Slice Master: 300mA Slice Slaves: 100mA maximum at 24VDC, 250mA maximum with HPP attached at 24VDC
Manufacturer	Koyo Electronics



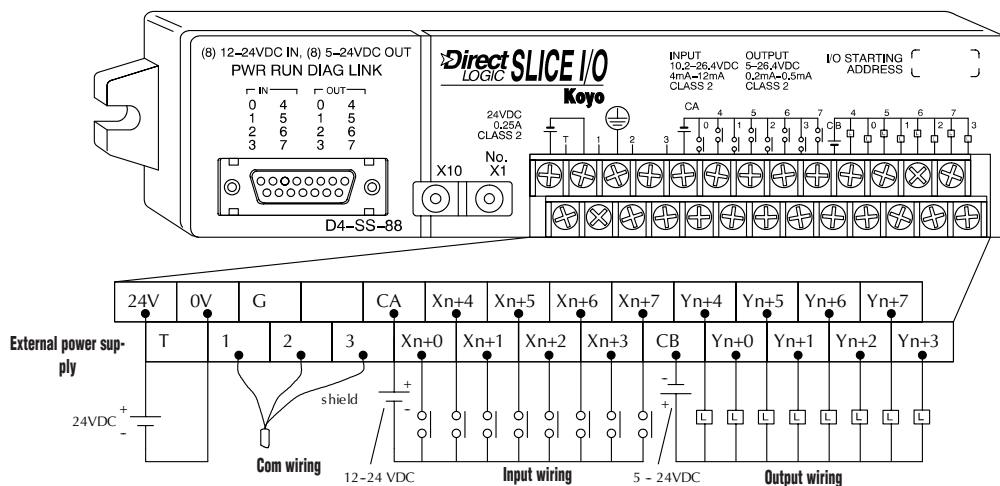
RS-485 twisted pair communication cable (maximum length of 915 feet/300m). Each slice I/O block contains a fixed number of I/O and an RS232C communication port. The units require 24VDC power to operate. You can assign normal input and output addresses to the remote points, or you can assign special remote I/O addresses. The Slice Master sends the remote I/O

information to the CPU. The communication between the Slice Master and the CPU is asynchronous to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the remote I/O points to be updated with every CPU scan.

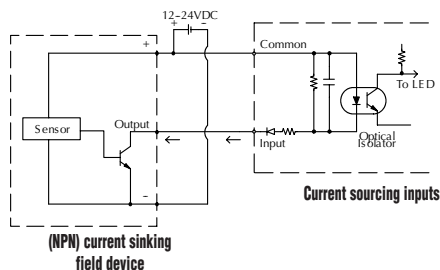
D4-SS-88

DC Input Specifications	
Number of Input Points	8, 1 common
Input Voltage Range	10.2 – 26.4VDC
ON Current/Voltage Level	>3.5mA/9.5VDC
OFF Current/Voltage Level	<1.5mA/4.0VDC
OFF to ON Response	1.0 – 7.0 ms
ON to OFF Response	2.0 – 12.0 ms

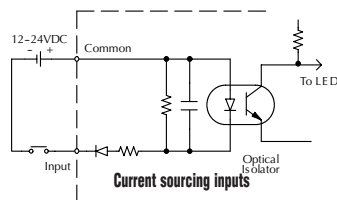
DC Output Specifications	
Number of Output Points	8, 1 common
Output Circuitry	NPN open collector
Input Voltage Range	5-26.4VDC
Peak Voltage	40VDC
ON Voltage	<1.0V at 0.5A
Maximum Current Out (Resistive)	0.5A/point 3A per common
Maximum Leakage Current	0.1mA at 40V
Maximum Inrush Current	2.0A for 10ms 1.0A for 100ms



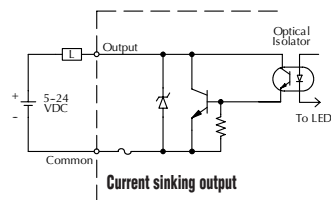
Solid state NPN field device wiring



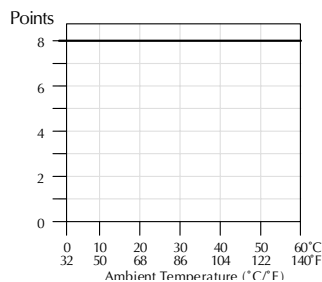
Typical input circuit



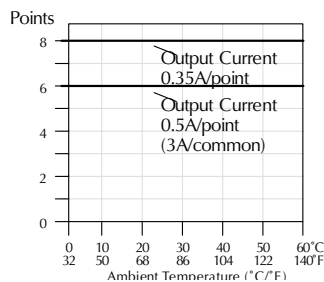
Typical output circuit



Derating Chart for D4-SS-88 Inputs



Derating Chart for D4-SS-88 Outputs





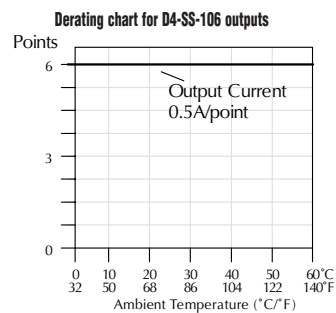
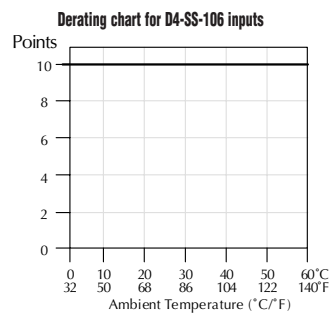
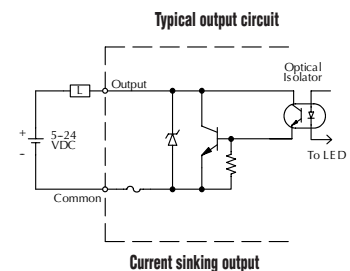
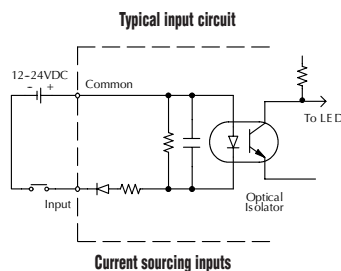
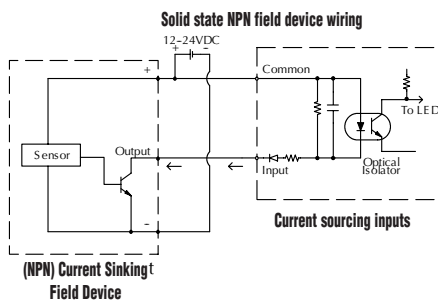
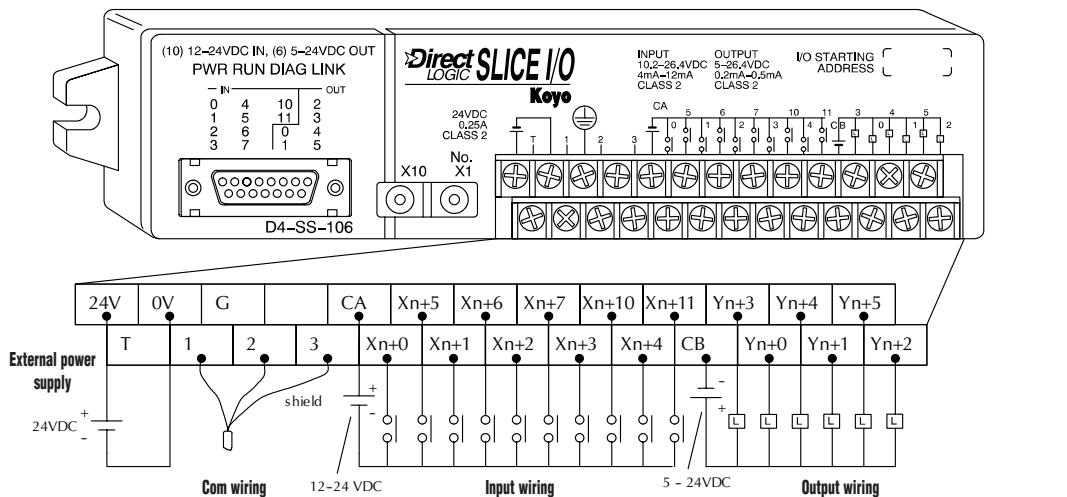
D4-SS-106

DC Input Specifications

Number of Input Points	10, 1 common
Input Voltage Range	10.2 – 26.4VDC
ON Current/Voltage Level	>3.5mA/9.5VDC
OFF Current/Voltage Level	<1.5mA/4.0VDC
OFF to ON Response	1.0 – 7.0 ms
ON to OFF Response	2.0 – 12.0 ms

DC Output Specifications

Number of Output Points	6, 1 common
Output Circuitry	NPN open collector
Input Voltage Range	5-26.4VDC
Peak Voltage	40VDC
ON Voltage Drop	<1.0V at 0.5A
Maximum Current Out (Resistive)	0.5A/point 3A per common
Maximum Leakage Current	0.1mA at 40V
Maximum Inrush Current	2.0A for 10ms 1.0A for 100ms

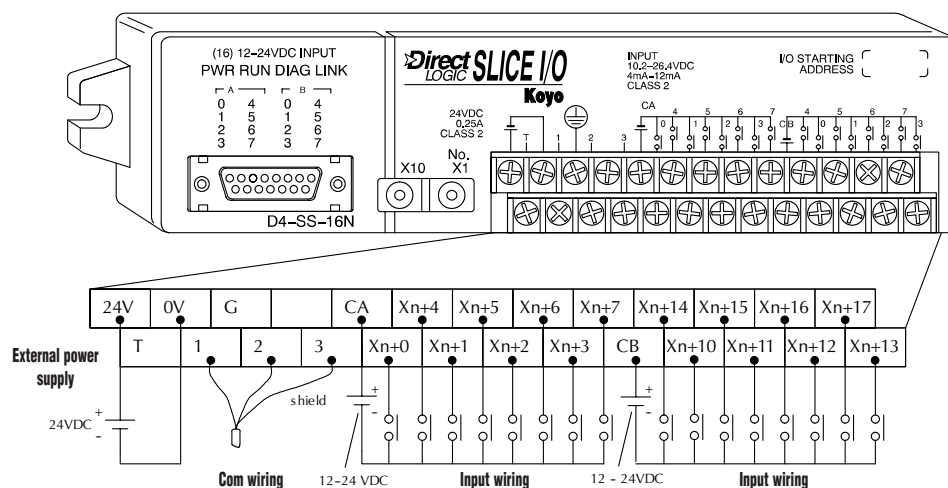




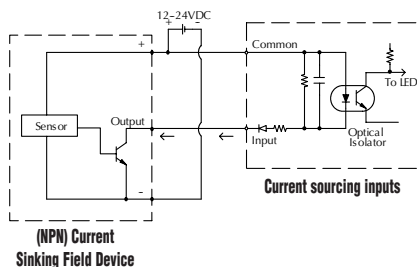
D4-SS-16N

DC Input Specifications

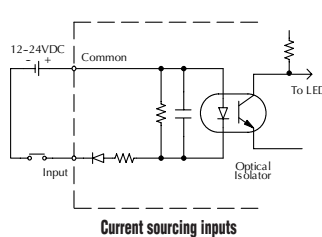
Number of Input Points	16, 2 commons
Input Voltage Range	10.2 – 26.4VDC
ON Current/Voltage Level	>3.5mA/9.5VDC
OFF Current/Voltage Level	<1.5mA/4.0VDC
OFF to ON Response	1.0 – 7.0 ms
ON to OFF Response	2.0 – 12.0 ms



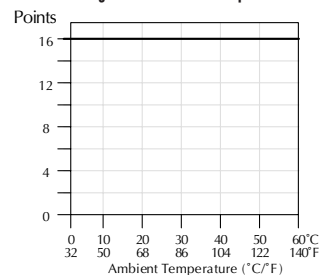
Solid state NPN field device wiring



Typical input circuit



Derating chart for D4-SS-16N inputs



Communication cables

Each Slave unit has a 15-pin D-shell communications port. This port is the same as the top port on the DL405 CPUs. You can program or monitor the CPU through this port with DirectSOFT32 or the handheld programmer.

You can also connect the DV-1000 Operator Interface to this port. (All DV-1000 units will show the same data.) If you're using the handheld programmer or the DV-1000, remember to add the power requirement for the device when you select your 24VDC power supply. You can order the necessary cables with the following part numbers.

D4-DSCBL—DirectSOFT32 programming cable for the DL405

D4-HPCBL-1—DL405 handheld programmer cable (9.24ft., 3m)

D4-HPCBL-2—DL405 handheld programmer cable (4.6ft., 1.5m)

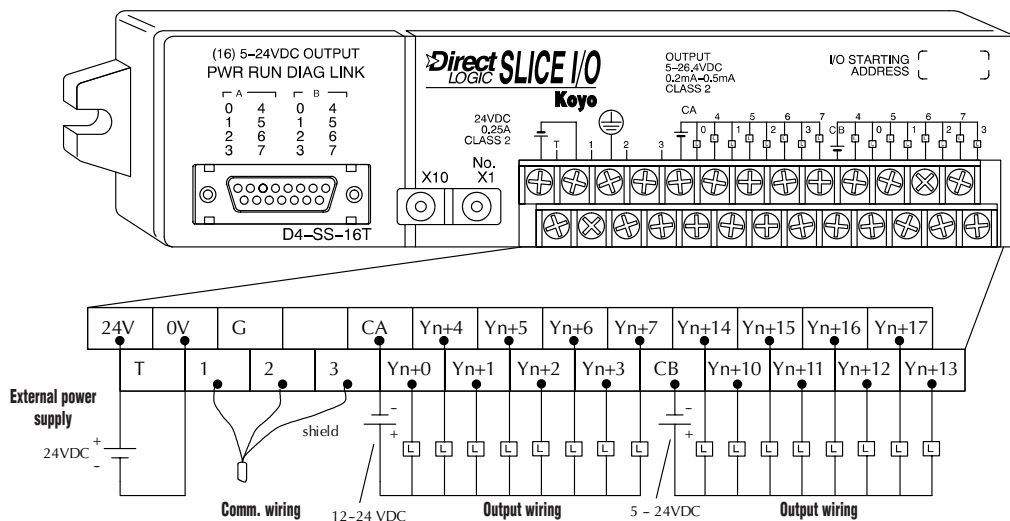
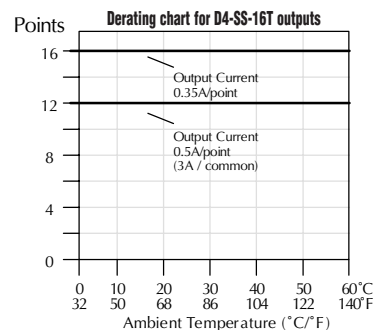
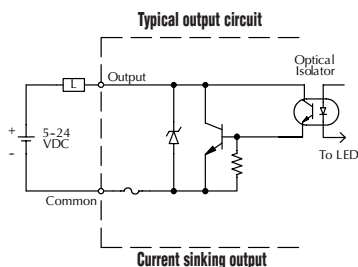
D4-1000CBL—DV-1000 cable used for DL405 top port (works on Slice slave also, 6.56ft., 2m)



D4-SS-16T

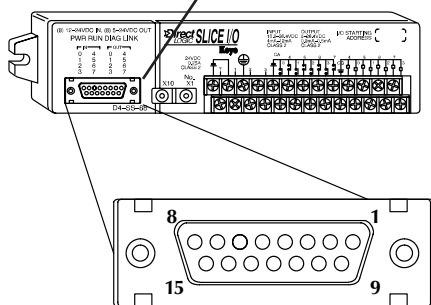
DC Output Specifications

Number of Output Points	16, two commons
Input Voltage Range	NPN Open collector
Peak Voltage	40VDC
ON Voltage Drop	<1.0V at 0.5A
Maximum Current Out (Resistive)	0.5A/point 3A per common
Maximum Leakage current	0.1mA at 40V
Maximum Inrush Current	2.0A for 10ms 1.0A for 100ms



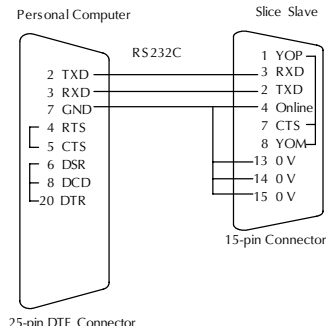
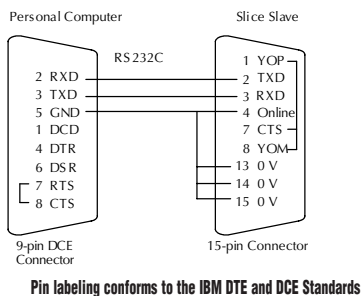
15-pin Female
RS232C
9600 Baud
8 Data Bits
1 Start Bit
1 Stop Bit
Odd Parity
Half-duplex
Asynchronous
DTE

Auxiliary communication port. Can be used for programming with the handheld programmer or DirectSOFT32.



Cable diagrams for custom cables

If one of our cables isn't just right for your application, you may need to build your own custom cable. We suggest a high-quality shielded cable to reduce noise susceptibility.





ETHERNET REMOTE I/O MASTER MODULES

Ethernet Remote I/O Master Module

H4-ERM**H4-ERM-F**

Ethernet remote I/O master

The Ethernet Remote Master H4-ERM (-F) connects 430, 440 and 450 CPU systems to slave I/O over a high-speed Ethernet link.

Need a lot of I/O?

Each ERM module can support up to 16 additional H2-EBC systems, (See next page for more information.) 16 Terminator I/O EBC systems, or 16 fully expanded H4-EBC systems. Of course, combinations are fine, too. The ERM also supports Edrives. See the Drives section for details.

Note: Applications requiring an extremely large number of T1H-EBC analog I/O or H4-EBC 16-channel analog I/O, could exceed the buffer capacity of a single H4-ERM module. In these cases, an additional H4-ERM may be required.

PC running ERM Workbench to configure the ERM network. PC may be removed once the ERM and its slaves are configured.



Simple connections

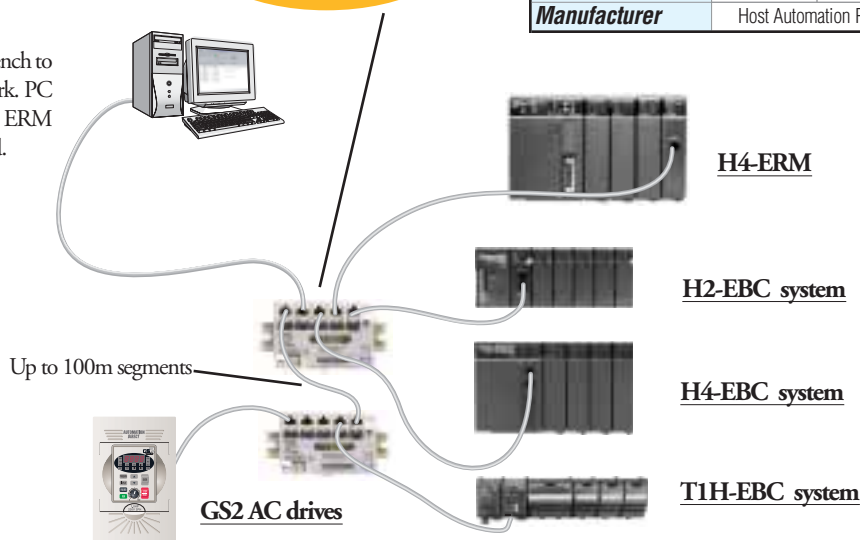
The ERM connects to your control network using Category 5 UTP cables for cable runs up to 100 meters. Use repeaters to extend distances and expand the number of nodes. Our fiber optic version uses industry standard 62.5/125 ST-style fiber optic cables and can be run up to 2,000 meters.

The PLC, ERM and EBC slave modules work together to update the remote I/O points. These three scan cycles are occurring at the same time, but asynchronously. It is recommended that critical I/O points that must be monitored every scan be placed in the CPU base.

Networking ERMs with other Ethernet devices

It is highly recommended to use a dedicated Ethernet remote I/O network for the ERM and its slaves. While Ethernet networks can handle a very large number of data transactions, and normally handle them very quickly, heavy Ethernet traffic can adversely affect the reliability of the slave I/O and the speed of the I/O network. Keep ERM networks, multiple ERM networks and ECOM/office networks isolated from one another.

E-SW05-U Ethernet Switch
(see the Communications Products section of this desk reference for details)



Software configuration

ERM Workbench is a software utility that must be used to configure the ERM and its remote Ethernet slaves. ERM workbench supports two methods of configuring the ERM I/O network:

- ERM Workbench PLC Wizard - greatly simplifies the configuration procedure when a PLC is used as the CPU interface.
- ERM Workbench - configures the I/O network whether the CPU interface is a PLC or WinPLC, and allows access to all ERM I/O network parameters.

ERM Workbench Software



Specifications	H4-ERM	H4-ERM-F
Communications	10BaseT Ethernet	10BaseFL Ethernet
Data Transfer Rate	10Mbps	
Link Distance	100 meters (328 ft)	2K meters (6560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	
Power Consumption	320mA @5VDC	450mA @5VDC
Manufacturer	Host Automation Products	



ETHERNET BASE CONTROLLER MODULES

Ethernet Base Controller Module

H4-EBC
H4-EBC-F

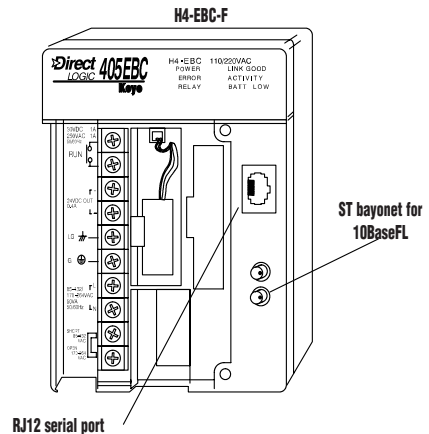
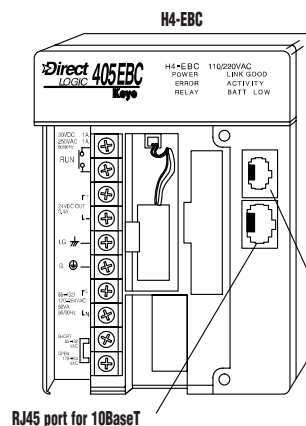


Use EBCs for PC-based control and for H4-ERM remote I/O slaves

The H4-EBC and H4-EBC-F Ethernet Base Controller modules provide a high-performance, low-cost Ethernet link between your PC-based control system or H4-ERM Ethernet remote I/O system and DL405 I/O. The H4-EBC module supports industry standard 10Base-T Ethernet communications, and the H4-EBC-F module supports 10Base-FL (fiber optic) Ethernet standards. Both modules offer 10Mbps transfer rates between your PC application and your DL405 I/O base. The EBC modules are compatible with TCP/IP and IPX protocols for flexible PC communications. Four addressing schemes make it easy to identify the module on the network using the method that works best for you. EBCs also offer:

- Virtually unlimited number of I/O points
- Deterministic I/O updates on dedicated networks
- Use off-the-shelf networking components to connect to your existing network
- Fast I/O updates at <1ms per base
- On-board serial port for operator interface, etc. (serial port not supported when used with the H4-ERM module)

Specifications	H4-EBC	H4-EBC-F
Communications	10BaseT Ethernet	10BaseFL Ethernet
Data Transfer Rate	10Mbps	10Mbps
Link Distance	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	TCP/IP, IPX
Serial Port	RJ12, K-sequence, ASCII IN/OUT	RJ12, K-sequence, ASCII IN/OUT
Power Supplied	3680mA @ 5VDC 400mA @ 24VDC	3550mA @ 5VDC 400mA @ 24VDC
Manufacturer	Host Automation Products	Host Automation Products

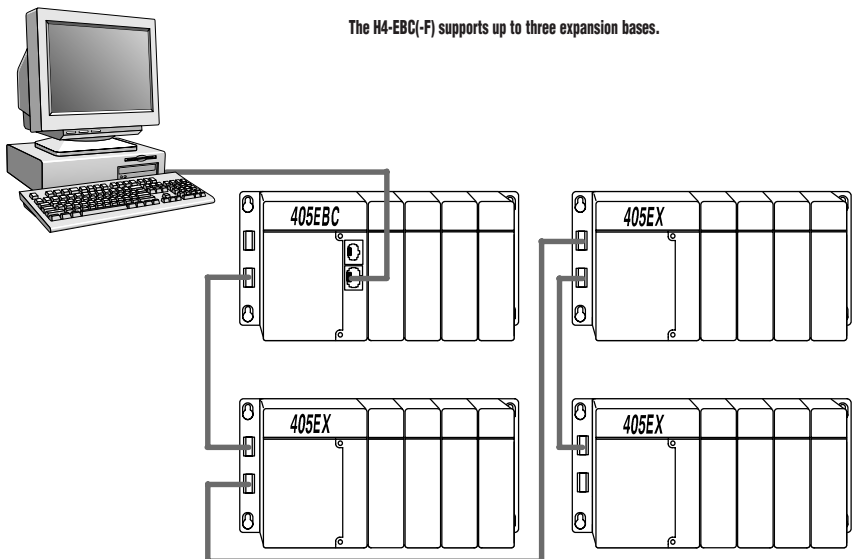


Easy to use, reliable and fast

The H4-EBC(-F) module plugs into the CPU slot of any DL405 I/O base. The 10BaseT or 10BaseFL port can be networked using commercially available cabling, hubs, and repeaters. The H4-EBC(-F) module supports all DL405

discrete and analog I/O modules. The H4-EBC module also supports the H4-CTRIO and D4-HSC, but no other intelligent modules are supported.

The H4-EBC(-F) supports up to three expansion bases.





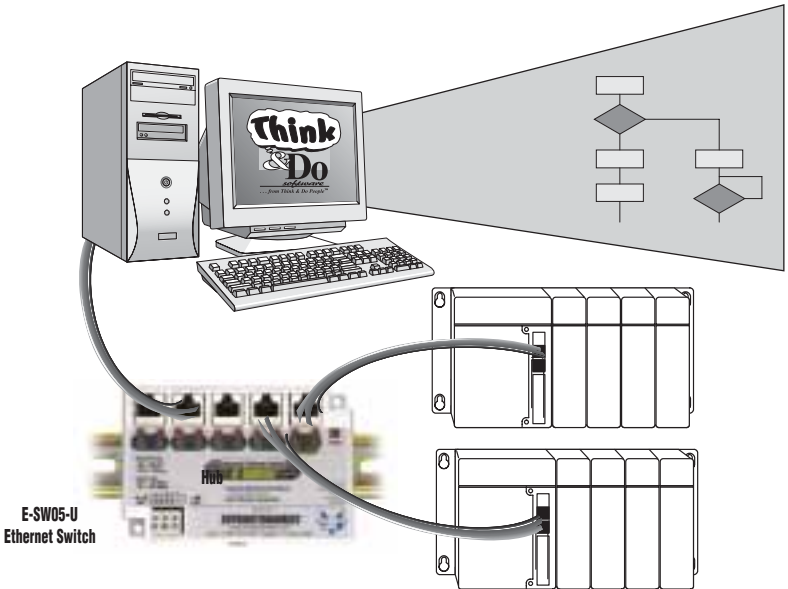
H4-EBC(-F)

Off-the-shelf solutions

You can purchase PC-based control software that is ready to use with the H4-EBC(-F) module. PC-based control packages are equipped with compatible I/O device drivers, program development tools, and run-time environments. See the PC-based Control Products section for a integrated PC-based Control solution to make your PC into an industrial controller.

Software developers

For programmers developing custom drivers for our I/O, we offer a free Ethernet Software Development Kit (SDK). The SDK provides a simplified API for interfacing with the H4-EBC(-F). The software interface libraries are provided for WIN32, WIN16, and DOS operating systems. The source code is available to developers under a non-disclosure agreement. Visit the technical support link at our Web site for more information.



The following vendors have PC-based Control products ready to control our I/O, or they have compatible products to be released in the future.

Vendor	Product	Web Address
AutomationDirect	KEPDirect EBC I/O Server	www.automationdirect.com
Entivity	Think & Do Live Entivity Studio Steeplechase	www.entivity.com
KEPware	KEPServerEX	www.kepware.com
Wonderware	InControl	www.wonderware.com

READ I/O

```
int HEIReadIO
(
    HEIDevice *pDevice,
    Byte *pBuffer,
    WORD BuffSize
);
```

WRITING I/O

```
int HEIWriteIO
(
    HEIDevice *pDevice,
    BYTE *pData,
    WORD SizeofData,
    BYTE *pReturnData,
    WORD *pSizeofReturnData
);
```





SMART DISTRIBUTED SYSTEM I/O

Smart Distributed System Module

F4-SDS



Overview

The Smart Distributed System (SDS) was developed by Honeywell for use with a wide variety of PLCs and I/O field devices from many different manufacturers. These devices support the communication protocol in the Bosch V2.0 Controller Area Network (CAN) specification. The SDS interface allows you to connect intelligent input and output devices such as limit switches, photoelectric and proximity sensors, positioners, and valve actuators, directly to the SDS network. The SDS network module replaces standard I/O modules, and accepts up to 64 discrete inputs or outputs.

SDS Interface Specifications	
Module Type	Intelligent device
Number of Masters per CPU	8 maximum
Module Location	In CPU Local base
Maximum Field Devices per SDS	64 (see table)
Maximum SDS Addresses per CPU	512
I/O Addresses Used	None for master. Field devices can be assigned as X, Y, or C data type.
Communication to Field Devices	Std. four-wire shielded cable to cabinet connector, special 4-wire cable @ up to 1 Mbps to field devices
Module Connector	9-pin D-shell (wire from D-shell to cabinet connector)
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Internal Power Consumption	110 mA maximum
Manufacturer	FACTS Engineering

Fast and easy installation

The installation and maintenance of SDS network devices takes significantly less time than traditional I/O. The use of quick-disconnect connectors eliminates tedious wire terminations, which are required each time an ordinary field device is installed or replaced. Wiring errors are virtually eliminated.

Built-in diagnostics

The built-in diagnostic features of SDS allow you to anticipate many potential problems before a failure results in costly machine downtime.

Diagnostic functions are dependent on the field devices, but may include broken-coil detection, sensor out-of-alignment (marginal gain), number of operations, power cycle monitoring, etc.

Setup

The SDS module is installed in the CPU base and controls up to 64 individual field devices. The SDS-compatible field devices are connected to the communications "trunk" cable using T-connectors (as shown

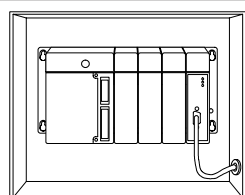
below). Various communication speeds are available, but the maximum speed depends on the length of the trunk cable. (See the table on the facing page.)

Programming

By adding a few lines to your control program, you identify the number of SDS inputs and outputs and their addresses, as well as the memory locations for error codes, I/O status, etc. You can use SDS inputs and outputs the same way you would use ordinary hardwired I/O.

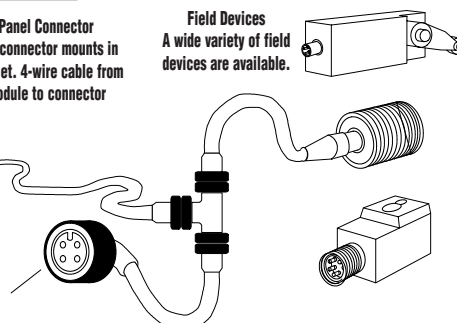
SDS Network Components & Distance Considerations					
Trunk Length		Bits/sec	Branch Length		Devices
Feet	Meters		Feet	Meters	
100	30.5	1Mbps	3	0.9	32
400	121.9	500Kbps	6	1.8	64
800	243.8	250Kbps	12	3.7	64
1600	487.7	125Kbps	12	7.3	64

DL405 PLC supports a maximum of 8 SDS network modules. Each network can be a different speed and/or distance.



Panel Connector
SDS connector mounts in cabinet. 4-wire cable from module to connector

Quick disconnect
Connectors provide
quick and easy field
device connections.



Field Devices
A wide variety of field
devices are available.

Limit switches

Prox. switches

Photo sensors

SDS Field Device Vendors	
Field Devices	Honeywell MICRO SWITCH Division Freeport, IL 60132 Phone: 800-537-6945
Cable and Connectors	Brad Harrison Line Daniel Woodhead Company Northbrook, IL 60062 Phone: 708-272-7990
Note: Many other vendors manufacture SDS-compatible devices. Some of these include: Festo, Mac Valves, Termiflex, GE Drives, etc. Check with these companies or your preferred supplier for SDS-compatible devices.	



SHARED DATA NETWORK

Shared Data Network Module

F4-SDN

Overview

The Shared Data Network CoProcessor, F4-SDN, is used to share data at high speeds between a maximum of 16 DL405 CPUs. A Shared Data Network CoProcessor (SDN) is installed in each PLC rack on the shared data network.

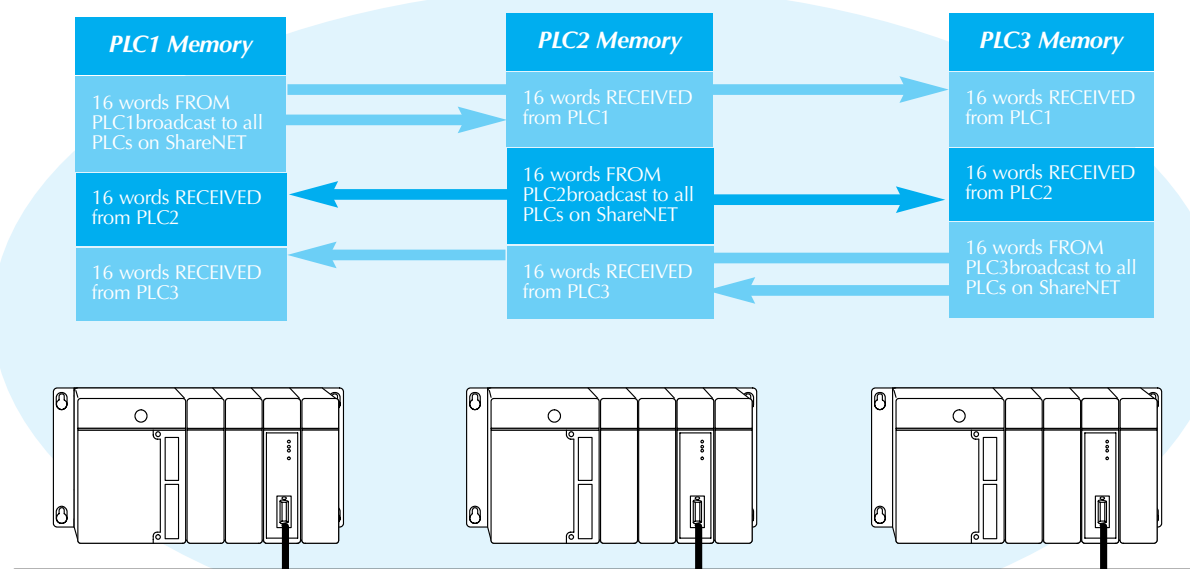
Each F4-SDN on the shared data network constantly sends a block of data from its DL405 CPU to every other SDN on the network. Each SDN takes the data received from the network and writes the data to a block of V-memory in its own DL405 CPU.

Specifications	
Module Type	CoProcessor, intelligent
Modules per CPU	Two maximum, must be in CPU Base
Communication	RS485 @ 250K Baud, CRC16 error detection
Recommended Cable	Belden 9841 or equivalent
Maximum Distance	4000 ft. (1219m) between extreme ends of the network
Modules per Network	16 (address is user selectable)
Maximum Number of V-memory Locations Broadcast to the Network per F4-SDN	16 (32 bytes), user-selectable from 1 to 32 bytes
Maximum Number of V-memory Locations Received from the Network per F4-SDN	256 (512 bytes), up to 32 bytes may be received from each active F4-SDN
Impact on PLC Scan Time	Adds 4 to 28 ms
Field Wiring Connector	9-pin D-sub
Internal Power Consumption	235 mA maximum at 5VDC (supplied by base power supply)
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering

The address of the module sending the data determines where in V-memory the data is placed.

This network is useful in applications where multiple independent DL405 CPUs control different parts of the same process. The Shared Data Network allows each DL405 CPU on the network to know, in real time, what every other DL405 CPU on the network is doing.

ShareNET



This example uses 48 Shared Words of Data Between three PLCs



MODBUS NETWORK MASTER

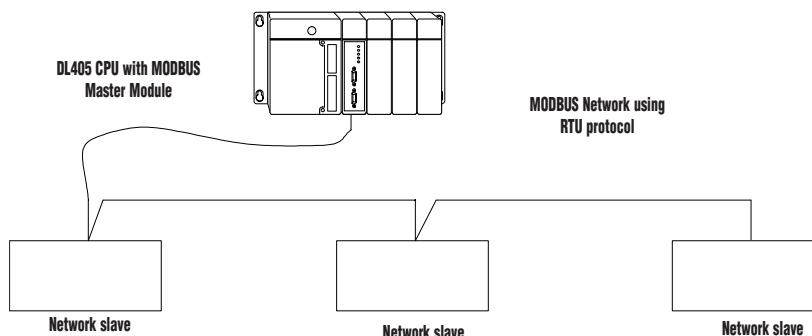
MODBUS RTU Network Master Module

F4-MAS-MB**F4-MAS-MBR**

Overview

Our MODBUS Master module allows you to use a DL405 PLC as the network master for a MODBUS RTU network. The module communicates with any network slave by using high level MODBUS commands.

Specifications	
Modules/CPU	Eight Maximum, any slot in CPU base
F4-MAS-MB	Ports 1 and 2, RS232C/422/485 selectable, maximum baud rate of 115.2K baud. Note: Select port 1 or port 2 as the MODBUS port (only one can be configured as a MODBUS port.) If port 2 is configured as the MODBUS port, then port 1 can be configured as a debug port.
F4-MAS-MBR	Port 1, RS232C, maximum baud rate of 57.6K baud. Port 2 features a built-in 300/600/1200 baud FSK, asynchronous leased-line/data radio modem (no RS-422/485). The modem is Bell 103/113/108, Bell 202, CCITT V.221 and V.23 compatible, with fast response times for direct connection to leased-line networks and radios. Full or half-duplexed operation, 4-wire or 2-wire connection. Transmit and receive 600 ohm transformers provide 1500VDC isolation and common-mode rejection. Adjustable transmit level and receive sensitivity for non-standard interfaces. Port 2 also has a normally open solid state relay contact for use in keying radio transmitter.
Recommended Cable	Belden 9841 or equivalent (RS485) Belden 9729 or equivalent (RS422)
Power Required	235mA max at 5VDC (supplied by base power supply); 350mA for F4-MAS-MBR
Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering



Easy setup and operation

Module setup is accomplished by loading values into special V-memory locations inside the DL405 CPU. The data read or written is also stored in the CPU's V-memory area, which makes it easily accessible for use in control schemes. If simplicity is your primary concern, you can use the DL405 RX and WX instructions in your ladder program to initiate read and write requests. Minimal setup is required with this option and it is especially useful for event-triggered data exchanges.

If you have more complex data requirements, you can use the Table Read/Write capability. By filling in a special block of the CPU's V-memory, you can specify a slave address, starting data address, and number of bytes to transfer. This option requires more setup, but it is also more useful if you need to constantly exchange data with several slave stations.

MODBUS NETWORK SLAVE

MODBUS RTU Network Slave Module

F4-SLV-MB

F4-SLV-MBR

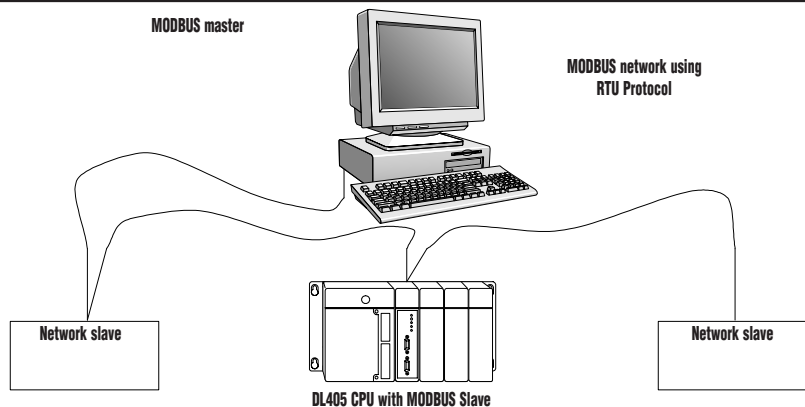


Overview

Our MODBUS Slave modules allow you to use a DL405 PLC as a network slave station on a MODBUS RTU network. The modules communicate with any network master by using high-level MODBUS commands. These modules are an alternate solution to the D4-DCM (or the built-in port on the D4-450 CPU) when MODBUS connectivity is required and you need:

- Baud rates greater than 38.4Kbaud (up to 115.2K baud)
- Connections to another RS232C/422/485 device (in addition to MODBUS)

Specifications	
Modules/CPU	Eight Maximum, any slot in CPU base
F4-SLV-MB	Ports 1 and 2, RS232C/422/485 selectable, maximum baud rate of 115.2K baud. Note: Select port 1 or port 2 as the MODBUS port (only one can be configured as a MODBUS port.) If port 2 is configured as the MODBUS port, then port 1 can be configured as a debug port.
F4-SLV-MBR	Port 1, RS232C, maximum baud rate of 57.6K baud. Port 2 features a built-in 300/600/1200 baud FSK, asynchronous leased-line/data radio modem (no RS-422/485). The modem is Bell 103/113/108, Bell 202, CCITT V.22 and V.23 compatible, with fast response times for direct connection to leased-line networks and radios. Full or half-duplexed operation, 4-wire or 2-wire connection. Transmit and receive 600 ohm transformers provide 1500VDC isolation and common-mode rejection. Adjustable transmit level and receive sensitivity for non-standard interfaces. Port 2 also has a normally open solid state relay contact for use in keying radio transmitter.
Recommended Cable	Belden 9841 or equivalent (RS485) Belden 9729 or equivalent (RS422)
Power Required	235mA max at 5VDC (supplied by base power supply); 350mA for F4-SLV-MBR
Environment	0°C to 60°C (32°F to 140°F), 5% to 95 % humidity (non-condensing)
Manufacturer	FACTS Engineering



Easy operation and setup

The modules can access many types of memory areas in the DL405 CPU including X, Y, C, V memory, etc. Module setup is accomplished by loading simple setup parameters directly into a special block of the CPU's V-memory area. If you're just reading V-memory data, then the module also provides an automatic fast response feature that can speed up data acquisition in applications that poll the same V-memory data areas repeatedly.



CoProcessor Modules

Basic CoProcessor Modules

F4-CP128-1

F4-CP512-1

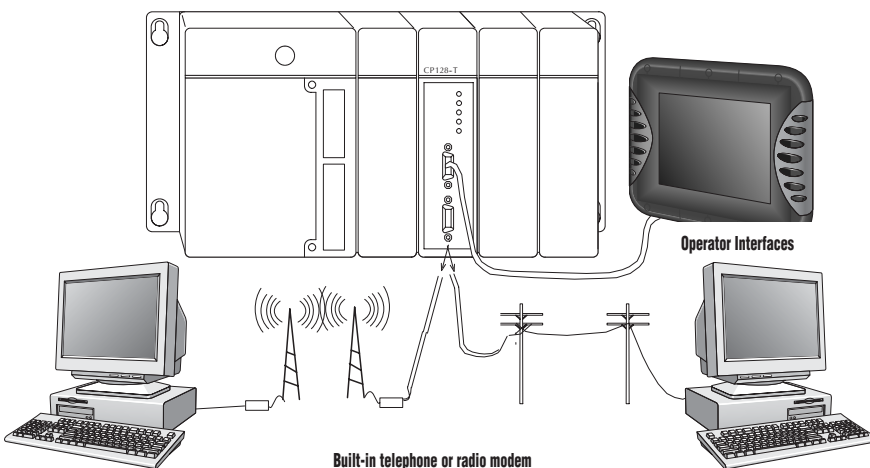
F4-CP128-T

F4-CP128-R



Overview

The FACTS CoProcessor Module interfaces the *DirectLOGIC* 405 family of programmable controllers with bar code readers, operator interface terminals, instrumentation equipment, computers, and other serial devices. The three ports offer a range of communication interfaces and baud rates. Please consult the port descriptions to see which module is best suited for your needs.



Features

- FACTS Extended BASIC and ABM Commander for Window software makes program development fast and simple. Allows ONLINE, full-screen BASIC program editing and the ability to programs on disk (software on CD included with each module)
- Non-volatile memory of up to 512K bytes allows multiple program storage and execution, DL405 register expansion, and retentive data storage and retrieval
- 16MHz or 26MHz CoProcessor provides fast program execution independent of the DL405 CPU scan
- Three buffered ports permit communication from module to three or more external devices
- Programmable from either port for complete serial port utilization without having to switch cables
- A real-time clock/calendar maintains time/date with battery backup when power outages occur. Programmable time-based BASIC interrupts to .005 of a second
- Directly access up to 254 bytes of DL405 CPU memory per scan. No supporting ladder logic is required
- Floating point math solves complex formulas to eight significant digits
- Options include a built-in 300/1200/2400 baud telephone modem or a leased-line radio modem
- Includes Modbus master/slave BASIC examples and other application examples on CD

CoProcessor applications

The CoProcessors are designed for use with intelligent devices such as:

- Barcode readers
- Welders
- Board level controllers
- Serial printers
- Intelligent sensors
- Almost any device with an RS-232C/422/485 port

CoProcessors are also good solutions for applications requiring large amounts of complex math.



CoProcessor Modules

Specifications	
Module Type	CoProcessor, intelligent
Modules per CPU	Eight Maximum, any slot in CPU base
Communication	256 character type-ahead input buffer on all ports. Ports are independently programmed by software, seven or eight data bits, 1 or 2 stop bits, even, odd or no parity. XON/XOFF software flow control and RTS/CTS handshake.
F4-CP128-1	128K bytes of battery-backed RAM, 26MHz clock rate. Runs BASIC programs two to three times faster than 16MHz CoProcessors. Port 1, RS232C/422/485 selectable, maximum baud rate of 115.2K baud. Port 2, RS232C/422/485 selectable, maximum baud rate 57.6K baud. Port 3, RS232C, maximum baud rate of 19.2K baud. Port 3 is available by using the RTS/CTS pins on Port 1. If you use these lines on Port 1, then Port 3 is not available.
F4-CP512-1	512K bytes of battery-backed RAM, 26MHz clock rate. Port 1, RS232C/422/485 selectable, maximum baud rate of 57.6K baud. Port 2, RS232C/422/485, maximum baud rate of 9600 baud. Port 3, RS232C, maximum baud rate of 9600 baud. Port 3 is available by using the RTS/CTS pins or Port 1. If you use these lines on Port 1, then Port 3 is not available.
F4-CP128-T	128K bytes of battery-backed RAM, 16 MHz clock rate. Port 1, RS232C/422/485 selectable, maximum baud rate of 57.6K baud. Port 2, RS232C, maximum baud rate 9600 baud. An optional use for port 2 is a built-in full-duplex, 300/1200/2400 baud PSK/FSK, asynchronous telephone modem. The modem is Bell 212A/103 & CCITT V.22/V.21 compatible. Automatic dialer with call progress monitoring detects no dial tone, ring and busy. Automatically answer calls. Can be used for remote data acquisition and diagnostics. Allows remote reprogramming of both BASIC CoProcessor and DirectLOGIC 405 CPUs. Exceeds FCC part 68 hazard protection requirements. Port 3, RS232C, maximum baud rate of 9600 baud. Port 3 is available by using the RTS/CTS pins on Port 1. If you use these lines on Port 1, then Port 3 is not available.
F4-CP128-R	128K bytes of battery-backed RAM, 16 MHz clock rate. Port 1, RS232C selectable, maximum baud rate of 57.6K baud. Port 2 features a built-in 300/600/1200 baud FSK, asynchronous leased-line/data radio modem (no RS-422/485). The modem is Bell 103/113/108, Bell 202, CCITT V.221 and V.23 compatible, with fast response times for direct connection to leased-line networks and radios. Full or half-duplexed operation, 4-wire or 2-wire connection. Transmit and receive 600 ohm transformers provide 1500VDC isolation and common-mode rejection. Adjustable transmit level and receive sensitivity for non-standard interfaces. Port 3, RS232C, maximum baud rate of 9600 baud. Port 3 is available by using the RTS/CTS pins on port 1. If you use these lines on Port 1, then Port 3 is not available.
ABM Commander for Windows (CD-ROM included with module)	Programming/documentation software for FACTS Engineering BASIC module. Key features include: • Runs under Windows 95/98/2000 or Windows NT 3.51 or later. • Command Mode allows the user to program and debug with a "Point and Click" or Command Line Interface. • Uses standard Windows applications for off-line edited (Notepad) and terminal emulation (Hyperterminal) • Text Upload and Download BASIC programs • Binary Upload and Download BASIC programs • Extensive help file contains full user manual information • Includes Modbus master and Modbus slave BASIC programs and other application examples
Field Termination	9 pin D-sub connectors for port 1 and port 2. Port 3 uses electrical connections from port 1. (F4-CP128-T uses an RJ12 phone jack located under the module)
Power Consumption	F4-CP128-1 — 305mA maximum at 5VDC, (supplied by base power supply) F4-CP512-1 — 235mA maximum at 5VDC, (supplied by base power supply) F4-CP128-T — 350mA maximum at 5VDC, (supplied by base power supply)
Operating Environment	0°C-60°C (32°F-140°F), 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering



16 Loop PID CoProcessor

16 Loop PID CoProcessor Module

F4-16PID



Overview

The F4-16PID is a Proportional Integral Derivative (PID) CoProcessor designed to execute up to 16 PID loops independent of the DL405 CPU. Using the high-speed Intelligent bus interface, the F4-16PID reads the process variable and writes the PID output directly into V-memory of the DL405 CPU. Software is provided to configure the PID loops via simple menus. Minimal ladder logic is required in the CPU therefore, the floating point math-intensive PID calculations in the CoProcessor have little effect on the CPU scan time. As a result, the CPU can perform high-speed discrete control while the CoProcessor performs high-speed PID. This architecture provides higher performance than a small PLC with PID instructions imbedded in the instruction set.

Operation

The process variable (PV) comes from an input module, usually an analog input or thermocouple. The user ladder logic copies the input value to the Process Variable location.

The PID module calculates the loop output value and places it at the Output location. The user can write this value to an analog output channel, use it as a time proportion for a discrete output, or send it to the setpoint or another loop for cascading loops.

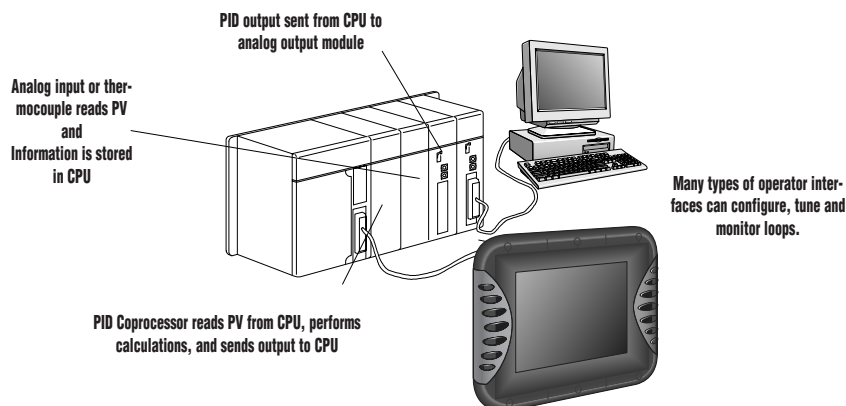
All loop information is read from and written to a user specified block of V-memory. Each loop that is enabled requires 32 V-memory locations. Since all loop parameters are stored in V-memory, any device capable of reading and writing DL405 V-memory can be used to configure, tune, and monitor loops. The information included in each loop's block of V-memory includes:

- Bit Mapped Mode Word
- Process Variable (PV)
- Setpoint (SP)
- Bias
- Output
- Bit mapped Alarm word
- Sample Rate (.1 to 999.9 Sec. or Min.)
- Gain
- Reset
- Rate
- PV Low Low Alarm
- PV Low Alarm
- PV High Alarm
- PV High High Alarm
- PV Yellow Deviation Limit
- PV Orange Deviation Limit

- Alarm Deadband
- Error Deadband Below SP
- Error Deadband Above SP
- Derivative Gain Limiting Coefficient
- Setpoint Low Limit
- Setpoint High Limit
- Maximum Output Clamp
- Minimum Output Clamp

Some variations of PID control are done with supporting ladder logic. Examples that are included in the PID manual are:

- Auto/Manual Mode Control
- Setpoint Ramp and Soak
- Alarm Word Decoding
- Time Proportioning Control Loops
- Cascading Loops
- Positioning Actuator Control Loops





16 Loop PID CoProcessor

Specifications and Key Features	
Module Type	CoProcessor, Intelligent
Number of Loops	16 maximum
Modules per CPU	Six maximum, any slot in CPU base
PID Algorithm	Position or Velocity form of the PID equation. Optionally specify direct or reverse acting, square root of the error and error squared control.
Sample Rate	Specify the time interval between PV samples, 0.1 to 999.9 in units of seconds or minutes
Auto/Manual	A control relay, CR, which when energized places the corresponding loop into automatic mode. PV alarm monitoring continues when loops are in manual mode.
Square Root PV	Specify a square root of the PV for a flow control application.
Limit SP	Specify a high and low limit for allowable setpoint changes.
Gain	Specify proportional gain of 0.00 to 99.99.
Reset	Specify reset time of 0.1 to 999.9 minutes, seconds, milliseconds, or microseconds
Bumpless Transfer I	Bias and setpoint are initialized automatically when the module is switched from manual to automatic. This provides for a bumpless transfer.
Bumpless Transfer II	Bias is set equal to the Output when the module is switched from manual to automatic. This allows switching in and out of automatic mode without having to re-enter the setpoint.
Limit Output	Optionally specify maximum and minimum output values
Step Bias	Provides proportional bias adjustment for large setpoint changes. This may stabilize the loop faster and reduce the chance of the output going out of range. Step bias should be used in conjunction with the normal adjusted bias operation.
Anti-windup	If the position form of the PID equation is specified, the reset action is stopped when the PID output reaches 0 or 100%. Select adjusted bias or freeze bias operation.
Rate	Specify the derivative time, 0 to 999.9 in units of minutes or seconds.
Rate Limiting	Specify a derivative gain limiting coefficient to filter the PV used in calculating the derivative term (99.99 to 00.01).
Error Deadband	Specify an incremental value above and below the setpoint in which no change in output is made.
Error Squared	Squaring the error minimizes the effect a small error has on the Loop output, however; both ErrorSquared and ErrorDeadband control may be enabled
20% offset of PV	Specify a 20% offset of the PV to input a 4-20 mA transmitter using a 0-20 mA analog input module range.
Internal Power Consumption	160 mA at +5 VDC, (supplied by base power supply)
Operating Environment	0°C to 60°C (32°F to 140°F) 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering
Alarm Specifications	
Deadband	Specify 0.1% to 5% alarm deadband on all alarms except Rate of Change.
PV Alarm Points	A Y output or CR may be activated based on four PV alarm points.
PV Deviation	A Y output or CR may be activated based on four PV alarm points. Specify an alarm for PV deviation above or below the setpoint (Yellow Deviation) and an alarm for greater PV deviation from the setpoint (Orange Deviation).
Rate of Change	A Y output or CR may be activated when the PV changes faster than a specified rate of change limit.
Broken Transmitter	Monitor the PV for a broken transmitter.



FOUR LOOP TEMPERATURE CONTROLLER

Four Loop Temperature Controller Module

F4-4LTC



Overview

The F4-4LTC combines the features of four Single Loop Temperature Controllers into one inexpensive module! The module has four asynchronous, configurable PID loops, with built-in temperature inputs and control outputs so that precision temperature control is maintained, even while the PLC is in program mode. This module can control temperatures up to $\pm 3276.7^{\circ}\text{C}/^{\circ}\text{F}$ and accepts either thermocouple or RTD inputs. By simply changing a jumper setting, you can choose the one that is best suited for your application. In addition, both versions have solid-state relay outputs for heater (or chiller) control.

Operation

The temperature is read directly into the F4-4LTC with the on-board RTD or Thermocouple inputs. If the temperature is not at the target value (setpoint), then the control outputs are automatically activated. The F4-4LTC also provides automatic tuning of the control loops, so the module can easily adapt to changing temperature and process conditions. And since the F4-LTC is an intelligent DL405 module, you can easily use simple ladder logic in a DL405 CPU for ramp and soak setpoint

changes. Minimal setup ladder logic is required in the CPU, and since the floating point calculations are performed in the Temperature Controller, there is little effect on the CPU scan time. The Temperature Controller also provides alarm and diagnostic capabilities by monitoring Low Alarm, High Alarm, Deviation Alarm, Heater Burn-out, and broken transmitter conditions.

All information from the F4-4LTC can be mapped directly into the DL405 CPU memory. As a result, information is freely accessible through the CPU for coordinated control, operator interface usage, or data collection.

The operating characteristics for each loop are programmed into a user-defined block of V-memory in the DL405 CPU. The Temperature Controller accesses this memory area to determine the operating parameters for each loop. Each loop that is enabled requires 24 V-memory locations. Since all loop parameters are stored in V-memory, any device capable of reading and writing DL405 V-memory can be used to configure or monitor loops. The Temperature Controller reads/writes in the PLC. This information includes:

Read continually

- Mode word
- Temperature setpoint

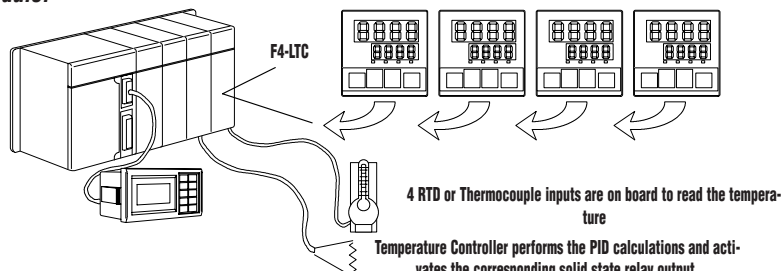
Written after loop update

- Output (0.0-100.0% or 0-4095)
- Alarm word
- Process temperature

Read setup/write after auto tune

- Gain
- Reset, Integral time (0-999.9s)
- Rate, Derivative time (0-999.9s)

Combines four Single Loop Controllers into one module!



Read for setup

- Temperature Low Alarm
- Temperature High Alarm
- Temperature Deviation Alarm
- Alarm Deadband
- Setpoint Low Limit
- Setpoint High Limit
- Input Type (for Thermocouple)
- PID Control Period
- On/Off Hysteresis

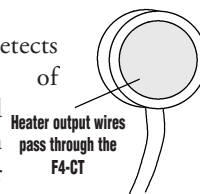
RTD or thermocouple inputs

The F4-4LTC can accept either RTD or Thermocouple inputs. See the specifications table on the following page.

Current transformer

The F4-CT detects the presence of current flow and is very useful in detecting heater burnout conditions. One F4-CT is included with the 4-loop Temperature Controller Module. The F4-4LTC has four inputs that can be used with these current transformers:

Leads:	2, approx. 4"
Ratio:	400:1
Inductance:	300mH (min.)
DC resistance:	8 (max.)





F4-4LTC SPECIFICATIONS AND KEY FEATURES

General Specifications	
Module Type	CoProcessor, Intelligent
Number of Loops	Four Maximum
Modules per CPU	Eight Maximum, CPU base, any slot
I/O Points Required	None
V Memory Required	24V-memory locations per loop
Input Type	RTD or Thermocouple
Controller Output	Open collector, high-current solid state relays, 5-26.4VDC @ 0.15A
Converter Type	Charge Balancing, 24-bit
Notch Filter	>100dB at 50Hz and 60Hz (f _{-3db} =13.1Hz)
Common Mode Rejection	90dB minimum at DC, 150dB minimum at 50Hz and 60Hz
Sampling Rate	Selectable per module 800ms (10Hz filter) 160ms (50Hz filter)
Current Transformer	0.5A to 50A sense range
Minimum Output On Time	300ms to sense heater current
Operating Environment	0°C to 60°C (32°F to 140°F) 5-95% humidity (non-condensing)
Power Requirements	280mA at +5VDC, (base power) 75mA at +24VDC external ±10%
Manufacturer	FACTS Engineering

Thermocouple Specifications	
Temperature Ranges	J, -190/760 °C(-310/1400°F) E, -210/1000 °C(-346/1832°F) K, -150/1372 °C(-238/2502°F) R, 65/1768 °C(149/3214°F) S, 65/1768 °C(149/3214°F) T, -230/400 °C(-382/752°F) B, 529/1820 °C(984/3308°F) N, -70/1300 °C(-94/2372°F) C, 65/2320 °C(149/4208°F)
Input Fault Protection	60Vrms or 50 VDC max
Cold Junction	Automatic compensation
Input Impedance	20Mohm DC
Resolution	±0.1°C (relative accuracy)
Maximum Inaccuracy	±3°C exc. thermocouple error

RTD Specifications	
Temperature Ranges	PT100 -200/850 °C (-328/1562°F) PT1000 -200/595°C (-328/1103°F) jPT100 -35/450°C (-36/842°F) 10ohm -200/260°C (328/500°F) 25ohm -200/260°C (328/500°F)
Input Fault Protection	50VDC maximum
RTD Excitation Current	200µA
Resolution	±0.1°C
Maximum Inaccuracy	±1°C

Loop Specifications	
Loop Operating Modes	PID control - computes and controls the outputs based on the PID parameters stored in V memory. If auto tuning is enable, the module uses PID parameters calculated during the auto tuning process. ON/OFF Control - the outputs turn on the off based on only the Process Temperature, Setpoint On/Off Hysteresis, and control type (heating or cooling).
PID Control Period	Specifies the sample rate and the time period the output is applied to (0.5 to 99.9 seconds)
Limit SP	Specify a high and low limit for allowable setpoint changes
Scaling	Automatically converts temperature to engineering units
Gain	Specify proportional gain of 0.0 to 6553.5. Gain may also be determined automatically by using the auto tuning feature.
Reset	Specify reset time of 0 to 65535 seconds. Reset may also be determined automatically by using the auto tuning feature.
Anti-windup	Stops the reset action when the PID output reaches 0 or 100%. Bias is automatically adjusted when the process temperature begins to respond.
Rate	Specify the derivative time, 0 to 65535 seconds. Rate may also be determined automatically by using the Auto Tuning feature.

Alarm Specifications	
Deadband	Specifies the temperature deadband on alarms. The alarm will remain active while the temperature is outside the alarm limit minus the deadband.
Temperature High	Temperature has risen above the programmed limit.
Temperature Low	Temperature has fallen below the programmed limit.
Deviation	A Y output or CR may be activated when the high or low temperature is further from the Setpoint than the programmed deviation limit.
Broken Transmitter	This alarm is turned on when the RTD of Thermocouple is burned out or missing.



MAGNETIC PULSE INPUT MODULE

Magnetic Pulse Input Module

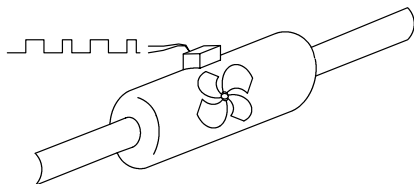
F4-8MPI



Overview

The F4-8MPI is an eight-channel Magnetic Pulse Input CoProcessor Module. It is designed to take input pulses from Hall effect type magnetic pick-ups, (typically found on turbine meters, tachometers and signal generators), and perform calculations. Up to eight differential inputs from magnetic pickups are wired directly to the terminal block on the front of the module.

The Magnetic Pulse module is based on the FACTS Engineering CoProcessor design. Therefore, it offers a built-in real-time battery-backed clock/calendar and a very fast floating point processor. Because of this powerful design, it can easily support Indicated Volume, Gross Volume, Volume Logging, Flow rate, and Tachometer modes. These operational modes are explained in the adjacent chart.



Specifications

Module Type	CoProcessor, Intelligent
Number of Channels	Eight Differential per module
Modules per CPU	Eight Maximum, any slot in CPU base
Input Voltage Range	±10 mV to ±10 VDC peak
Input Frequency Range	DC to 5.0 KHz (channels 1 to 4) DC to 2.5 KHz (channel 5 to 8)
Maximum Continuous Overload	-150 to +150 VDC, 220 Vrms
Input Impedance	100KW
Differential Low – Pass Filter	f-3db = 20KHz, 6db per octave roll-off
Common Mode Voltage Range	±15VDC
Common Mode Rejection	Over common mode input voltage range
Update Time	3 PLC scans minimum
Isolation	750 VDC, channels to PLC
LED Status Indicators	Power ON, Input Pulse (8 LEDs)
Field Termination	20 position removable terminal block 16 positions, ±CHn, Pulse inputs 2 positions, 24 VDC power supply
External Power Required	170 mA maximum, +18 to +25VDC
Internal Power Consumption	225 mA from 5VDC maximum
External Power Required	170 mA maximum, +18 to +25VDC
Internal Power Consumption	225mA from 5VDC maximum
Operating Environment	0°C to 60° C (32°F to 140°F)/5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering

Modes

Indicated and Gross Volume	
Configuration	The module calculates Indicated Volume of flow given a K Factor. The K Factor is the nominal pulses per unit for the flow meter. This is the factory calibration number normally stamped on the flow meter housing. Indicated volume may be in pulses, gallons, dm ³ , or barrels depending on the K Factor. Gross Volume may also be calculated by substituting for the K Factor, the K Factor divided by the Meter Factor (Meter Factor is the calibration factor derived at the installation).
Output Data	Total volume of flow is output to the PLC in engineering units. The formulas used to calculate volume are: Indicated Volume = Total Pulses ÷ K Factor Gross Volume = Total Pulses ÷ (K Factor/Meter Factor)
Flow Rate	
Configuration	The Flow Rate calculation uses the same configuration information as the Volume calculation. The sample rate may range from .1 to 999.9 seconds, or minutes.
Output Data	Flow rate is output to the PLC in engineering units. The formula used to calculate flow rate is: (Volume last sample time – Current Volume) ÷ Sample Rate.
Volume Logging	
Configuration	Indicated or Gross Volume may be logged at either a particular time or at periodic intervals throughout the day. If desired, the counters may be automatically reset when the data is logged. The built-in real time battery-backed clock calendar must be set before volume logging is enabled.
Output Data	Indicated or Gross Volume is output to the PLC in engineering units. A one-shot flag is also set to indicate to the PLC that new data has been logged.
Tachometer	
Configuration	Tachometer applications are simply a variation of the flow rate calculation. To calculate revolutions per minute, set the K Factor equal to the number of pulses per revolution multiplied by 60. Set the Sample Rate equal to one second. To calculate pulses per second (PPS), set the K Factor equal to one and the Sample Rate equal to one second.
Output Data	RPM or PPS



INTERRUPT INPUT MODULE

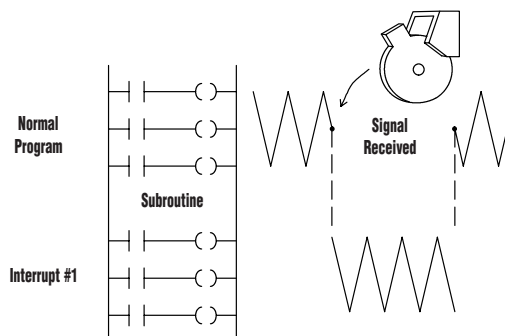
Interrupt Input Module

D4-INT

Overview

The D4-INT is an 8-point interrupt module. This module is intended for applications that have a high-priority event that requires special operations to be performed. When this high priority event occurs, the interrupt module senses a DC level input signal. The module automatically informs the CPU to interrupt its present operation. The CPU immediately suspends its routine scan cycle and jumps to a subroutine identified with that particular interrupt input signal point. The CPU then executes the logic in the subroutine (subroutines can even use immediate I/O instructions to immediately read and write I/O points if a time-critical update is necessary). When the subroutine is complete, the CPU automatically resumes its routine scan cycle starting at the exact location where it was interrupted. The CPU continues the routine scan until another interrupt signal is sensed.

Module Specifications	
Modules per CPU	One for DL430, 2 for DL440 & DL450 (modules must be in 1st then 2nd slot of the CPU base)
Input Points	8 (requires 16 points from I/O)
Input Voltage Range	10.20-26.4VDC
Maximum Input Current	10.0mA
Impedance	~ 2.7Kohm
Input Current	4.4mA at 12VDC, 9.0 mA at 24VDC
ON Level Voltage	9.5VDC
OFF Level Voltage	3.0VDC
Maximum OFF Current	1.5mA
Minimum ON Current	4.0mA
OFF to ON Response	0.08 ~ 0.59ms or 0.88 ~ 6.47ms
ON to OFF Response	0.15 ~ 0.89ms or 1.64 ~ 9.81ms
Terminal Type	Removable connector
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Internal Power Consumption	100mA max
Manufacturer	Koyo Electronics



Hardware features

The D4-INT is designed to accept eight input signals. These inputs are labeled 0-7. If multiple inputs are received at the same time, they are prioritized by their respective label number, 0 being first and 7 being last.

Input points not used as interrupt points can be used as normal DC input points. This is accomplished with an 8-bit dipswitch located on the back of the module.

Interrupt signals can be triggered with a rising or falling edge signal. This is selectable via a dipswitch.

Two ranges of input filtering for response times are available via a dipswitch.



High-Speed Counter Module

High-speed Counter Module

D4-HSC



Overview

The DL405 high-speed counter provides high-speed up or down counting capability. It provides the user with count data and output signals such as Clockwise, Counter-clockwise, Decelerate, and Equal. The module functions asynchronously with the DL405 CPU, allowing fast response and control. This module is particularly well-suited for applications associated with an encoder (quadrature or up/down), and bidirectional motor.

The D4-HSC module supports the following key features:

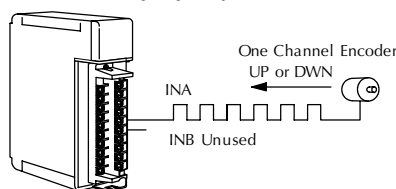
- Quadrature or up/down encoder input
- Maximum input pulse rate of 100KHz (50% duty cycle)
- Seven user control inputs
- Four external outputs for controlling motor velocity and direction
- Counting range from -8388608 to +8388607 with overflow
- Counter input multiplication of X1, X2, or X4
- User selectable count direction
- A or B mode selection
- A mode to reset counter at equal
- B mode to continue counting after equal
- B mode to continue counting after equal
- Find "Home" mode to search home position automatically
- Sampling count to determine pulse rate

Specifications

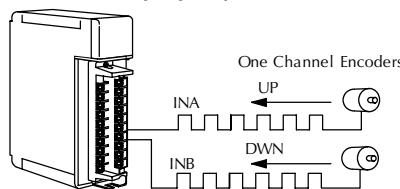
Module Type	Intelligent
I/O Points Assigned	16 X input, 32 Y output
Modules per CPU	Eight, in any local or expansion slot location
Field Wiring Connector	Removable terminal type
Count Signal Level	4.75VDC-30VDC less than 10 mA
Maximum Count Speed	100KH (50% duty cycle)
Minimum Input Pulse Width	5µs
Internal Power Consumption	300 mA maximum at 5VDC (supplied by base power supply)
Operating Environment	0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing)
Manufacturer	Koyo Electronics

See the DL205 H2-CTRIO module section in this desk reference for information on the new H4-CTRIO High-speed Counter I/O Module for the DL405 CPUs. Also check our web site for the latest information on the CTRIO modules.

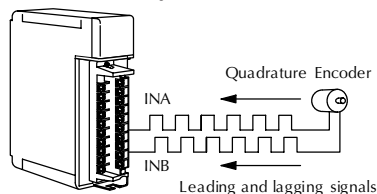
Standard counting using one input



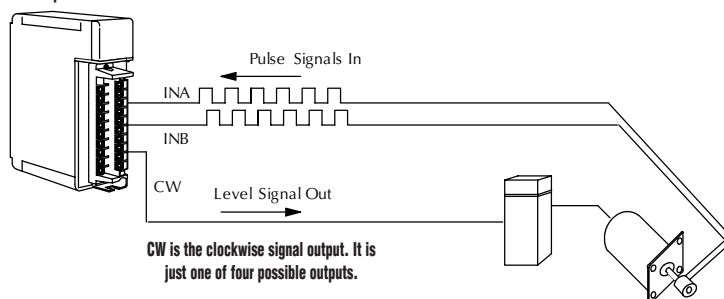
Standard counting using two inputs



Quadrature counting



Output control



With a rotary encoder, the leading and lagging signal is determined by which direction the shaft is turning. This is how quadrature counting is able to sense direction.



D4-HSC

External Module Input Descriptions

IN A	Depending on mode chosen, this is either a standard UP/DOWN counter input, or one of the quadrature counter inputs.
IN B	Depending on mode chosen, this is either a standard UP/DOWN counter input, or one of the quadrature counter inputs.
IN Z	This input can be used to help you find home position for positioning control. It can also be used as an external means of resetting the counter.
LD (Load)	If you want to use an offset number with your counting, a rising edge signal at this terminal will copy the offset value into the current count.
RST (Reset)	A high (ON) signal at this terminal resets the counter to zero and it remains there until there is a transition to a low signal (OFF).
LATCH	You may want to store the current count. The rising edge of a signal at this terminal will store the current count in shared RAM. Counting continues with no interruption.
C.INH	You may want to temporarily ignore the count inputs coming in on INA and INB. A high (ON) signal at this terminal will inhibit the counting to accomplish this need. Current count is suspended until a transition to a low (OFF) signal is seen.
RUN	Not to be confused with Run mode of the DL405, a high (ON) signal here will activate HSC RUN. A low (OFF) signal will deactivate it.
LS1 and LS2	Either or both of these terminals can be connected to limit switches to help find home position, or they can merely be used as discrete inputs.

External Module Output Descriptions

CW	Clockwise – Turns on when the optional HSC RUN mode is invoked and the current count is less than the preset value. It will reset when the current count equals the preset value. This output can also be controlled independently from the count values with an internal output bit allocated to the HSC.
CCW	Counter Clockwise – Turns on when the optional HSC RUN mode is invoked and the current count is greater than the preset value. It will reset when the current count equals the preset value. It can also be controlled independently from the count values with an internal output bit allocated to the HSC.
OUT1	Deceleration – If the optional HSC RUN mode is active, this output turns on when the current count equals the deceleration value. It is reset when HSC RUN mode is exited and re-entered, or when an internal output bit allocated to the HSC is enabled.
OUT2	Brake – If the optional HSC RUN mode is active, this output turns on when the current count equals the preset value. It is reset when HSC RUN mode is exited and re-entered, or when an internal output bit allocated to the HSC is enabled.

Internal Interface Signals from DL405 CPU to D4-HSC

Reset OUT 1 and OUT 2
Reset Overflow
Load Offset to Counter
Enabled HSC RUN
Enable CCW
Enable OUT2
Enable CW
Enable OUT1
Inhibit Counting
Latch Current Count
Reset Current Count
Select count Mode
Change Count Direction
Enable Home Search
Enable x2 Operation
Enable x4 Operation
Select Reset Operation
Enable Sampling
Copy Offset
Reset CW, CCW
Reset Home Search Error
Enable Reset with INZ
Enable OUT2 after Home Search

Internal Interface Signals from D4-HSC to DL405 CPU

Current Count > Preset Value
Current Count = Preset Value
Current Count < Preset Value
Count Overflow
CCW Status
OUT2 Status
CW Status
OUT1 Status
LS2 Status
LS1 Status
Home Search Executing
Sampling Executing
Missing Terminal Block
External Power Supply Failure
Internal HSC Error



DC INPUT MODULES

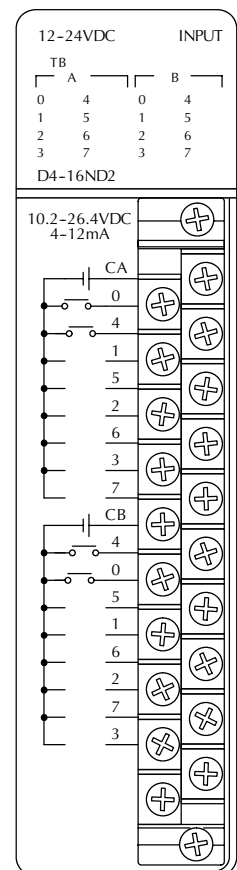
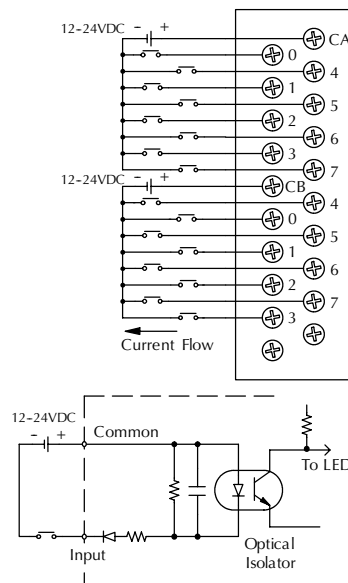
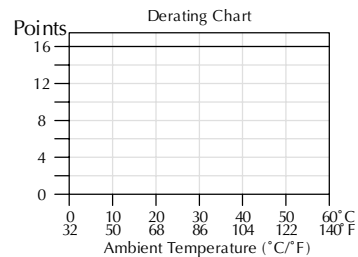
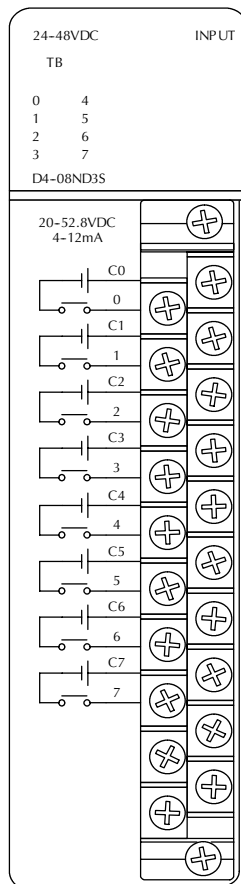
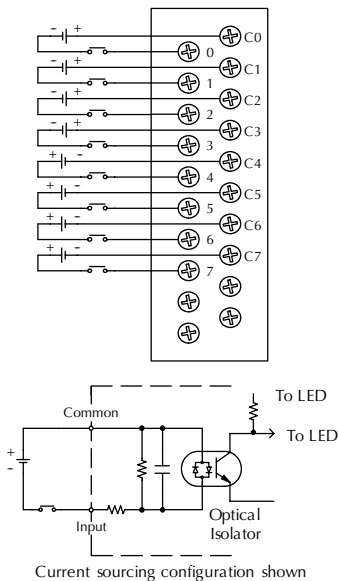
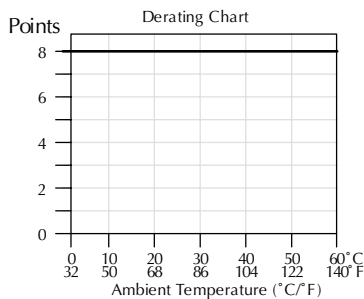
D4-08ND3S DC Input	
Inputs per Module	Eight (sink/source)
Commons per Module	Eight (isolated)
Input voltage Range	20- 52.8VDC
Peak Voltage	52.8VDC
ON voltage Level	>18V
OFF voltage Level	<7V
Input Impedance	4.8K
Input Current	5mA @ 24VDC 10 mA @ 48VDC
Minimum ON Current	3.5mA
Maximum OFF Current	1.5mA
Base power Required 5v	100mA max
OFF to ON Response	3-10ms
ON to OFF Response	3-12ms
Terminal Type	Removable
Status Indicators	Logic Side
Weight	8.8oz. (250g)

See the Connection Systems section in this desk reference for part numbers of **ZIPLink** cables and terminal blocks compatible with this module.



D4-16ND2 DC Input	
Inputs per Module	16 (current sourcing)
Commons per Module	Two (isolated)
Input Voltage Range	10.2- 26.4VDC
Peak Voltage	26.4VDC
ON Voltage Level	>9.5V
OFF Voltage Level	<4.0V
Input Impedance	3.2K @ 12VDC 2.9K @ 24VDC
Input Current	3.8mA @ 12VDC 8.3mA @ 24VDC
Minimum ON Current	3.5mA
Maximum OFF Current	1.5mA
Base Power Required 5v	150mA max
OFF to ON Response	1-7ms (2.3 typical)
ON to OFF Response	2-12ms (4.6 typical)
Terminal Type	Removable
Status Indicators	Logic side
Weight	8.8oz. (250g)

See the Connection Systems section in this desk reference for part numbers of **ZIPLink** cables and terminal blocks compatible with this module.





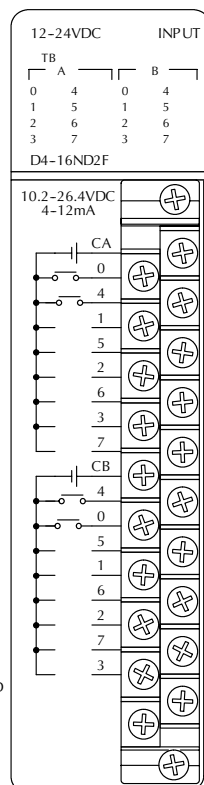
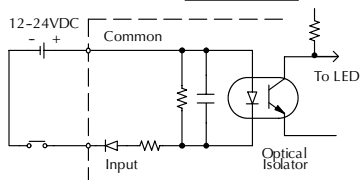
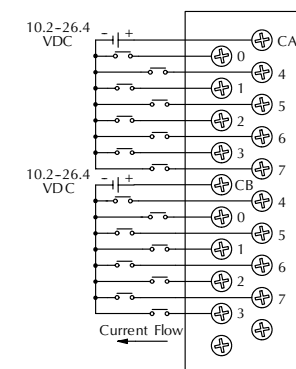
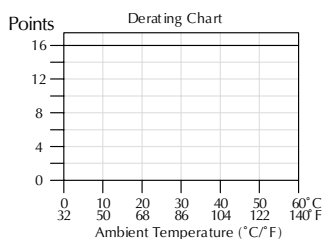
DC INPUT MODULES

D4-16ND2F DC Input

Inputs per Module	16 (current sourcing)
Commons per Module	Two (isolated)
Input Voltage Range	10.2- 26.4VDC
Peak Voltage	26.4VDC
ON Voltage Level	>9.5V
OFF Voltage Level	<4.0V
Input Impedance	3.2K @ 12VDC 2.9K @ 24VDC
Input Current	3.8mA @ 12VDC 8.3mA @ 24VDC
Minimum ON Current	3.5mA
Maximum OFF Current	1.5mA
Base Power Required 5v	150mA max
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	8.8oz. (250g)

¹ Connector sold separately. See Connection Systems section for wiring options.

See the Connection Systems section in this desk reference for part numbers of *ZIP*Link cables and terminal blocks compatible with this module.





DC INPUT MODULES

D4-32ND3-1 DC Input

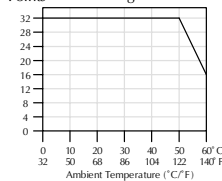
Inputs per Module	32 (sink/source)
Commons per Module	4 (isolated)
Input Voltage Range	20- 28 VDC
Peak Voltage	30VDC
ON Voltage Level	>19V
OFF Voltage Level	<10V
Input Impedance	4.8K
Input Current	5mA
Minimum ON Current	3.5mA
Maximum OFF Current	1.6mA
Base Power Required 5v	150mA max
OFF to ON Response	2-10ms
ON to OFF Response	2-10ms
Terminal type	Removable; connectors sold separately. Use ZIPLinks or the connectors/cables on page 549.
(See ZIPLinks note below)	
Status Indicators	Logic side
Weight	6.6oz. (190g)

Only 16 status points can be displayed at one time on the front of the module. In the A-B position, the status of the first group of 16 input points (A0-A7, B0-B7) are displayed. In the C-D position, the status of the second group of 16 input points (C0-C7, D0-D7) are displayed.

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.

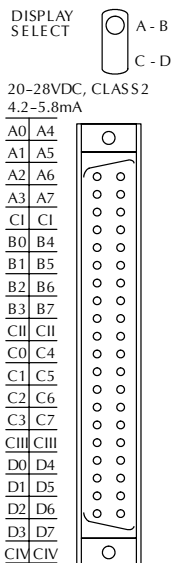
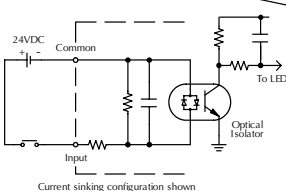
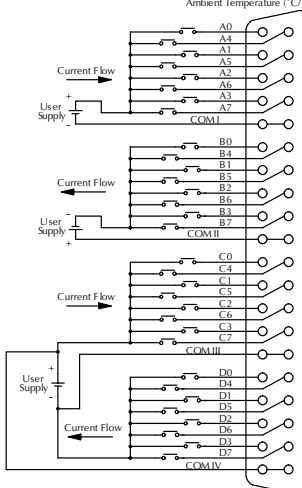


Points Derating Chart



24VDC		INPUT	
A/C	B/D	A-B	C-D
0	4	0	4
1	5	1	5
2	6	2	6
3	7	3	7

D4-32ND3-1



D4-32ND3-2 DC Input

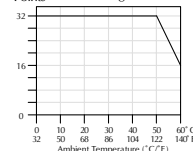
Inputs per Module	32 (sink/source)
Commons per Module	4 (isolated)
Input Voltage Range	4.75-13.2VDC
Peak Voltage	15VDC
ON Voltage Level	>4V
OFF Voltage Level	<2V
Input Impedance	2Kohm @ 5V 1.6mohm @ 12VDC
Input Current	2.5mA @ 5V 7.5mA @ 12V
Minimum ON Current	1.8mA
Maximum OFF Current	0.8mA
Base Power Required 5v	150mA max
OFF to ON Response	1-4ms
ON to OFF Response	1-4ms
Terminal type	Removable; connectors sold separately. Use ZIPLinks or the connectors/cables on page 549.
(See ZIPLinks note below)	
Status Indicators	Logic side
Weight	6.6oz. (190g)

Only 16 status points can be displayed at one time on the front of the module. In the A-B position, the status of the first group of 16 input points (A0-A7, B0-B7) are displayed. In the C-D position, the status of the second group of 16 input points (C0-C7, D0-D7) are displayed.

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.

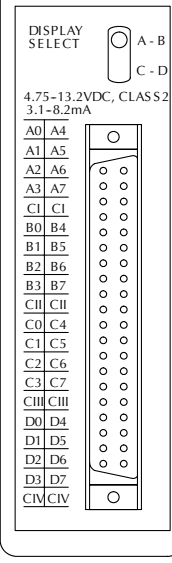
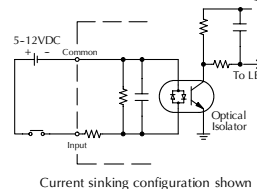
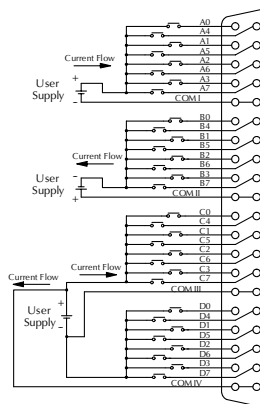


Points Derating Chart



5-12VDC		INPUT	
A/C	B/D	A-B	C-D
0	4	0	4
1	5	1	5
2	6	2	6
3	7	3	7

D4-32ND3-2





DC INPUT MODULES

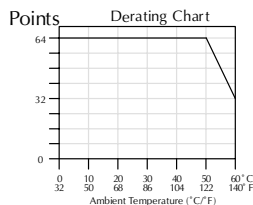
D4-64ND2 DC Input	
Module Location	CPU base only*
Inputs per Module	64 (current sourcing)
Commons per Module	Eight (isolated)
Input Voltage Range	20-28VDC
Peak Voltage	30VDC
ON Voltage Level	>20.0V
OFF Voltage Level	<13.0V
Input Impedance	4.8K
Input Current	5.0mA @ 24VDC
Minimum ON Current	3.6mA
Maximum OFF Current	2.6mA
Base Power Required 5v	300mA max

External Power Required (optional)	24VDC $\pm$ 10%, 320mA max
OFF to ON Response	2.5 ms (typical)
ON to OFF Response	5 ms (typical)
Terminal Type	Removable; connectors sold separately. Use ZIPLinks or the connectors/cables on page 549.
(See ZIPLinks note below)	
Status Indicators	Logic side
Weight	7.8oz. (220g)

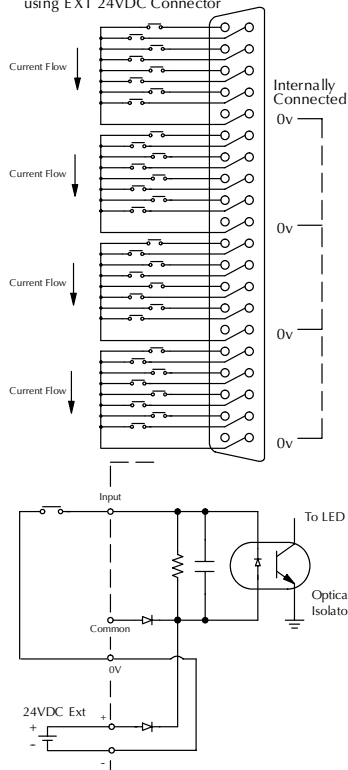
Since there are only 32 LED's on the module, you can only display the status for 32 points at one time. In the A - B position, the status of the first group of 32 input points (A0-A17, B0-B17) are displayed (connector 1). In the C - D position, the status of the second group of 32 input points (C0-C17, D0-D17) are displayed (connector 2).

- * 1. If you are using 64-pt. modules, you cannot install any speciality modules in slots 5, 6, or 7 of the local CPU base.
 2. Modules are only allowed in expansion bases if you are using the D4-450 CPU and ALL bases in the system are D4-xB-1 bases.

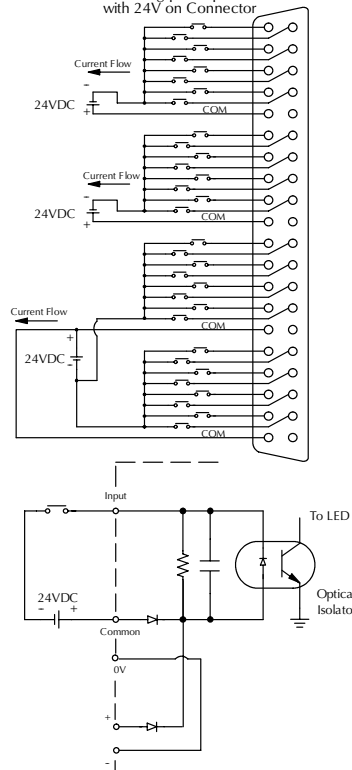
See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



Wiring per 32pts. using EXT 24VDC Connector

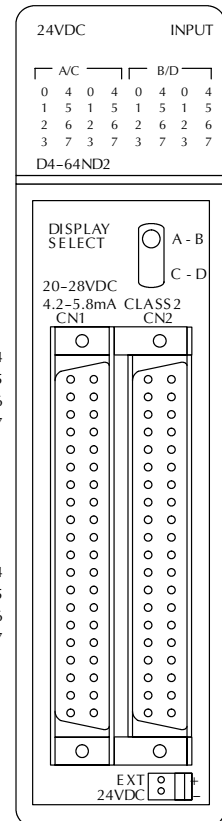


Wiring per 32pts. with 24V on Connector



Connector Pins

A0	A4	C0	C4
A1	A5	C1	C5
A2	A6	C2	C6
A3	A7	C3	C7
C1	0V	C5	0V
A10	A14	C10	C14
A11	A15	C11	C15
A12	A16	C12	C16
A13	A17	C13	C17
C2	0V	C6	0V
B0	B4	D0	D4
B1	B5	D1	D5
B2	B6	D2	D6
B3	B7	D3	D7
C3	0V	C7	0V
B10	B14	D10	D14
B11	B15	D11	D15
B12	B16	D12	D16
B13	B17	D13	D17
C4	0V	C8	0V



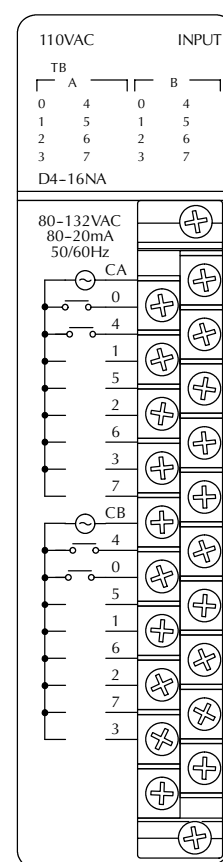
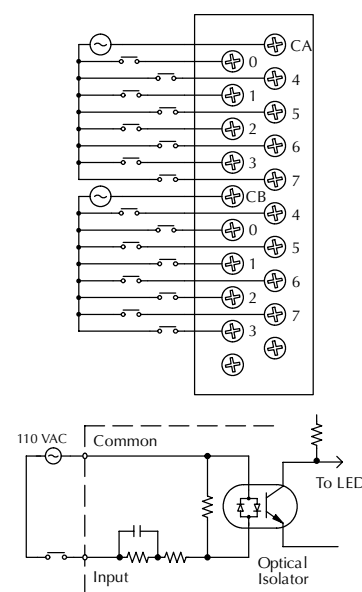
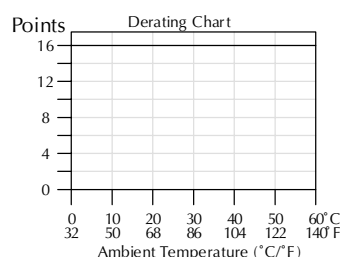
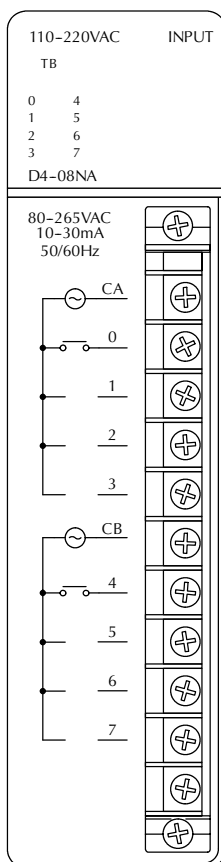
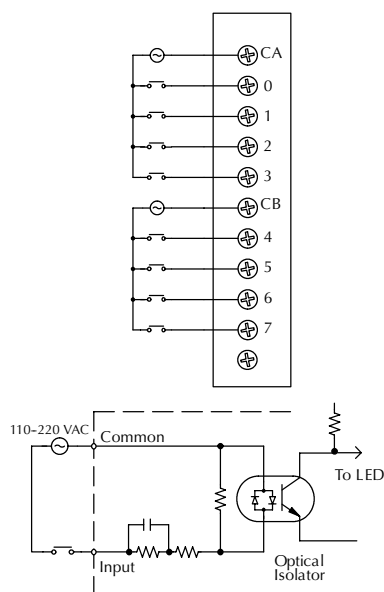
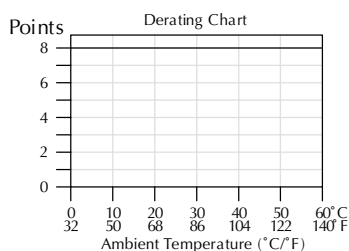


AC INPUT MODULES

D4-08NA AC Input	
Inputs per Module	8
Commons per Module	2 (isolated)
Input Voltage Range	80-265VAC
Peak Voltage	265VAC
AC Frequency	47-63Hz
ON Voltage Level	>70V
OFF Voltage Level	<30V
Input Impedance	12 K
Input Current	8.5mA @ 100VAC 20mA @ 230VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
Base Power Required 5v	100mA max
OFF to ON Response	5-30ms
ON to OFF Response	10-50ms
Terminal Type	Removable
Status Indicators	265VAC Logic side
Weight	8.4 oz. (240g)

D4-16NA AC Input	
Inputs per Module	16
Commons per Module	2 (isolated)
Input Voltage Range	80-132VAC
Peak Voltage	132VAC
AC Frequency	47-63Hz
ON Voltage Level	>70V
OFF Voltage Level	<20V
Input Impedance	8K
Input Current	14.5mA @ 120VAC
Minimum ON Current	7mA
Maximum OFF Current	2mA
Base Power Required 5v	150mA max.
OFF to ON Response	5-30ms
ON to OFF Response	10-50ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	9.5oz. (270g)

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



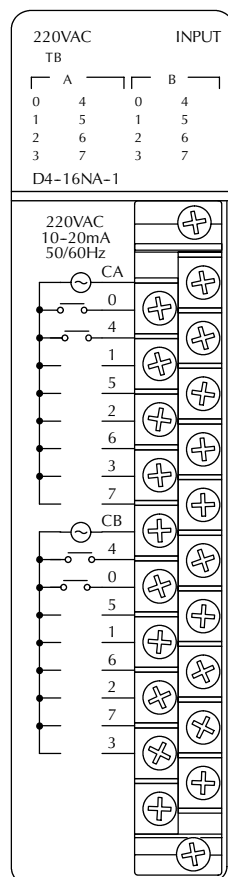
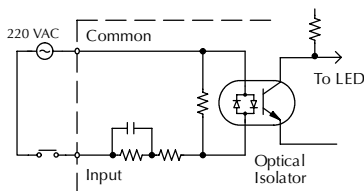
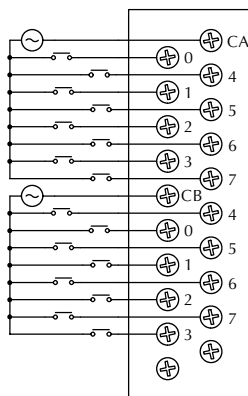
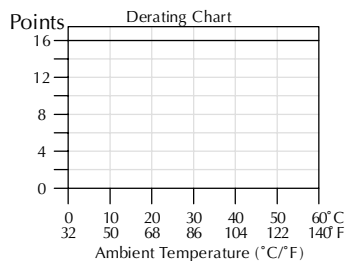


AC AND AC/DC INPUT MODULES

D4-16NA-1 AC Input

Inputs per Module	16
Commons per Module	2 (isolated)
Input Voltage Range	187-238VAC
Peak Voltage	265VAC
AC Frequency	47-63Hz
ON Voltage Level	>150V
OFF Voltage Level	<40V
Input Impedance	22K
Input Current	10.0mA @ 220VAC
Minimum ON Current	7mA
Maximum OFF Current	2mA
Base Power Required 5v	150mA max
OFF to ON Response	5-30ms
ON to OFF Response	10-50ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	9.2oz. (260g)

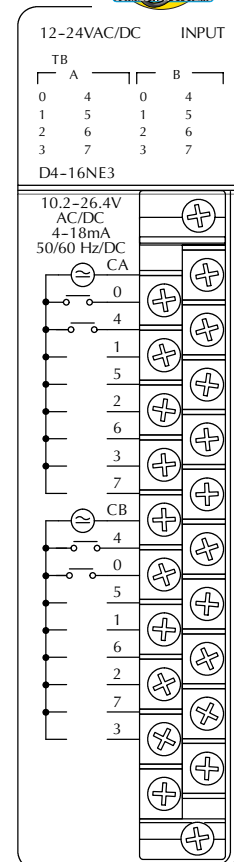
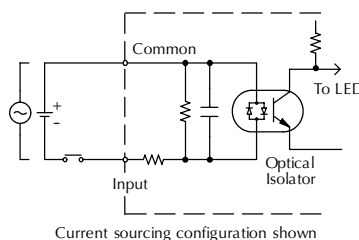
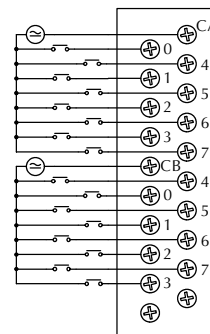
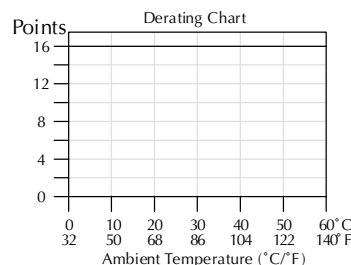
See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



D4-16NE3 AC/DC Input

Inputs per Module	16 (sink/source)
Commons per Module	2 (isolated)
Input Voltage Range	10.2-26.4VAC/VDC
Peak Voltage	37.5VAC/VDC
AC Frequency	47-63Hz
ON Voltage Level	>9.5V
OFF Voltage Level	<3.0V
Input Impedance	3.2 K @ 12V 2.9 K @ 24V
Input Current	3.8mA @ 12V 8.3mA @ 24V
Minimum ON Current	4mA
Maximum OFF Current	1.5mA
Base Power Required 5v	150mA max
OFF to ON Response	5-40ms
ON to OFF Response	10-50ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	8.8oz. (250g)

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



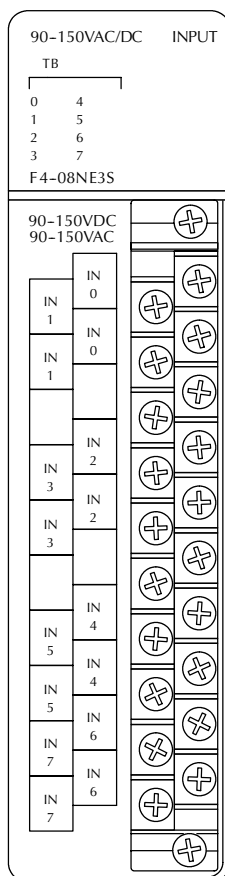
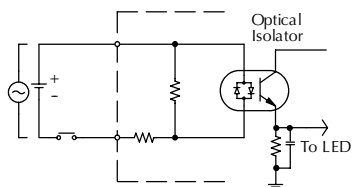
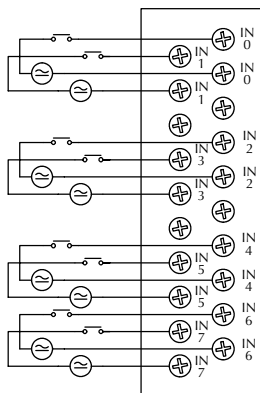
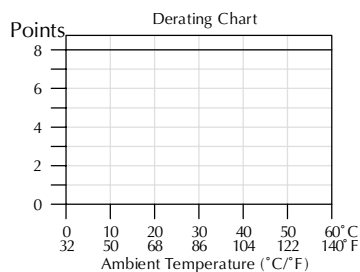


AC/DC INPUT AND SIMULATOR MODULES

F4-08NE3S AC/DC Input

Inputs per Module	8 (sink/source)
Commons per Module	8 (isolated)
Input Voltage Range	90-150VAC/VDC
Peak Voltage	350 peak < 1ms
AC Frequency	47-63Hz
ON Voltage Level	>90VDC/75 VAC
OFF Voltage Level	<60VDC/45 VAC
Input Impedance	22K
Input Current	5.5mA @ 120V
Minimum ON Current	4mA
Maximum OFF Current	2mA
Base Power Required 5v	90mA max
OFF to ON Response	8ms
ON to OFF Response	15ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	9oz. (256g)

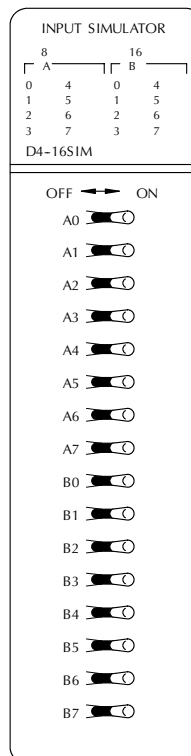
See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



D4-16SIM Input Simulator

Inputs per Module	8 or 16 selectable by internal switch
Base Power Required 5v	150 mA max
Terminal Type	None
Status Indicators	Logic side
Weight	8.8oz. (250g)

8 or 16 point selection switch is located on the back of the module
8 or 16 point selection is indicated by the LEDs above the input switch status



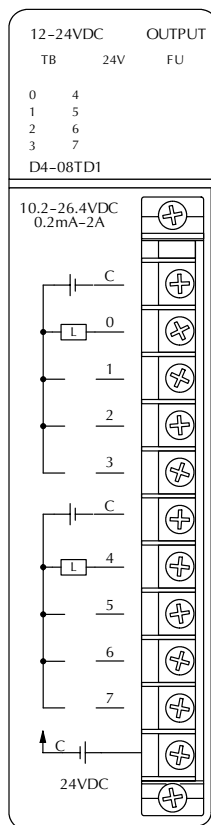
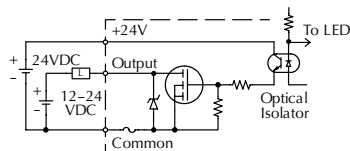
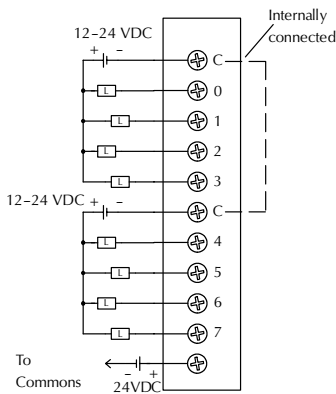
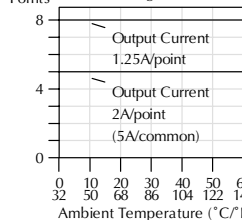


DC OUTPUT MODULES

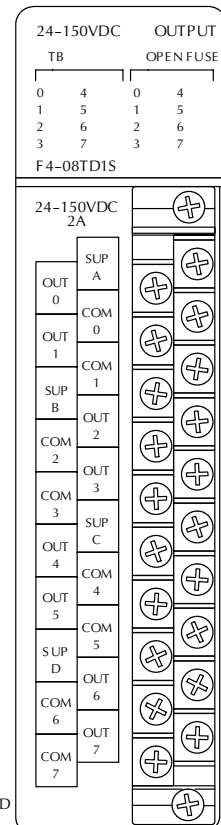
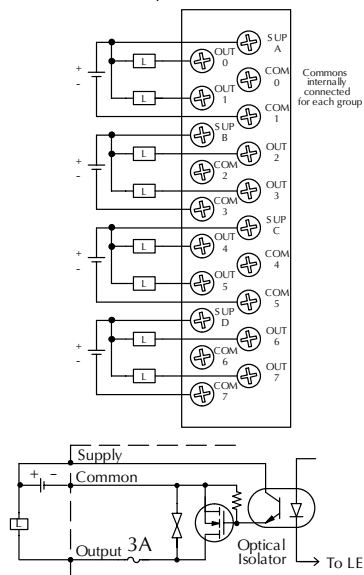
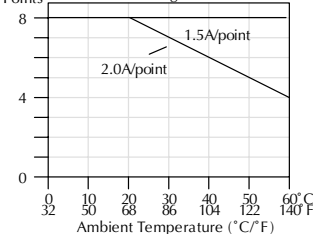
D4-08TD1 DC Output	
Outputs per Module	8 (current sinking)
Commons per Module	2 internally connected
Operating Voltage	10.2-26.4VDC
Output Type	NMOS FET (open drain)
Peak Voltage	40VDC
ON Voltage Drop	0.5VDC @ 2A 0.2VDC @ 1A
Max Current (resistive)	2A/point 5A/common
Max Leakage Current	0.1mA @ 40VDC
Max Inrush Current	12A for 10 ms 6A for 100 ms
Minimum Load	0.2mA
Base Power Required 5v	150mA max
External DC Required	24VDC $\pm$ 10% @ 35mA
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	8.4oz. (240g)
Fuses	1 (7A) per common Non-replaceable

F4-08TD1S DC Output	
Outputs per Module	8 (current sinking)
Commons per Module	4 (isolated, 8 terminals)
Operating Voltage	24-150VDC
Output Type	MOS FET
Peak Voltage	200VDC < 1ms
ON Voltage Drop	0.5VDC @ 2A
Max Current (Resistive)	2A/point 4A/common
Max Leakage Current	5 μ A
Max Inrush Current	30A for 1ms 19A for 10ms
Minimum Load	N/A
Base Power Required 5v	295mA max
External DC Required	None
OFF to ON Response	25 μ s
ON to OFF Response	25 μ s
Terminal Type	Removable
Status Indicators	Logic side
Weight	10oz. (282g)
Fuses	1 (3A) per output (see diagram) Non-replaceable

Derating Chart



Derating Chart





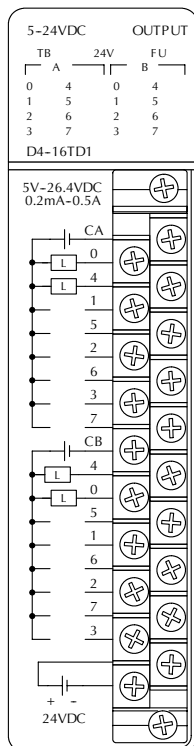
D4-16TD1 DC Output	
Outputs per Module	16 (current sinking)
Commons per Module	2 internally connected
Operating Voltage	4.5-26.4VDC
Output Type	NPN Open collector
Peak Voltage	40VDC
ON Voltage Drop	0.5VDC @ 0.5A 0.2VDC @ 0.1A
Max Current (Resistive)	0.5A/point - 3A/common
Max Leakage Current	0.1mA @ 40VDC
Max Inrush Current	2A for 10ms 1A for 100ms
Minimum Load	0.2mA
Base Power Required 5v	200mA max
External DC Required	24VDC $\pm$ 10% @ 125mA
OFF to ON Response	0.5ms
ON to OFF Response	0.5ms
Terminal type	Removeable
Status Indicators	Logic side
Weight	9.5oz. (270g)
Fuses	1 (5A) per common Non-replaceable



This module can be used with

ZIP LINK

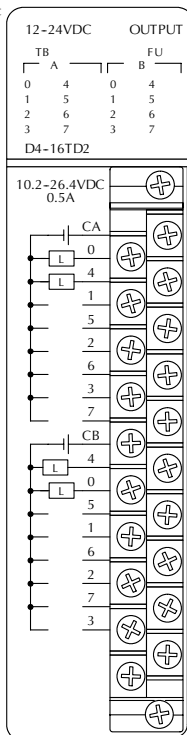
CONNECTION SYSTEMS



D4-16TD2 DC Output	
Outputs per Module	16 (current sourcing)
Commons per Module	2 (isolated)
Operating Voltage	10.2-26.4VDC
Output Type	NPN Emitter Follower
Peak Voltage	40VDC
ON Voltage Drop	1.5VDC @ 0.5A
Max Current (Resistive)	0.5A/point 3A/common @ 50° C 2.5A/common @ 60° C
Max leakage Current	0.1mA @ 40VDC
Max Inrush Current	2A for 10ms 1A for 100ms
Minimum Load	0.2mA
Base Power Required 5v	400mA max
External DC Required	None
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type	Removeable
Status Indicators	Logic side
Weight	9.8oz. (280g)
Fuses	1 (5A) per common Non-replaceable



This module can be used with
ZIP LINK
CONNECTION SYSTEMS



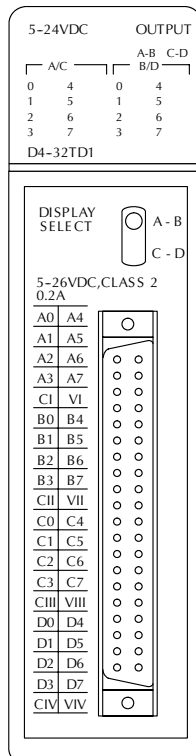
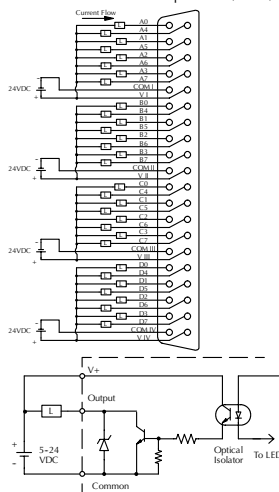
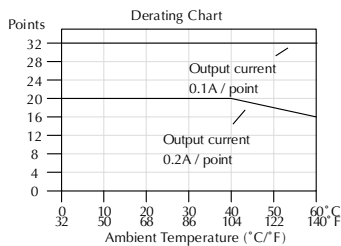


DC OUTPUT MODULES

D4-32TD1 DC Output	
Outputs per Module	32 (current sinking)
Commons per Module	4 (isolated)
Operating Voltage	4.75–26.4 VDC
Output Type	NPN Open Collector
Peak Voltage	36VDC
ON Voltage Drop	0.6VDC @ 0.2A
Max Current (Resistive)	0.2A/point 1.6A/common
Max Leakage Current	0.1mA @ 36 VDC
Max Inrush Current	1A for 10 ms 0.5A for 100 ms
Minimum Load	0.1mA
Base Power Required 5v	250mA max
External DC Required	24VDC± 10%, 140mA max
OFF to ON Response	0.1ms
ON to OFF Response	0.1ms
Terminal type	Removable; connectors sold separately Use ZIPLinks or the connectors/cables on page 549. (See ZIPLinks note below)
Status indicators	Logic side
Weight	6.7oz. (190g)
Fuses	None

Only 16 status points can be displayed at one time on the front of the module.
In the A - B position the status of the first group of 16 output points (A0–A7, B0–B7) are displayed. In the C - D position the status of the second group of 16 output points (C0–C7, D0–D7) are displayed.

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



This circuit shows 24VDC used for the module and load. If load voltages less than 24VDC are required, you must use separate supplies.



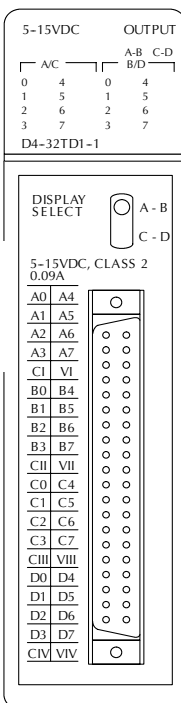
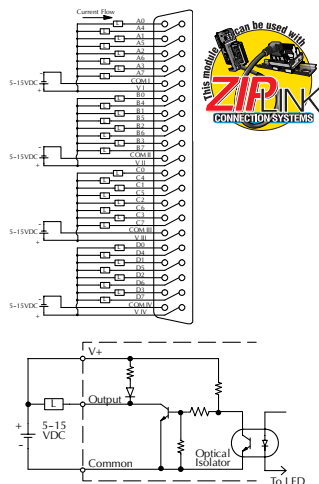
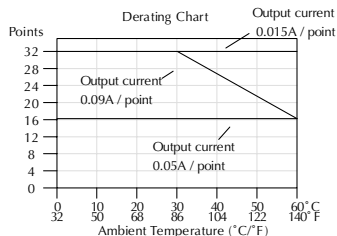
DC OUTPUT MODULES

D4-32TD1-1 DC Output

Outputs per Module	32 (current sinking)
Commons per Module	4 (isolated)
Operating Voltage	5-15VDC
Output Type	NPN Open Collector (with pull-up)
Peak Voltage	16.5VDC
ON Voltage Drop	0.4VDC @ 0.1A
Max Current (Resistive)	0.9A/point 0.72A/common 2.88A/module
Max Leakage Current	0.01mA @ 16.5VDC
Max Inrush Current	0.5A for 10ms 0.2A for 100ms
Minimum Load	0.15mA
Base Power Required 5v	250mA max
External DC Required	5-15VDC $\pm$ 10%, 150mA max
OFF to ON Response	0.1ms
ON to OFF Response	0.1ms
Terminal Type	Removable; connectors sold separately. Use ZIPLinks or the connectors/cables on page 549.
(See ZIPLinks note below)	
Status Indicators	Logic side
Weight	6.7 oz. (190g)
Fuses	None

Only 16 status points can be displayed at one time on the front of the module.
In the A - B position, the status of the first group of 16 output points (A0-A7, B0-B7) are displayed.
In the C - D position, the status of the second group of 16 output points (C0-C7, D0-D7) are displayed.

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.

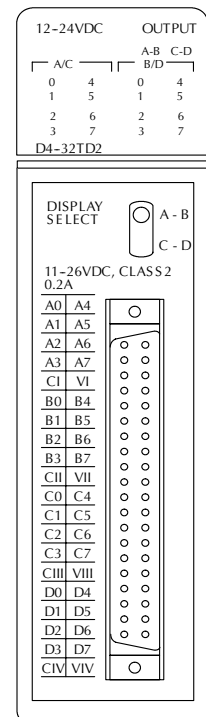
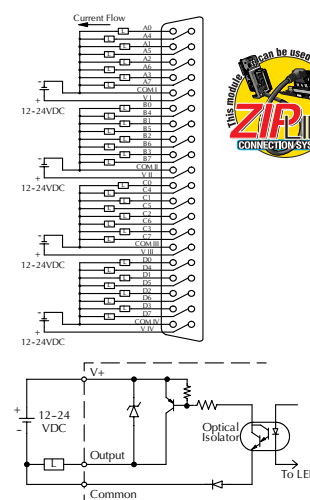
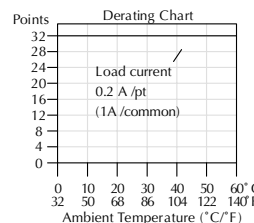


D4-32TD2 DC Output

Outputs per Module	32 (current sourcing)
Commons per Module	4 (isolated)
Operating Voltage	10.8-26.4 VDC
Output Type	PNP Open Collector
Peak Voltage	30VDC
ON Voltage Drop	0.6VDC @ 0.2A
Max Current (Resistive)	0.2A/point 1.0A/common 4.0A/module
Max Leakage Current	0.01mA @ 26.4VDC
Max Inrush Current	500mA for 10ms
Minimum Load	0.2mA
Base Power Required 5v	350mA max
External DC Required	10.8-26.4VDC 1A/common including load
OFF to ON Response	0.2ms
ON to OFF Response	0.2ms
Terminal Type	Removable; connectors sold separately. Use ZIPLinks or the connectors/cables on page 549.
(See ZIPLinks note below)	
Status Indicators	Logic side
Weight	6.7 oz. (190g)
Fuses	None

Only 16 status points can be displayed at one time on the front of the module.
In the A - B position, the status of the first group of 16 output points (A0-A7, B0-B7) are displayed.
In the C - D position, the status of the second group of 16 output points (C0-C7, D0-D7) are displayed.

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.





DC OUTPUT MODULES

D4-64TD1 DC Output	
Module Location	CPU base only*
Outputs per Module	64 (current sinking)
Commons per Module	8 (isolated)
Operating Voltage	4.75-26.5VDC
Output Type	NPN Open Collector
Peak Voltage	36VDC
ON Voltage Drop	0.6VDC @ 0.1A
Max Current (Resistive)	0.1A/point, 1A/common, 7A per module total
Max Leakage Current	0.01mA @ 36VDC
Max Inrush Current	1A for 1ms, 700mA for 100ms
Minimum Load	0.1mA

Base power Required 5v	800mA max
External DC Required	24VDC $\pm$ 10 % (850mA per common) 7.0A total max
OFF to ON Response	0.1ms
On to OFF Response	0.2ms
Terminal type	Removable; connectors sold separately Use ZIPLinks or the connectors/cables on page 549.
Status Indicators	Logic side
ON Voltage Drop	1.5VAC @ 2A
Weight	7.4oz. (210g)
Fuses	None

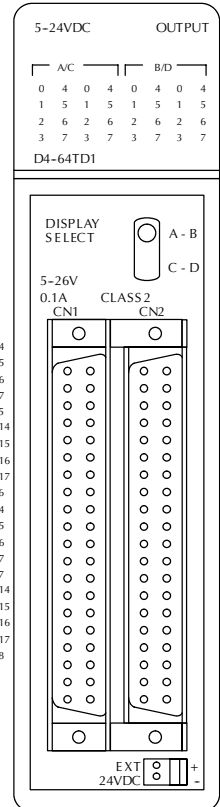
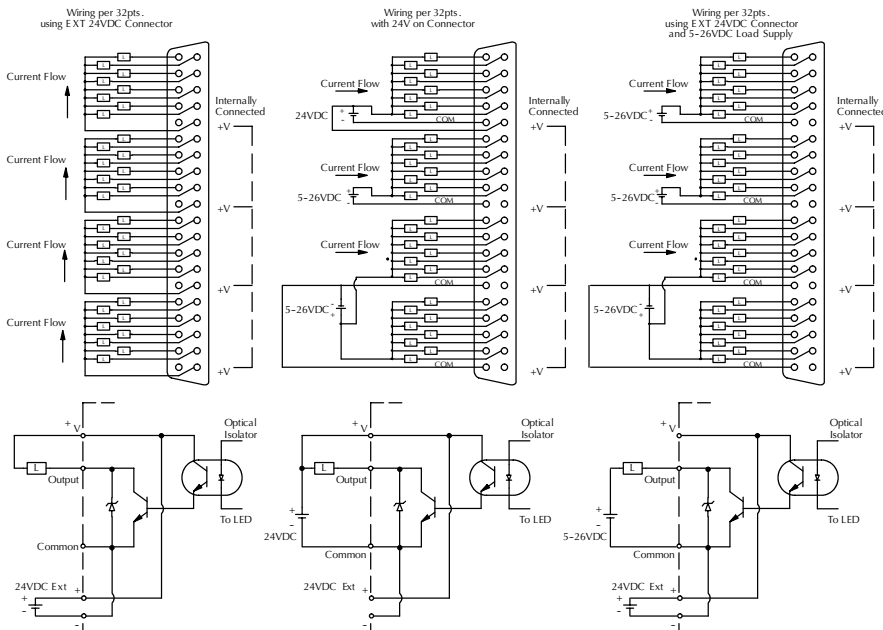
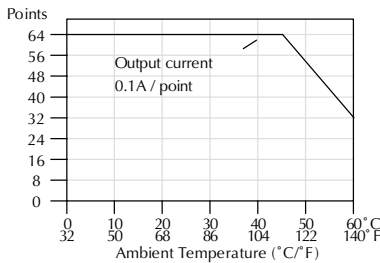
Only 32 status points can be displayed at one time on the front of the module. In the A-B position, the status of the first group of 32 output points (A0-A17, B0-B17) are displayed (connector 1). In the C-D position, the status of the second group of 32 output points (C0-C17, D0-D17) are displayed (connector 2).

* 1. If you are using 64pt. modules, you cannot install any speciality modules in slots 5, 6, or 7 of the local CPU base.

2. Modules are only allowed in expansion bases if you are using the D4-450 CPU and ALL bases in the system are D4-xB-1 bases.



See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.



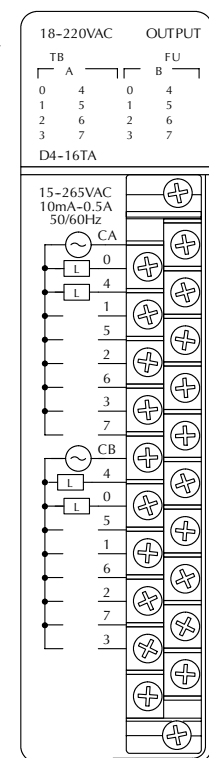
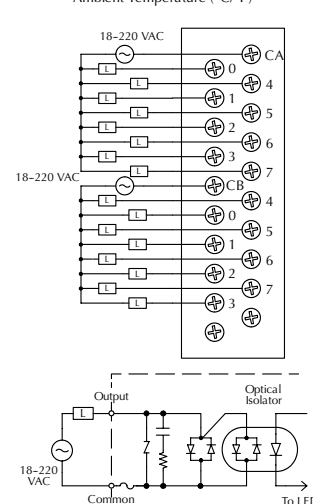
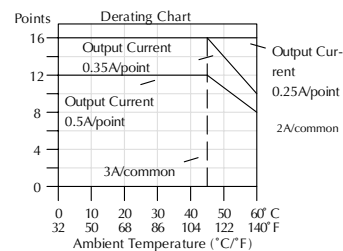
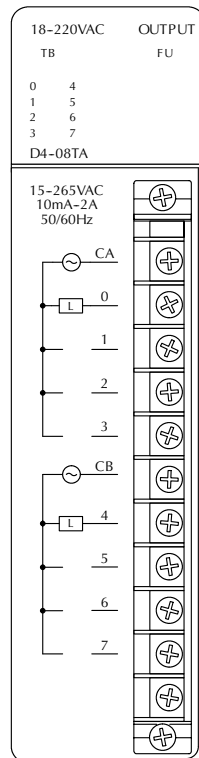
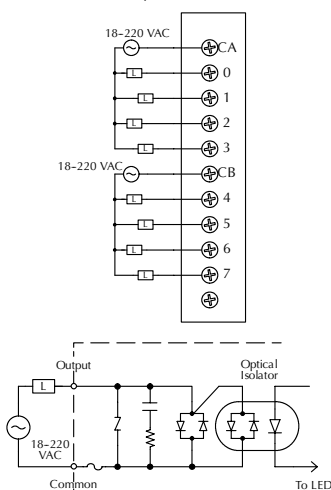
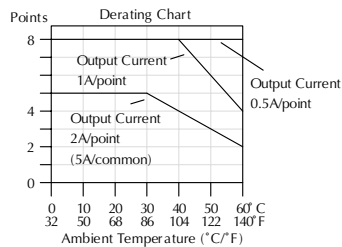


AC OUTPUT MODULES

D4-08TA AC Output	
Outputs per Module	8
Commons per Module	2 (isolated)
Operating Voltage	15-265VAC
Output Type	SSR (triac)
Peak Voltage	265VAC
AC Frequency	47-63 Hz
ON Voltage Drop	1.5VAC @ 2A
Max Current	2A/point 5A/common @ 30° C 2A/common @ 60° C
Max Leakage Current	5mA @ 265VAC
Max Inrush Current	30A for 10ms 10A for 100ms
Minimum Load	10mA
Base Power Required 5v	250mA max
OFF to ON Response	1ms
ON to OFF Response	1ms + 1/2 cycle
Terminal Type	Removable
Status Indicators	Logic side
Weight	11.6 oz. (330g)
Fuses	1 (8A) per common Non-replaceable

D4-16TA AC Output	
Outputs per Module	16
Commons per Module	2 (isolated)
Operating Voltage	15-265VAC
Output Type	SSR (triac)
Peak Voltage	265VAC
AC Frequency	47-63Hz
ON Voltage Drop	1.5VAC @ 0.5A
Max Current	0.5A/point 3A/common @ 45° C 2A/common @ 60° C
Max Leakage Current	4mA @ 265VAC
Max Inrush Current	15A for 10ms 10A for 100ms
Minimum Load	10mA
Base Power Required 5v	450mA max
OFF to ON Response	1ms
ON to OFF Response	1ms + 1/2 cycle
Terminal Type	Removable
Status Indicators	Logic Side
Weight	12.2oz. (350g)
Fuses	1 (5A) per common Non-replaceable

See the Connection Systems section in this desk reference for part numbers of ZIPLink cables and terminal blocks compatible with this module.





RELAY OUTPUT MODULES

D4-08TR Relay Output

Outputs per Module	8 relays
Commons per Module	2 (isolated)
Operating Voltage	5-30VDC/5-250VAC
Output Type	Form A (SPST-NO)
Peak Voltage	30VDC/256VAC
AC Frequency	47-63Hz
ON Voltage Drop	N/A
Max Current (Resistive)	2A/point 5A/common
Max Leakage Current	0.1mA @ 265VAC
Max Inrush Current	2A
Minimum Load	5mA
Base Power Required 5v	550mA max
External DC Required	None
OFF to ON Response	12ms
ON to OFF Response	12ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	9.1oz. (260g)
Fuses	1 (8A) per common Non-replaceable

F4-08TRS-1 Relay Output

Outputs per Module	8 relays
Commons per Module	8 (isolated)
Operating Voltage	12-30VDC/12-125VAC *125VAC-250VAC
Output Type	4, Form C (SPST) 4, Form A (SPST-NO)
Peak Voltage	30VDC/250VAC @ 10A
AC Frequency	47-63Hz
ON Voltage Drop	N/A
Max Current (Resistive)	10A/point 40A/module
Max Leakage Current	N/A
Max Inrush Current	10A
Minimum Load	100mA @ 12 VDC
Base Power Required 5v	575mA max
External DC Required	None
OFF to ON Response	7ms
ON to OFF Response	9ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	13.2oz. (374g)
Fuses	1 (10A) per common Non-replaceable

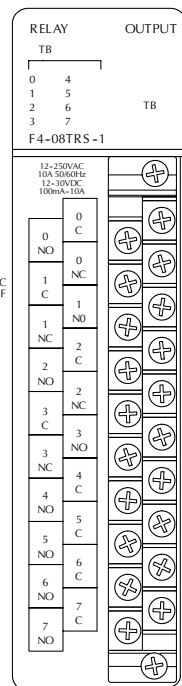
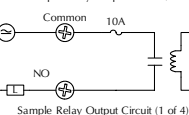
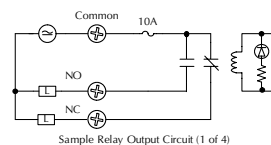
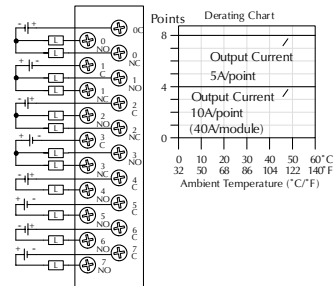
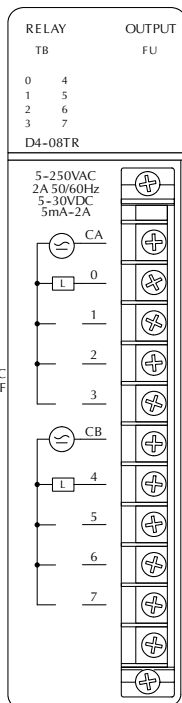
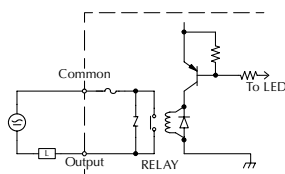
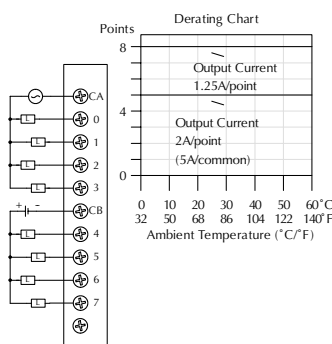
Maximum DC voltage rating is 120 VDC @ 0.5A @ 30,000 cycles typical. Motor starters up to and including NEMA size 4 can be used with this module.

Typical Relay Life (Operations)

Maximum Resistive or Inductive Inrush Load Current	Operating Voltage		
	30 VDC	120 VAC	250 VAC
2A resistive	100K	300K	200K
2A inductive	100K	80K	60K
0.5A resistive	800K	1M	800K
0.5A inductive	300K	300K	200K

Typical Relay Life (Operations)

Maximum Resistive or Inductive Inrush Load Current	Operating Voltage		
	28 VDC	120 VAC	250 VAC
1/4HP		25K	
10.0A	50K	50K	
5.0A	200K	100K	
3.0A	325K	125K	50K
.05A	>50M		





RELAY OUTPUT MODULES

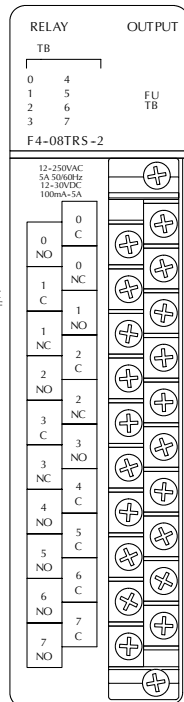
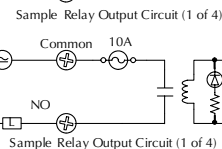
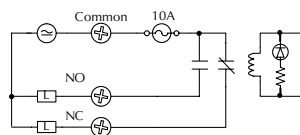
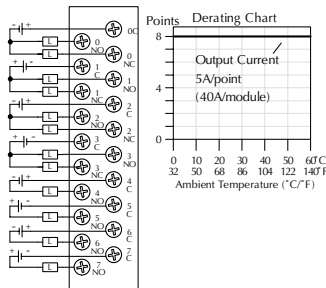
F4-08TRS-2 Relay Output

Outputs per Module	8 relays
Commons per Module	8 (isolated)
Operating Voltage	12-30VDC-12-250VAC
Output Type	4, Form C (SPDT) 4, Form A (SPST-NO)
Peak Voltage	30VDC/250VAC @ 5A
AC Frequency	47-63Hz
ON Voltage Drop	N/A
Max Current (Resistive)	5A/point 40A/module
Max Leakage Current	N/A
Max Inrush Current	10A
Minimum Load	100mA @ 12 VDC
Base Power Required 5v	575mA max, 60 mA/point
External DC Required	None
OFF to ON Response	7ms
ON to OFF Response	9ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	13.8oz. (390g)
Fuses 19379-K- Wickman	1 (10A 250V) per common User replaceable

Maximum DC voltage rating is 120 VDC @ 0.5A @ 30,000 cycles typical. Motor starters up to and including NEMA size 3 can be used with this module.

Typical Relay Life (Operations)

Maximum Resistive or Inductive Inrush Load Current	Operating Voltage		
	28 VDC	120 VAC	240 VAC
5.0A	200K	100K	
3.0A	325K	125K	50K
.05A	>50M		

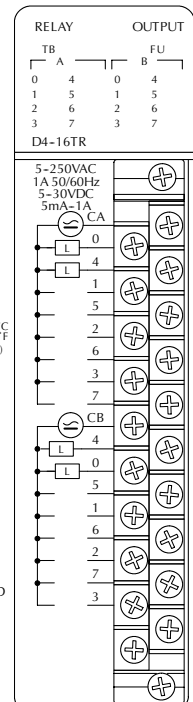
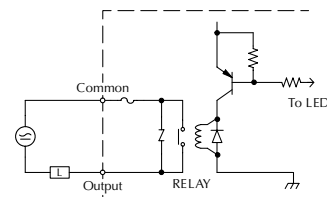
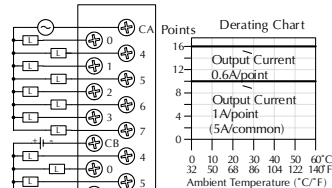


D4-16TR Relay Output

Outputs per Module	16 relays
Commons per Module	2 (isolated)
Operating Voltage	5-30VDC-5-250VAC
Output Type	Form A (SPST-NO)
Peak Voltage	30VDC/250VAC
AC Frequency	47-63Hz
ON Voltage Drop	N/A
Max Current (Resistive)	1A/point 5A/common
Max Leakage Current	0.1mA @ 265VAC
Max Inrush Current	4A
Minimum Load	5mA
Base Power Required 5v	1000mA max, 60 mA/point
External DC Required	None
OFF to ON Response	10ms
ON to OFF Response	10ms
Terminal Type	Removable
Status Indicators	Logic side
Weight	10.9oz. (310g)
Fuses	1 (8A) per common (Non-replaceable)

Typical Relay Life (Operations)

Maximum Resistive or Inductive Inrush Load Current	Operating Voltage		
	30 VDC	125 VAC	250 VAC
1A resistive	>1M	500K	300K
1 A inductive	400K	200K	100K
0.5A resistive	>2M	800K	500K
0.5A inductive	>1M	300K	200K

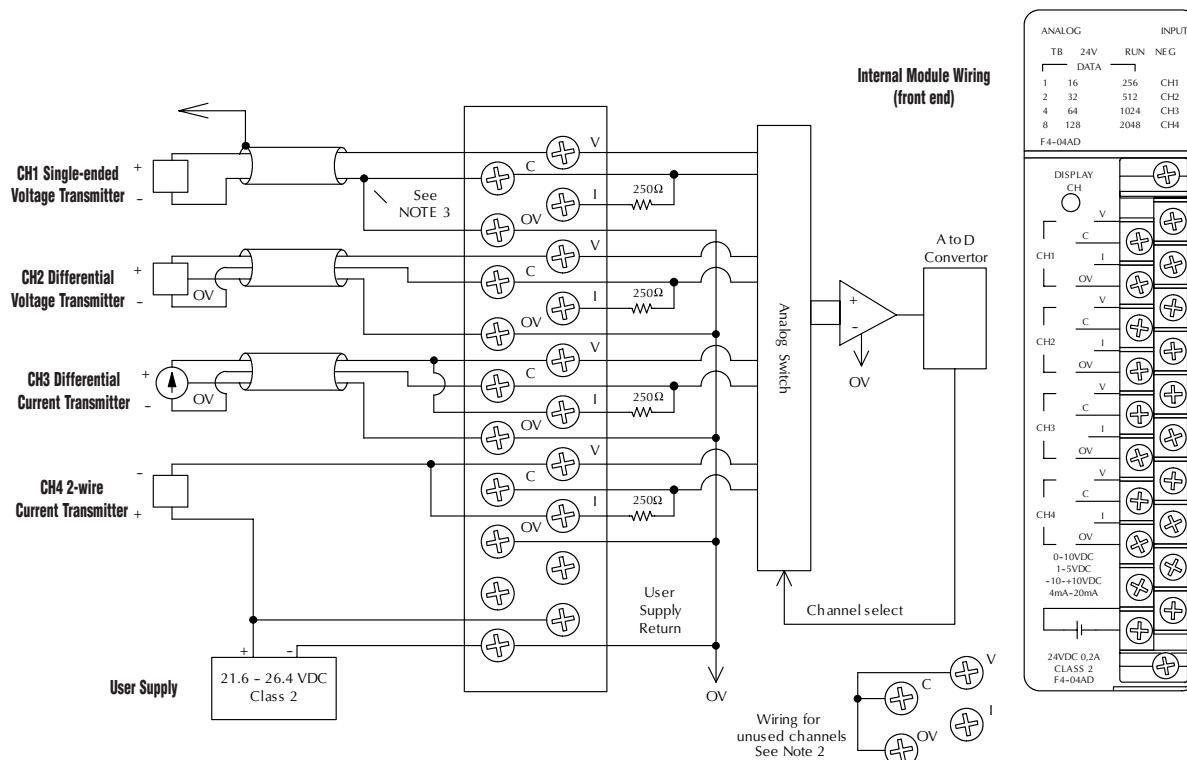


ANALOG INPUT MODULES

F4-04AD 4-Channel Analog Input	
Number of Channels	4
Input Type	Single-ended or differential Voltage or current
Input Ranges	0-5V, 1-5V, 0-10V, $\pm 5V$, $\pm 10V$ 0-20mA, 4-20mA
Channels Individually Configurable	Range is selected for all channels. Each channel can be wired for voltage or current
Resolution	12 bit (0 to 4095), unipolar 13 bit (-4095 to +4095), bipolar
Input Impedance	20M Ω - minimum, voltage input 250- 1/2W, $\pm 0.1\%$, 25 ppm/ $^{\circ}C$ current in
Max. Continuous Overload	± 50 VDC, voltage input, ± 45 mA, current input
Recommended External Fuse	0.32A, Series 217 fast acting, current inputs
Common Mode Voltage Range	$\pm 10V$ maximum
Linearity	$\pm 0.025\%$ of span (± 1 count max. unipolar)
Input Stability	$\pm 1/2$ count
Cross Talk	-80dB, 1/2 count maximum
Full Scale Calibration Error	± 12 counts max., voltage input ± 16 counts max., at 20.0 mA current input
Offset Calibration Error	± 1 count max., voltage input ± 2 counts max., at 4.0 mA current input
Maximum Inaccuracy	0.4% max. @ 77°F (25°C) 0.55% max. @ 32 to 140°F (0 to 60°C)

Conversion Time	<6mS per selected channel
Noise Rejection Ratio	Normal mode: -3dB @ 50Hz, -6 dB/octave Common mode: -70dB, DC to 12 KHz
PLC Update Rate	1 channel per scan, min., 4 per scan, max.
Digital Input Points Required	16 (X) input points (12 binary data bits, 2 channel ID bits, 1 sign, 1 broken transmitter) Optional 32 input point operation for D4-04AD compatibility mode
Base Power Required 5V	85mA
External Power Supply	24VDC, $\pm 10\%$, 100 mA, class 2
Accuracy vs. Temperature	± 45 ppm/ $^{\circ}C$ full scale calibration change (including maximum offset change of 2 counts)
Operating Temperature	32° to 140°F (0 to 60°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
Insulation Resistance	10M, 500VDC
Noise Immunity	NEMA ICS3-304

NOTE 1: Shields should be grounded at the signal source
NOTE 2: Unused channel should be shorted for the best noise immunity
NOTE 3: When a differential input is not used, OV should be connected to C of the channel



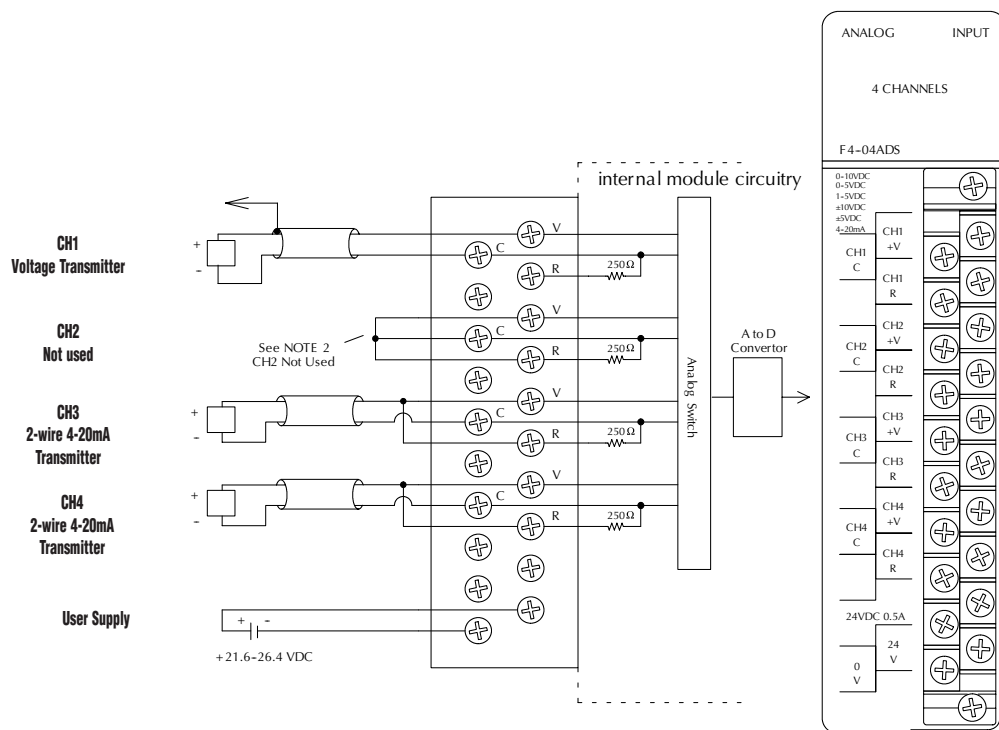


ANALOG INPUT MODULES

F4-04ADS 4-Channel Isolated Analog Input	
Number of Channels	4
Input Ranges	0-5V, 0-10V, 1-5V, $\pm 5V$, $\pm 10V$ 0-20mA, 4-20mA
Channels Individually Configurable	Yes
Resolution	12 bit (1 to 4,096)
Conversion Method	Successive Approximation
Input Type	Differential
Max. Common Mode Voltage	$\pm 750V$ peak continuous transformer isolation
Noise Rejection Ratio	Common mode: -100dB @ 60Hz
Active Low-pass Filtering	-3dB at 20Hz, -12 dB per octave
Input Impedance	$250 \pm 0.1\%$, 1/2W current input 200K voltage point
Absolute Maximum Ratings	-45mA to +45mA, current input $\pm 100V$ voltage input
Conversion Time	1mS per selected channel
Linearity Error	unipolar ± 1 count (0.025% of full scale) max. bipolar ± 2 counts (0.025% of full scale) max.
Full Scale Calibration Error	± 8 counts maximum ($V_{in} = 20mA$)
Offset Calibration Error	± 8 counts maximum ($V_{in} = 4mA$)

PLC Update Rate	1 channel per scan
Digital Input Points Required	16 (X) input points (12 binary data bits, 4 active channel indicator bits)
Accuracy vs. Temperature	± 100 ppm/°C maximum full scale (including maximum offset)
Base Power Required 5V	270mA
External Power Supply	24VDC, $\pm 10\%$, 120 mA, class 2
Recommended Fuse	0.032 A, Series 217 fast-acting, current inputs
Operating Temperature	32° to 140°F (0 to 60°C)
Accuracy vs. Temperature	± 100 ppm/°C maximum full scale (including maximum offset)
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 4,096).
NOTE 1: Shields should be grounded at signal source
NOTE 2: Unused channels should have V & C & R of the channels jumpered

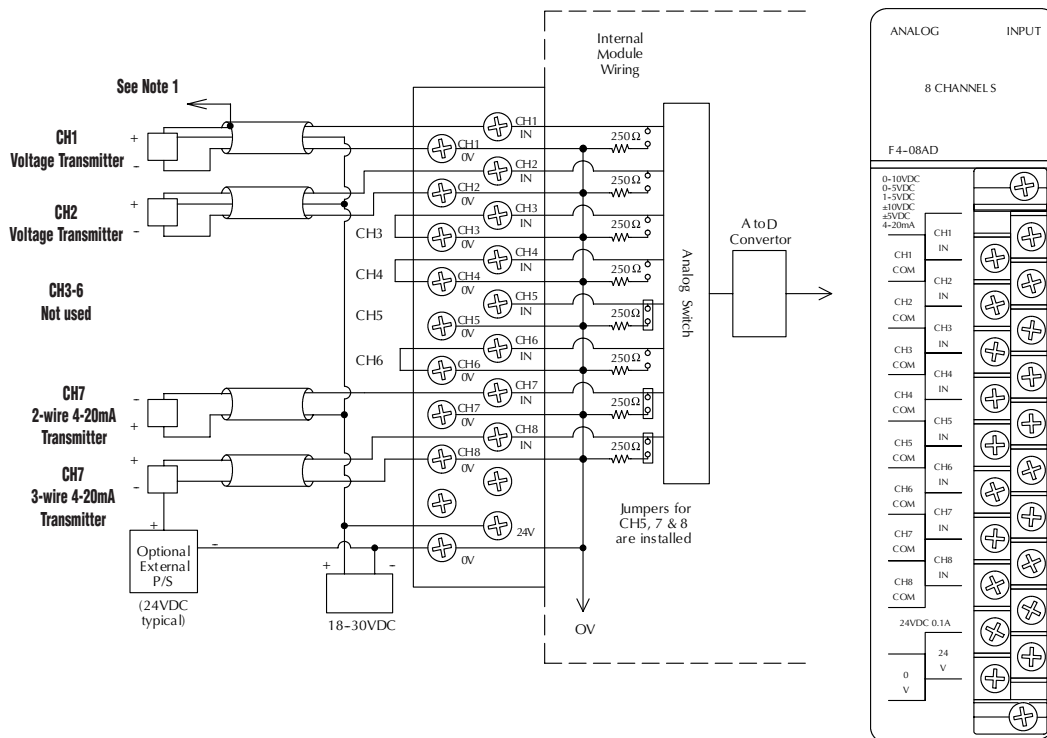


ANALOG INPUT MODULES

F4-08AD 8-Channel Analog Input	
Number of Channels	8, single ended (one common)
Input Ranges	0-5V, 0-10V, 1- 5V, $\pm 5V$, $\pm 10V$ 0-20mA, 4- 20mA
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	$250 \pm 0.1\%$, 1/2VV current input >20M voltage input 1 M minimum
Absolute Maximum Ratings	-45mA to + 45mA, current input -75V to +75V, voltage input
Conversion Time	0.4ms per channel (module conversion) 1 ms 0 per selected channel minimum (CPU)
Linearity Error (End to End)	± 1 count (0.025% of full scale) max.
Input Stability	$\pm 1/2$ count
Full Scale Calibration Error (Offset error not included)	± 12 counts voltage input ± 12 counts max. @ 20mA current input
Offset Calibration Error	± 2 counts max., unipolar voltage input ± 4 counts max., bipolar voltage input, ± 4 counts max., 4mA current input

PLC Update Rate	1 channel per scan min., 8 per scan, max.
Digital Input Points Required	16 (X) input points (12 binary data bits, 3 active channel bits, 1 bit unused)
Base Power Required 5V	75mA
External Power Supply	18-30VDC, 120mA, class2
Recommended Fuse	0.032 A, Series 217 fast-acting, current inputs
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
NOTE 2: Unused channels should be connected to 0V or have current jumpers installed
More than one external power supply can be used (see channel 8)
A Series 217, 0.032A, fast-acting fuse is recommended for 4-20mA current loops.
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. To avoid "ground loop" errors, recommended 4-20mA transmitter types are:
2 or 3 wire: Isolation between input signal and power supply.
4 wire: Isolation between input signal, power supply and 4-20mA output.





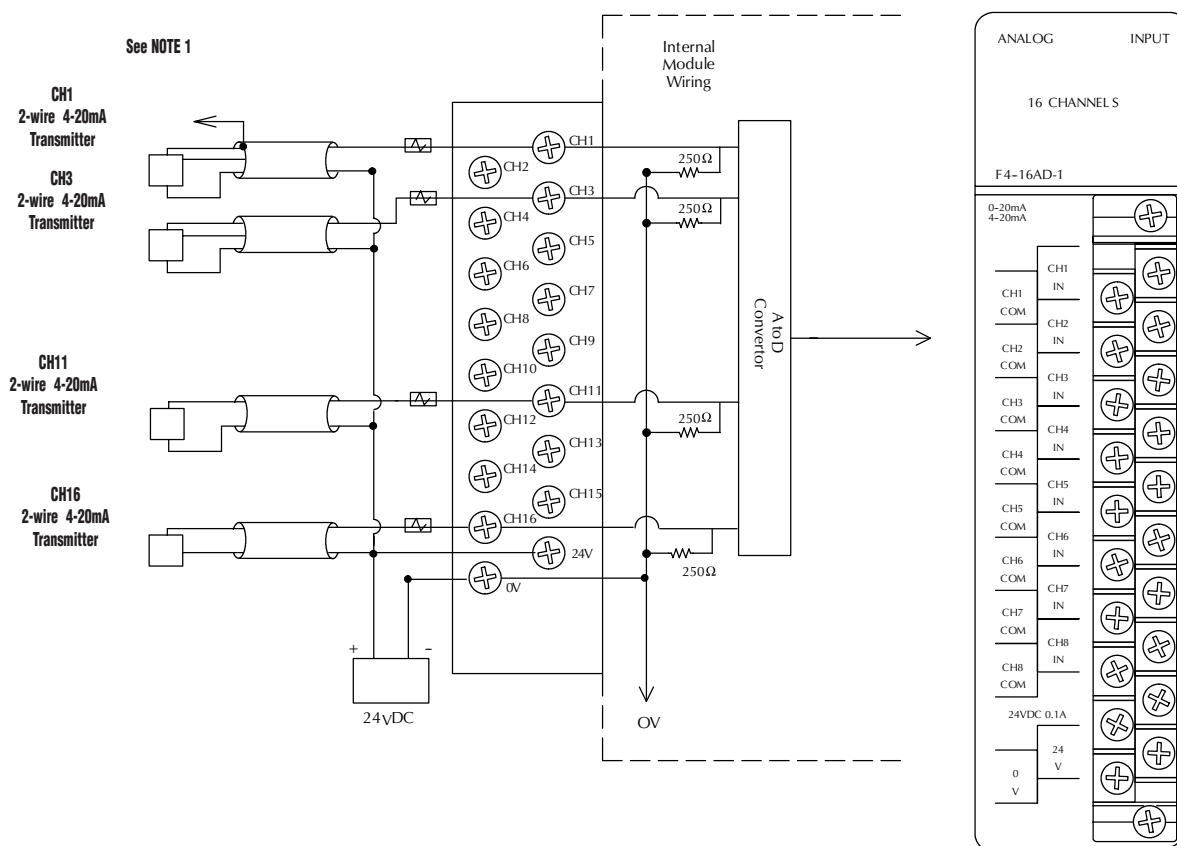
ANALOG INPUT MODULES

F4-16AD-1 16-Channel Analog Input	
Number of Channels	16, single ended (one common)
Input Ranges	0-20mA, 4-20mA
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	250 $\pm$ 0.1%, 1/2W current input >20M voltage input 1 M minimum
Absolute Maximum Ratings	-45mA to + 45mA, current input -75V to +75V, voltage input
Conversion Time	2mS per channel (module conversion)
Linearity Error (End to End)	$\pm$ 2 count (0.025% of full scale) max.
Input Stability	$\pm$ 1 count
Full Scale Calibration Error (Offset error not included)	$\pm$ 12 counts max. @ 20mA current input
Offset Calibration Error	$\pm$ 3 counts max., 4mA current 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
External Power Supply	21.6-26.4VDC, 10 0mA, class2
Recommended Fuse	0.032 A, Series 217 fast-acting, current inputs
Operating Temperature	32° to 140°F (0 to 60°C)
Accuracy vs. Temperature	$\pm$ 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
A Series 217, 0.032A, fast-acting fuse is recommended for 4-20mA current loops.
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. To avoid "ground loop" errors, recommended 4-20mA transmitter types are:

2 or 3 wire:	Isolation between input signal and power supply.
4 wire:	Isolation between input signal, power supply and 4-20mA output.



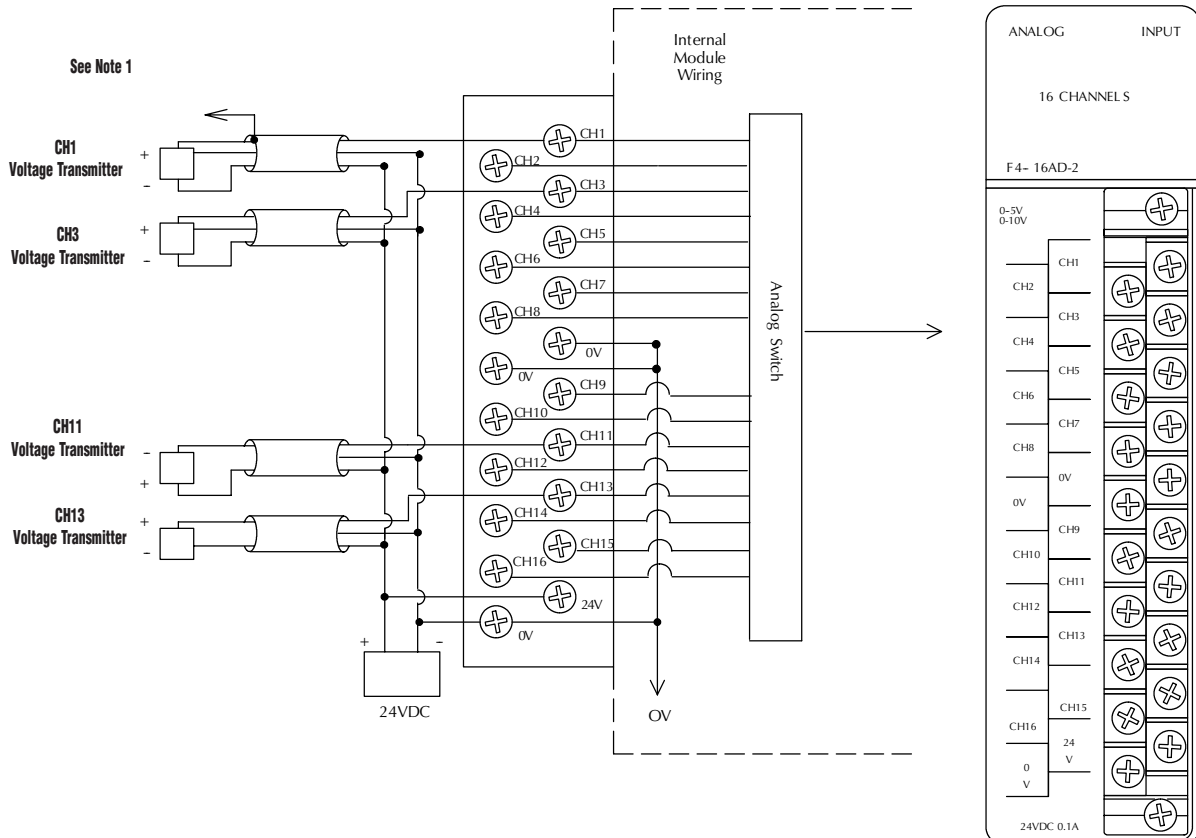
ANALOG INPUT MODULES

F4-16AD-2 16-Channel Analog Input

Number of Channels	16, single ended (one common)
Input Ranges	0-5V, 0-10V,
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	1M minimum
Absolute Maximum Ratings	130VAC/100VDC,
Conversion Time	0.4mS per channel (module conversion) 2 ms 0 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
External Power Supply	21.6-26.4VDC, 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.





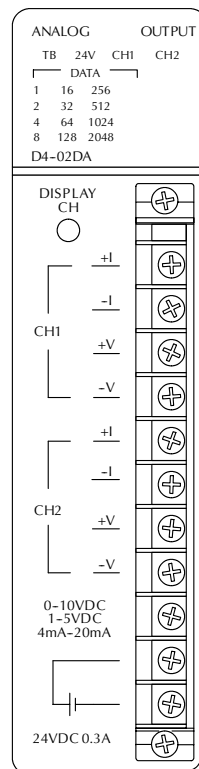
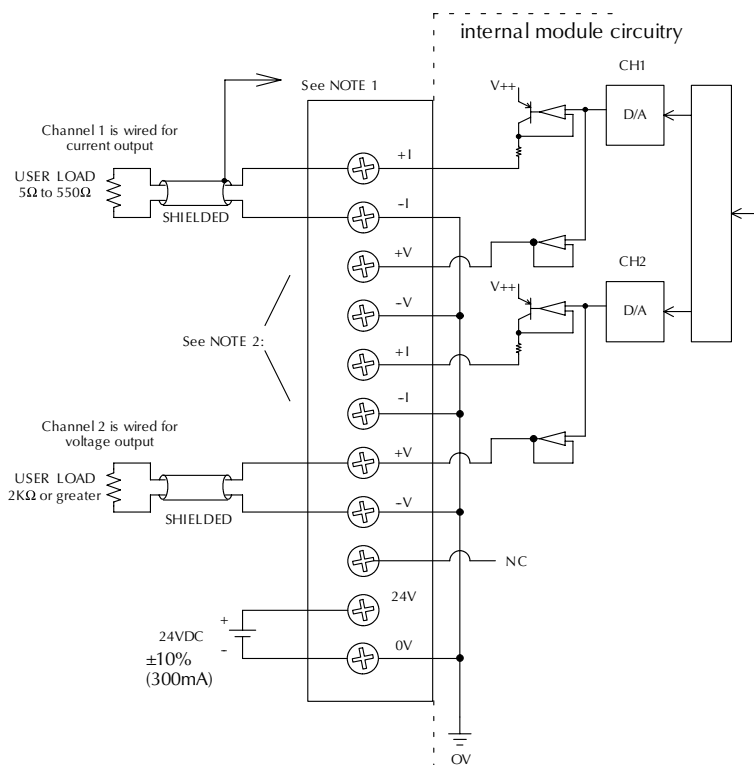
ANALOG OUTPUT MODULES

D4-02DA 2-Channel Analog Output

Number of Channels	2 (independent)
Output Ranges	0-10V, 1-5V, 4-20 mA
Channels Individually Configurable	Range determined by field wiring connections used
Resolution	12 bit (1 to 4096)
Output Type	Single ended
Output Impedance	0.5 maximum, voltage output
Output Current	5 mA maximum, voltage output
Load Impedance	550ohm maximum, 5.0 minimum, current output 2Kohm minimum, voltage output
Linearity	± 0.1% maximum
Accuracy vs Temperature	± 70 ppm/°C maximum
Maximum Inaccuracy	± 0.2% maximum at 25°C
Conversion Method	Integration
Conversion Time	Start of scan, 30µS + one scan

PLC Update Rate	1 or 2 channels per scan
Digital Output Points Required	32 (Y) Output points (12 binary data bits times 2, eight unused bits.)
Base Power Required 5V	250mA
External Power Supply	24VDC, ± 10%, 300 mA, class2
Operating Temperature	32° to 140°F (0 to 60°C)
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
Insulation Resistance	10M, 500 VDC
Noise Immunity	NEMA ICS3-304

NOTE 1: Shields should be connected to the 0V of the module or to the 0V of the power supply
NOTE 2: Unused voltage & current outputs should remain open (no connections)



ANALOG OUTPUT MODULES

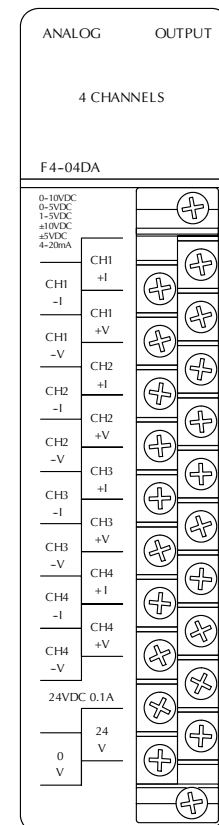
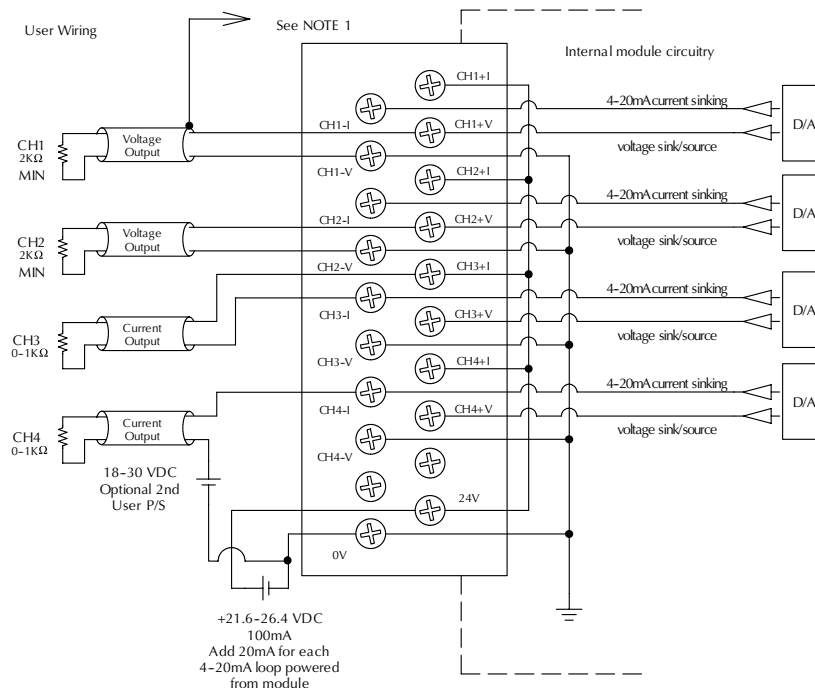
F4-04DA 4-Channel Analog Output

Number of Channels	4
Output Ranges	0-5V, 0-10V, 4-20 mA
Channels Individually Configurable	Yes*
Resolution	12 bit (1 to 4,096)
Conversion Method	Successive approximation
Output Type	Single ended, 1 common
Output Impedance	0.2 typical, voltage output
Load Impedance	2Kohm minimum, voltage output 0ohm minimum, current output
Maximum Load/Power Supply	680/18V, 1Kohm/24V, 1.5K/36V, current output
Voltage Output Current	5mA sink or source
Short-circuit Current	15mA typical, voltage output
Linearity Error	± 0.1 count (± 0.25%) maximum
Gain Calibration Error	± 8 counts max., voltage output -8 to +11 counts max., current output
Offset Calibration Error	± 2 counts max., voltage output -5 to +9 counts max., current output

Conversion Time	5µs max., settling time 0.3 ms max., digital out to analog out
Digital Output Points Required	16 (Y) output points (12 bits binary data and 4 channel select bits)
Base Power Required 5V	120 mA
External Power Supply	+24VDC (± 10%), 100 mA, class 2 (add 20 mA for each current loop used)
Accuracy vs. Temperature	± 50 ppm/°C maximum offset ±25 ppm/°C maximum full scale
Operating Temperature	32° to 140°F (0 to 60°C)
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
Insulation Resistance	10M, 500VDC
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 4,096).
NOTE 1: Shields should be grounded at the signal source
NOTE 2: Unused channels should be connected to 0V or have current jumpers installed

Note: The F4-04DA is not recommended for new applications. It is recommended that the F4-04DA-1 or F4-04DA-2 module be used.



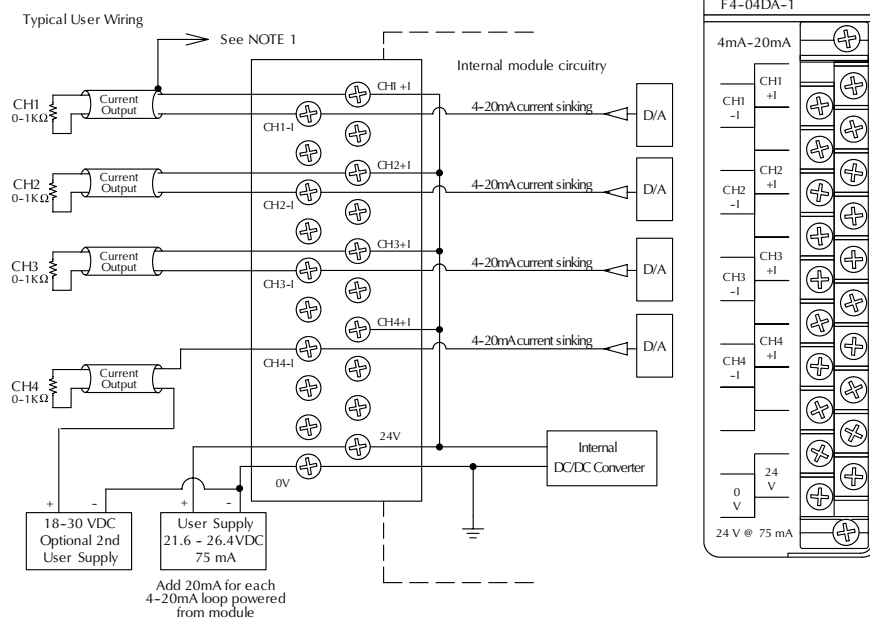


ANALOG OUTPUT MODULES

F4-04DA-1 4-Channel Analog Current Output	
Number of Channels	4, single-ended (one common)
Output Range	4-20 mA current
Resolution	12 bit (1 to 4095)
Output Type	Outputs sink 4-20mA from external supply
External Load Resistance	0 minimum
Maximum Loop Supply	30VDC
Peak Output Voltage	40VDC (clamped, transient suppressor)
Maximum Load/Power Supply	620/18V, 910ohm/24V, 1200/30V
Linearity Error (best fit)	± 1count (±0.025%) maximum
Gain Calibration Error	± 5 counts maximum
Offset Calibration Error	± 3 counts maximum
Maximum Inaccuracy	±0.1% @ 77° F (25° C) ±0.3% @ 32 to 140° F (0 to 60° C)
Conversion Time	100µs max., settling time 2.0 ms max., digital out to analog out

Digital Output Points Required	16 (Y) output points (12 bits binary data, 4 active channel bits)
Base Power Required 5V	70 mA
External Power Supply	21.6-26.4 VDC, 75 mA, class 2 (add 20 mA for each current loop used)
Accuracy vs. Temperature	± 57 ppm/°C full scale calibration range (including maximum offset change, 2 counts)
Operating Temperature	32° to 140°F (0 to 60°C)
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 4,096).
 NOTE 1: Shields should be connected to the 0V of the User Power Supply at the module terminal block.
 NOTE 2: Unused current outputs should remain open (no connections)



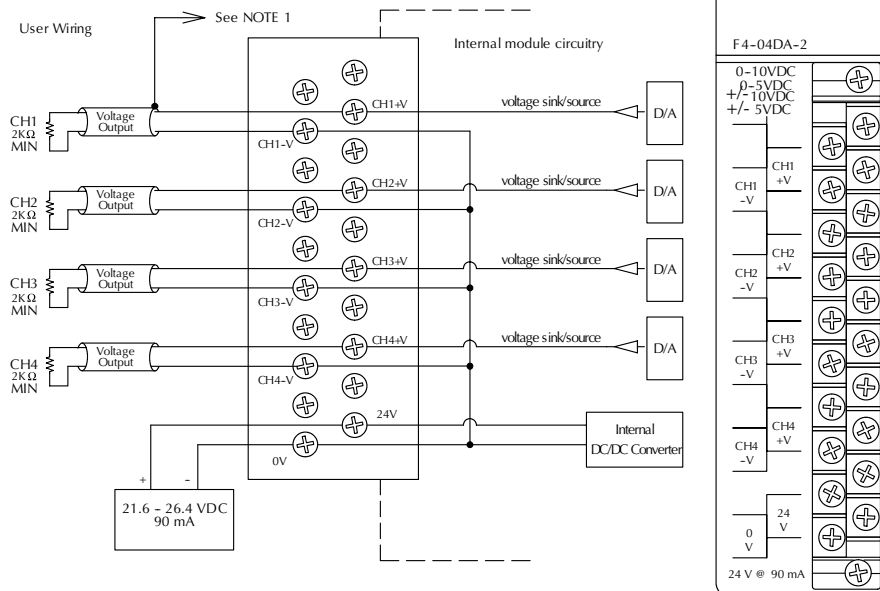
ANALOG OUTPUT MODULES

F4-04DA-2 4-Channel Analog Voltage Output

Number of Channels	4, single ended (one common)
Output Ranges	0-5V, 0-10V, $\pm 5V$, $\pm 10V$
Channels Individually Configurable	Yes
Resolution	12 bit (1 to 4,095)
Load Impedance	2K minimum
Load Capacitance	0.01 μ F maximum
Voltage Output Current	5.0mA sink or source
Short-circuit Current	15 mA typical
Linearity Error (End to End) and Relative Accuracy	± 1 count ($\pm 0.025\%$) maximum
Offset Calibration Error	± 3 counts maximum, unipolar ± 4 counts maximum, bipolar
Full Scale Calibration Error	± 8 counts maximum (offset error included)
Maximum Inaccuracy	$\pm 0.2\%$ @ 77° F (25° C) $\pm 0.4\%$ @ 32 to 140° F (0 to 60° C)

Conversion Time	5 μ s maximum, settling time 2.0 ms maximum, digital out to analog out
Digital Output Points Required	16 (Y) output points (12 bits binary data, 4 active channel bits or 2 active channel bits and 1 sign bit for bipolar)
Base Power Required 5V	90 mA
External Power Supply	21.6-26.4 VDC, 90 mA, class 2 (outputs fully loaded)
Accuracy vs. Temperature	± 57 ppm/ $^{\circ}$ C full scale calibration change (including maximum offset change, 2 counts)
Operating Temperature	32° to 140°F (0 to 60°C)
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 connected to the 0V of the module or the 0V of the P/S
NOTE 2: Unused voltage outputs should remain open (no connections)





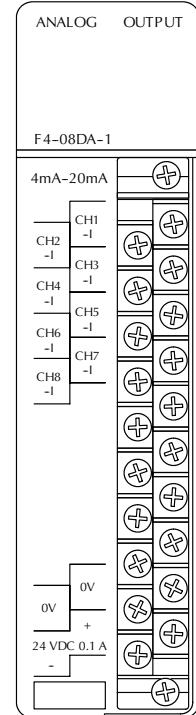
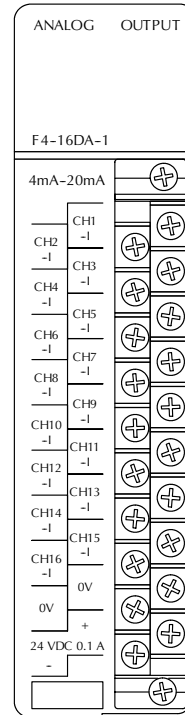
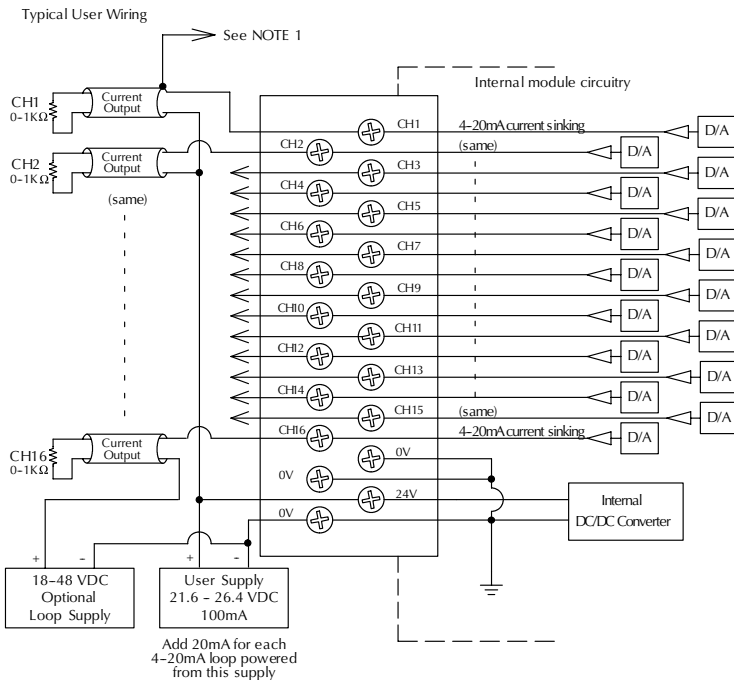
ANALOG OUTPUT MODULES

F4-08DA-1 8-Channel Analog Current Output F4-16DA-1 16-Channel Analog Current Output

Number of Channels F4-08DA-1 F4-16DA-1	8, single ended (one common) 16, single ended (one common)
Output Ranges	4-20mA current
Resolution	12 bit (1 to 4095)
Output Type	Outputs sink 4-20 mA from external supply
Peak Output Voltage	40VDC (no transient voltage suppression)
External Load Resistance	0-480 @ 18V, 220-740 @ 24V, 1550-1760 @ 48 V
Maximum Loop Supply	48VDC (with load resistance in proper range)
Crosstalk	-70dB, ± 1 count maximum
Linearity Error (End-to-End) & Relative accuracy	± 1 count maximum
Full Scale Calibration Error (offset error incl.)	± 8 counts max. (20.0 mA at 25° C)
Offset Calibration Error	± 3 counts max. (4.0 mA at 25° C)
Maximum Inaccuracy	$\pm 0.2\%$ @ 77° F (25° C) $\pm 0.4\%$ @ 32 to 140° F (0 to 60° C)

Conversion Time	400 μ s maximum, for full scale change 2.25 to 4.5 ms for digital out to analog out
Digital Output Points Required	F4-16DA-1 16 (Y) output points (12 bits binary data, 3 bits channel select, 1 bit output enable) F4-08DA-1 32 (Y) output points 2 sets each (12 bits binary data, 3 bits channel select, 1 bit output enable)
Base Power Required 5V	90 mA
External Power Supply	21.6-26.4 VDC, 100 mA, class 2 (add 20 mA for each current loop used)
Accuracy vs. Temperature	± 57 ppm/°C full scale calibration range (including maximum offset change, 2 counts)
Operating Temperature	32° to 140°F (0 to 60°C)
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 4,096).
NOTE 1: Shields should be connected to the 0V of the User Power Supply at the module terminal block.
NOTE 2: Unused current outputs should remain open (no connections)



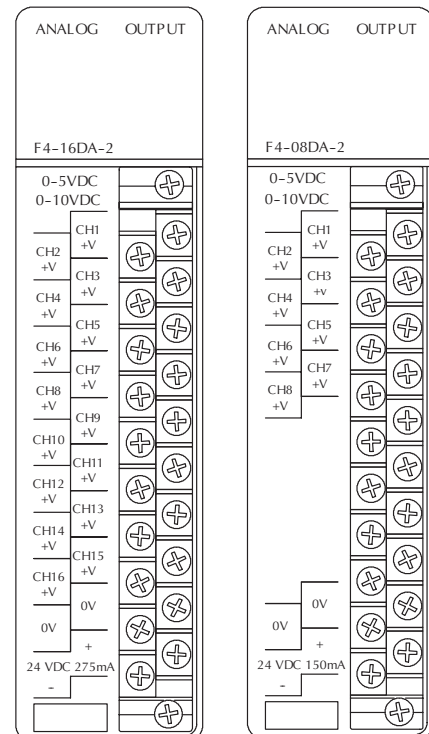
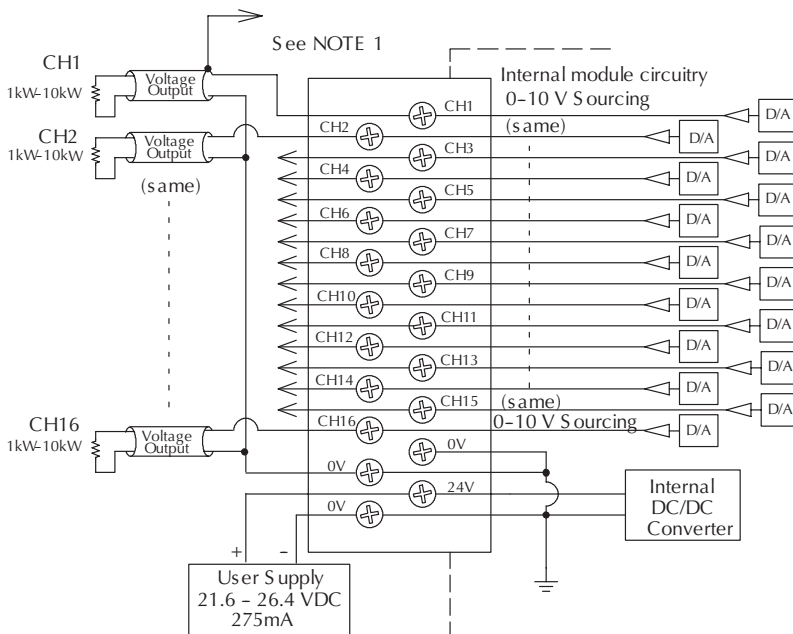
ANALOG OUTPUT MODULES

F4-08DA-2 8-Channel Analog Voltage Output F4-16DA-2 16-Channel Analog Voltage Output	
Number of Channels F4-08DA-2 F4-16DA-2	8, single ended (one common) 16, single ended (one common)
Output Range	0-5VDC, 0-10VDC
Resolution	12 bit (1 to 4095)
Output Type	Voltage Sourcing 10mA max.
External Load Resistance	1K max./10K min. (example: 10volts@ 1K = 10mA load)
Crosstalk	-70dB, ± 1 count maximum
Linearity Error (End-to-End) and Relative Accuracy	± 1 count maximum (10VDC at 25°C)
Full Scale Calibration Error (Offset Error Included)	± 6 counts max. (10VDC at 25°C)
Offset Calibration Error	± 3 counts max. (0VDC at 25°C)
Maximum Inaccuracy	$\pm 0.2\%$ @ 77°F (25°C) $\pm 0.4\%$ @ 32 to 140°F (0 to 60°C)

Conversion Time	400 μ s maximum, for full scale change 4.5 to 9 ms for digital out to analog out
Digital Output Points Required	F4-08DA-2 16 (Y) output points 12 bits binary data, 3 bits channel select, 1 bit output enable) F4-16DA-2 32 (Y) output points (two sets each of 12 bits binary data, 3 bits channel select, 1 bit output enable)
Power Budget Require	80mA @ 5VDC (base power)
External Power Supply	21.6-26.4VDC, 150mA, class 2
Accuracy vs. Temperature	± 57 ppm/°C full scale calibration range (including maximum offset change, 2 counts)
Operating Temperature	32° to 140°F (0 to 60°C)
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 4,096).
NOTE 1: Shields should be connected to the 0V of the User Power Supply at the module terminal block.

Typical User Wiring





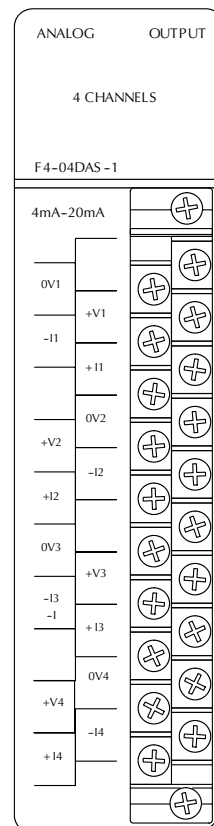
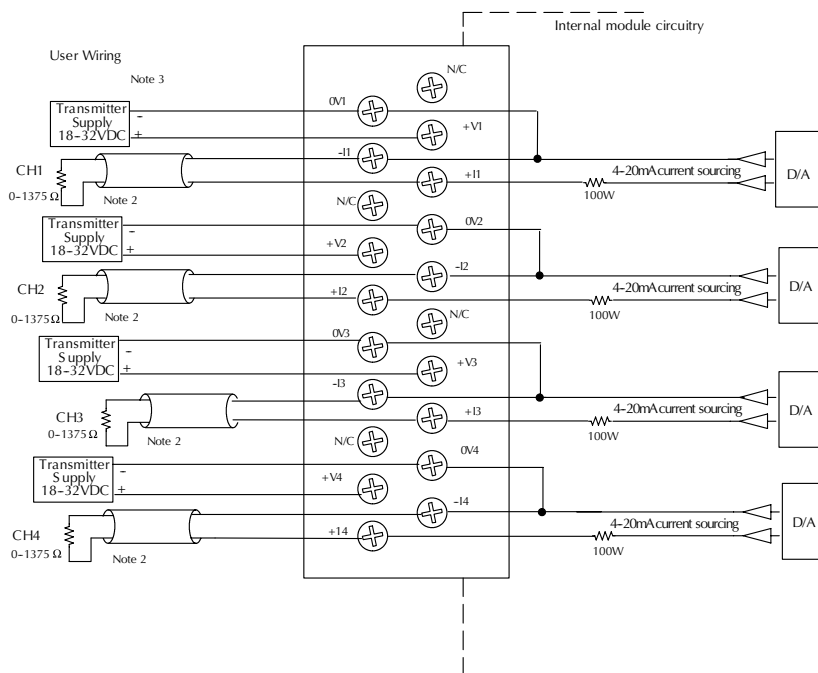
ANALOG OUTPUT MODULES

F4-04DAS-1 4-Ch. 4-20mA Isolated Analog Out

Number of Channels	4, isolated current sourcing
Output Range	4-20mA current
Resolution	16 bit (1 to 65536)
Output Type	Outputs source 4-20 mA from external supply
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Loop Supply	12-32VDC
Output Loop Compliance	V _{in} - 2.5V
Load Impedance	0-1375 Ω (@ 32V)
Maximum Load/Power Supply	375/12V, 975/24V, 1375/32V
PLC Update Rate	1 channel per scan min., 4 per scan max.
Digital Output Points Required	32 (Y) output points 16 binary data, 2 channel identification, 1bit output enable)
Power Budget Requirement	60mA @ 5VDC (supplied by base)
External Power Supply	50mA per channel

Linearity Error (End-to-End)	± 10 count maximum (0.015% of full scale)
Conversion Settling Time	3ms to 0.1% of full scale
Gain Calibration Error	± 32 counts (± 0.05%)
Offset Calibration Error	± 13 counts (± 0.02%)
Output Drift	50ppm/°C
Maximum Inaccuracy	±0.07% @ 77° F (25° C) ±0.18% @ 32 to 140° F (0 to 60° C)
Operating Temperature	0 to 60°C (32° to 140°F)
Storage Temperature	-20 to 70° C (-4 to 158°F)
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 65536).
NOTE 1: Shields should be connected to the 0V.
NOTE 2: Load must be within compliance voltage.
NOTE 3: For non-isolated outputs, connect all 0V's together (0V1...0V4) and connect all +V's together (+V1...+V4).



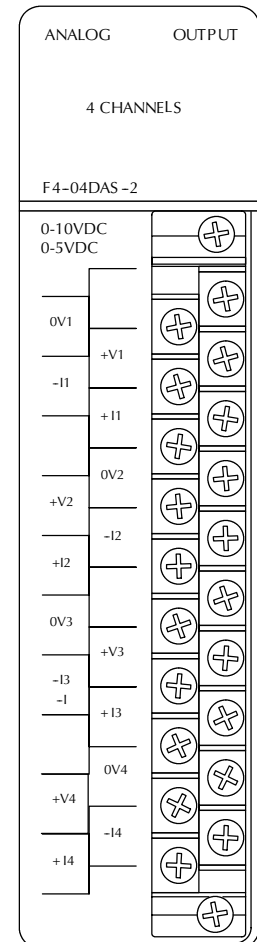
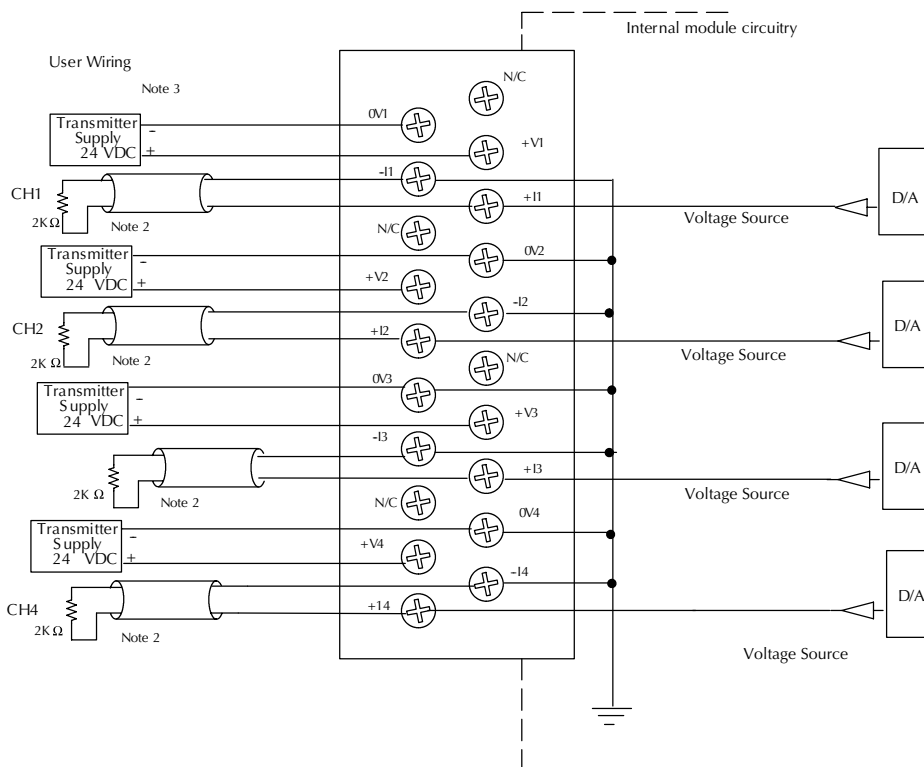
ANALOG OUTPUT MODULES

F4-04DAS-2 4-Channel 0-5V/10V Isolated Analog Output

Number of Channels	4, isolated
Output Range	0-5VDC, 0-10VDC
Resolution	16 bit (1 to 65536)
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Load Impedance	2k min
PLC Update Rate	1 channel per scan min., 4 per scan max.
Digital Output Points Required	16 data bits, 2 channel ID, 1 output enable 32 (Y) output points
Power Budget Requirement	60mA @ 5VDC (supplied by base)
External Power Supply	60mA per channel, 21.6VDC-26.4VDC

Linearity Error (End-to-End)	± 10 count maximum (0.015% of full scale)
Conversion Settling Time	3ms to 0.1% of full scale
Gain Calibration Error	± 32 counts (± 0.05%)
Offset Calibration Error	± 13 counts (± 0.02%)
Maximum Inaccuracy	±0.07% @ 77° F (25° C) ±0.18% @ 32 to 140° F (0 to 60° C)
Operating Temperature	0 to 60°C (32° to 140°F)
Storage Temperature	-20 to 70° C (-4 to 158°F)
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

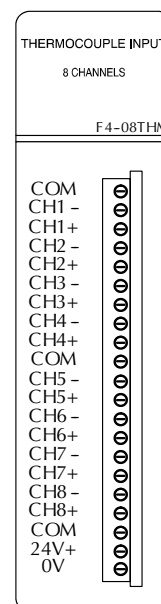
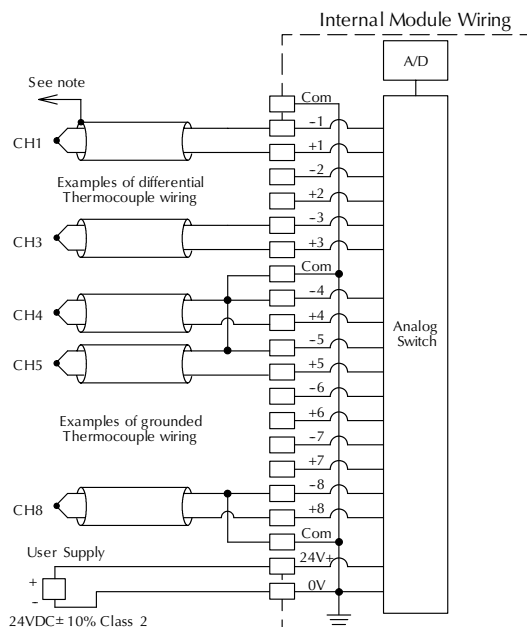
One count in the specification table is equal to one least significant bit of the analog data value (1 in 65536).
NOTE 1: Shields should be connected to the 0V.
NOTE 2: Load must be within compliance voltage.





TEMPERATURE INPUT MODULES

F4-08THM 8-Channel Thermocouple Input					
General Specifications		Thermocouple Specifications			
Number of Channels	8, differential	Input Ranges*	Type J	-190 to 760°C	-310 to 1400°F
Common Mode Range	± 5VDC		Type E	-210 to 1000°C	-346 to 1832°F
Common Mode Rejection	90dB min. @ DC, 150dB min. @ 50/60Hz.		Type K	-150 to 1372°C	-238 to 2502°F
Input Impedance	1M		Type R	65 to 1768°C	149 to 3214°F
Absolute Maximum Ratings	Fault-protected inputs to ± 50VDC		Type S	65 to 1768°C	149 to 3214°F
Accuracy vs. Temperature	± 5ppm/°C maximum full scale calibration (including maximum offset change)	Type T	-230 to 400°C	-382 to 752° F	
PLC Update Rate	8 channels per scan max	Type B	529 to 1820°C	984 to 3308°F	
Digital Inputs	16 binary data bits, 2 channel ID bits, 4 diagnostic bits	Type N	-70 to 1300°C	-94 to 2372°F	
Input Points Required	32 points (X) input module	Type C	65 to 2320°C	149 to 4208°F	
External Power Supply	60mA maximum, 18 to 26.4VDC	Display Resolution	± 0.1°C or ± 0.1°F		
Power Budget Requirements	110mA max., 5VDC (supplied to base)	Cold Junction Compensation	Automatic		
Operating Temperature	0° to 60°C (32° to 140°F)	Conversion Time	100ms per channel		
Storage Temperature	-20° to 70°C (-4° to 158°F)	Warn-Up Time	30 minutes typically ± 1°C repeatability		
Relative Humidity	5 to 95% (non-condensing)	Linearity Error (End to End)	± .05°C maximum, ± .01°C typical		
Environmental Air	No corrosive gases permitted	Maximum Inaccuracy	± 3°C (excluding thermocouple error)		
Vibration	MIL STD 810C 514.2	Voltage Input Specifications			
Shock	MIL STD 810C 516.2	Voltage Ranges	0-5V, ± 5V, 0-156.25mV, ± 156.25mVDC		
Noise Immunity	NEMA ICS3-304	Resolution	16 bit (1 in 65535)		
		Full Scale Calibration Error (Offset error Incl.)	± 13 counts typical, ± 33 maximum		
		Offset Calibration Error	± 1 count maximum, @ 0V input		
		Linearity Error (End to End)	± 1 count maximum		
		Maximum Inaccuracy	± 02% @ 25°C (77°F)		
		NOTE 1: Terminate shields at the respective signal source NOTE 2: Leave unused channels open (no connection) *Thermocouple type is selected by setting internal jumpers			



TEMPERATURE INPUT MODULES

F4-08THM-n-8-Channel Thermocouple Input

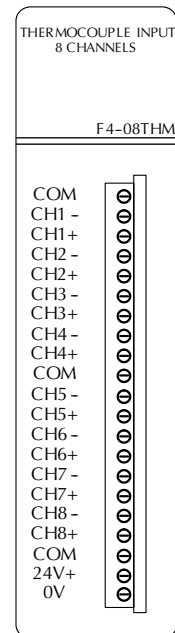
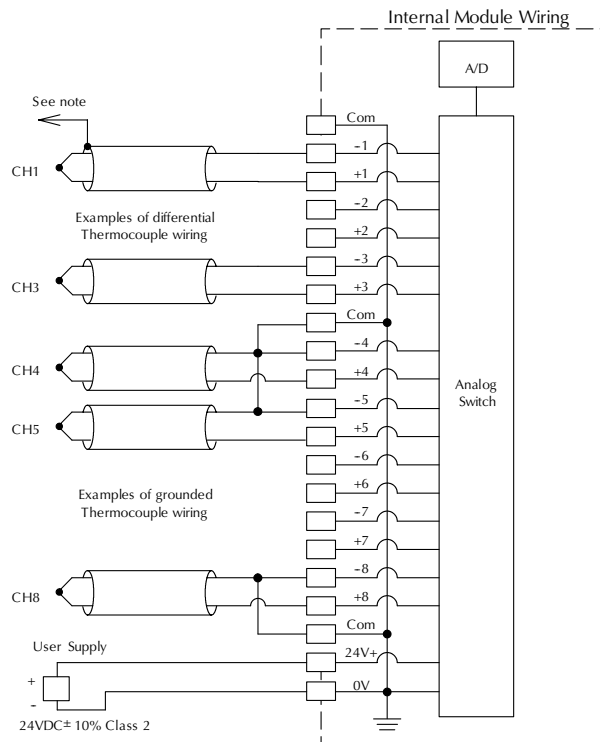
When you order the module, replace the "n" with the type of Thermocouple needed. For example, to order a Type J thermocouple module, order part number F4-08THM-J or part number F4-08THM-K for a Type K module.

Number of channels	8, differential inputs
Input Ranges	Type B 529/1820°C, 984/3308°F Type C 65/2320°C, 149/4208°F Type E -270/1000°C, -450/1832°F Type J -210/760°C, -350/1390°F Type K -270/1372°C, -450/2502°F Type R 0/1768°C, 32/3214°F Type S 0/1768°C, 32/3214°F Type T -270/400°C, -450/752°F -1: 0-50 mV -2: 0-100 mV -3: 0-25mV
Resolution	12 bit (1 in 4,096)
Input Impedance	27Kohm DC
Absolute Maximum Ratings	Fault protected input, 130 Vrms or 100VDC
Cold Junction Compensation	Automatic
Conversion Time	15ms per channel, minimum 1 channel per CPU scan
Converter Type	Successive Approximation, 574

Linearity Error	± 1 count (0.03% of full scale) maximum
Full Scale Calibration Error	± 0.35% of full scale
Maximum Inaccuracy*	± 1°C for type E, J, K, and T ± 3°C for type B, C, R, and S
PLC Update Rate	1 ch. per scan min., 8 per scan max.
Digital Input Points Required	16 (X) input points (12 binary data bits, 3 channel ID bits, 1 sign bit)
Base Power Required 5V	120 mA
External Power Supply	24VDC ±10%, 50 mA current
Operating Temperature	32 to 140°F (0 to 60°C)
Storage Temperature	-4 to 158°F (-20 to 70° C)
Accuracy vs Temperature*	57 ppm/°C maximum full scale
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

Note 1: Terminate shields at the respective signal source
Note 2: Leave unused channels open (no connection)

*Max. inaccuracy is not guaranteed for temperatures lower than:
-220°C for types E & T
-200°C for types J & K
+100°C for types R & S





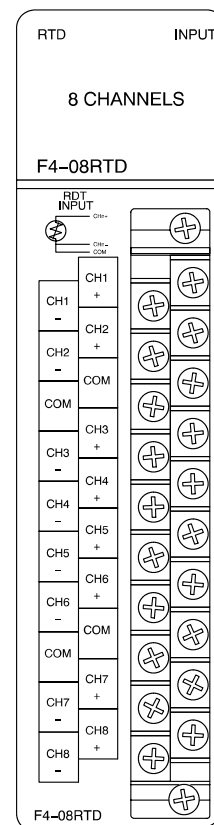
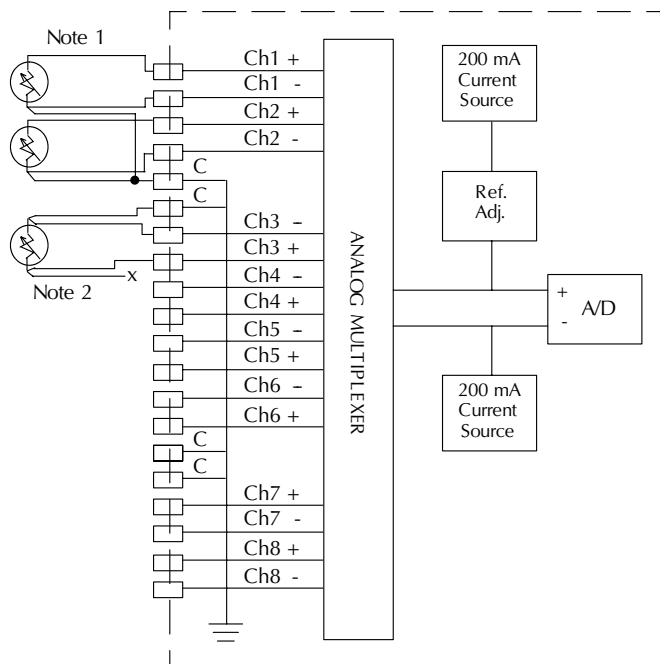
TEMPERATURE INPUT MODULES

F4-08RTD 8-Channel RTD Input	
Number of Channels	8
Input Ranges	Type Pt100: -200.0/850.0°C, -328/1562°F Type Pt1000: -200.0/595.0°C, -328/1103°F Type jPT100: -38.0/450.0°C, -36/842°F Type CU-10/25W: -200.0/260.0°C, -328/500°F
Resolution	16 bit (1 in 65535)
Input Impedance	27K DC
Display Resolution	± 0.1°C, ±0.1°F (±3276.7)
RTD Excitation Current	200µA
Input Type	Differential
Notch Filter	>100db notches at 50/60Hz -3db=13.1 Hz
Maximum Settling Time	100 msec (full-scale step input)
Common Mode Range	0-5Vdc

Absolute Maximum Ratings	Fault protected inputs to ±50Vdc
Converter Type	Charge Balancing
Linearity Error	± 1°C maximum, ±0.1°C typical
Full Scale Calibration Error	± 1°C
PLC Update Rate	1 ch. per scan min., 8 per scan max.
Digital Input Points Required	32 (X) input points (15 binary data bits, 3 channel ID bits, 1 sign bit, 8 fault bits)
Base Power Required 5V	80mA @ 5 VDC
Operating Temperature	32° to 140°F (0 to 60°C)
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

Notes:

1. the three wires connecting the RTD to the module must be the same type and length. Do not use the shield or drain wire for the third connection.
2. If a RTD sensor has 4 wires, the plus sense wire should be left unconnected as shown.



INSTRUCTION SET

Boolean Instructions		
Store (STR) Begins a new rung or an additional branch in a rung with a normally open contact. Store Not (STR NOT) Begins a new rung or an additional branch in a rung with a normally closed contact. Or (OR) Logically ors a normally open contact in parallel with another contact in a rung. Or Not (OR NOT) Logically ors a normally closed contact in parallel with another contact in a rung. And (AND) Logically ands a normally open contact in series with another contact in a rung. And Not (AND NOT) Logically ands a normally closed contact in series with another contact in a rung. And Store (AND STR) Logically ands two branches of a rung in series. Or Store (OR STR) Logically ors two branches of a rung in parallel. Out (OUT) Reflects the status of the rung (on/off) and outputs the discrete (on/off) state to the specified image register point or memory location. Or Out (OR OUT) Reflects the status of the rung and outputs the discrete (ON/OFF) state to the image register. Multiple OR OUT instructions referencing the same discrete point can be used in the program. Not (NOT) Inverts the status of the rung at the point of the instruction. Set (SET) An output that turns on a point or a range of points. The reset instruction is used to turn the point(s) OFF that were set ON with the set instructions. Reset (RST) An output that resets a point(s). Pause outputs (PAUSE) Disables the update for a range of specified output points.		
Comparative Boolean Instructions		
Store if Equal (STR E) Begins a new rung or additional branch in a rung with a normally open comparative contact. The contact will be on when $A=B$. Store if Not Equal (STR NOT E) Begins a new rung or additional branch in a rung with a normally closed comparative contact. The contact will be on when $A \neq B$. Or if Equal (OR E) Connects a normally open comparative contact in parallel with another contact. The contact will be on when $A=B$. Or if Not Equal (OR NOT E) Connects a normally closed comparative contact in parallel with another contact. The contact will be on when $A \neq B$. And if Equal (AND E) Connects a normally open comparative contact in series with another contact. The contact will be on when $A=B$. And if Not Equal (AND NOT E) Connects a normally closed comparative contact in series with another contact. The contact will be on when $A \neq B$. Store (STR) Begins a new rung or additional branch in a rung with a normally open comparative contact. The contact will be on when $A \geq B$. Store Not (STR NOT) Begins a new rung or additional branch in a rung with a normally closed comparative contact. The contact will be on when $A < B$. Or (OR) Connects a normally open comparative contact in parallel with another contact. The contact will be on when $A \geq B$. Or Not (OR NOT) Connects a normally open comparative contact in parallel with another contact. The contact will be on when $A < B$. And (AND) Connects a normally open comparative contact in series with another contact. The contact will be on when $A \geq B$. And Not (AND NOT) Connects a normally open comparative contact in series with another contact. The contact will be on when $A < B$.		
Bit of Word Boolean Instructions		
Store Bit of Word (STRB) DL450 Only Begins a new rung or an additional branch in a rung with a normally open contact that examines a single bit of a V-memory location. Store Not Bit of Word (STRNB) DL450 Only Begins a new rung or an additional branch in a rung with a normally closed contact that examines a single bit of a V-memory location. Or Bit of Word (ORB) DL450 Only Logically ors a normally open bit of word contact in parallel with another contact in a rung. Or Not Bit of Word (ORNB) DL450 Only Logically ors a normally closed bit of word contact in parallel with another contact in a rung. And Bit of Word (ANDB) DL450 Only Logically ands a normally open bit of word contact in series with another contact in a rung. And Not Bit of Word (ANDNB) DL450 Only Logically ands a normally closed bit of word contact in series with another contact in a rung. Out Bit of Word (OUTB) DL450 Only Reflects the status of the rung (on/off) and outputs the discrete (on/off) state to the specified bit of a V-memory location. Set Bit of Word (SETB) DL450 Only An output that turns on a single bit of a V-memory location. The bit remains on until it is reset. The reset bit of word instruction is used to turn off the bit. Reset Bit of Word (RSTB) DL450 Only An output that resets a single bit of a V-memory location.		
Differential Instructions		
Positive differential (PD) One-shot output coil. When the input logic produces an off to on transition, the output will energize for one CPU scan. Store Positive Differential (STRD) DL450 Only Leading edge triggered one-shot contact. When the corresponding memory location transitions from low to high, the contact comes on for one CPU scan. Store Negative Differential (STRND) DL450 Only Trailing edge triggered one-shot contact. When the corresponding memory location transitions from high to low, the contact comes on for one CPU scan. Or Positive Differential (ORD) DL450 Only Logically ors a leading edge triggered one-shot contact in parallel with another contact in a rung. Or Negative Differential (ORND) DL450 Only Logically ors a trailing edge triggered one-shot contact in parallel with another contact in a rung. And Positive Differential (ANDD) DL450 Only Logically ands a leading edge triggered one-shot contact in series with another contact in a rung. And Negative Differential (ANDND) DL450 Only Logically ands a trailing edge triggered one-shot contact in series with another contact in a rung.		
Immediate Instructions		
Store immediate (STR I) Begins a rung/branch of logic with a normally open contact. The contact will be updated with the current input field status when processed in the program scan. Store Not Immediate (STR NOT I) Begins a rung/branch of logic with a normally closed contact. The contact will be updated with the current input field status when processed in the program scan. Or Immediate (OR I) Connects a normally open contact in parallel with another contact. The contact will be updated with the current input field status when processed in the program scan. Or Not Immediate (OR NOT I) Connects a normally closed contact in parallel with another contact. The contact will be updated with the current input field status when processed in the program scan. And Immediate (AND I) Connects a normally open contact in series with another contact. The contact will be updated with the current input field status when processed in the program scan. And Not Immediate (AND NOT I) Connects a normally closed contact in series with another contact. The contact will be updated with the current input field status when processed in the program scan. Out Immediate (OUT I) Reflects the status of the rung. The output field device status is updated when the instruction is processed in the program scan. Or Out Immediate (OR OUT I) Reflects the status of the rung and outputs the discrete (ON/OFF) state to the image register. Multiple OR OUT instructions referencing the same discrete point can be used in the program. The output field device status is updated when the instruction is processed in the program scan.		
Set Immediate (SET I) An output that turns on a point or a range of points. The reset instruction is used to turn the point(s) off that were set. The output field device status is updated when the instruction is processed in the program scan. Reset Immediate (RST I) An output that resets a point or a range of points. The output field device status is updated when the instruction is processed in the program scan. Load Immediate (LDI) DL450 Only Loads the accumulator with the contents of a specified 16-bit V-memory location. The status for each bit of the specified V-memory location is loaded into the accumulator. Typically used for input module V-memory addresses. Allows you to specify the V location instead of the X location and the number of points as with the LDIF. Load immediate Formatted (LDIF) DL440&DL450 Only Loads the accumulator with a specified number of consecutive inputs. The field device status for the specified inputs points is loaded into the accumulator when the instruction is executed. Out Immediate (OUTI) DL450 Only Outputs the contents of the accumulator to a specified V-memory location. The status for each bit of the specified V-memory location will reflect the status of the lower 16 bits of the accumulator. Typically used for output module V-memory addresses. Allows you to specify the V location instead of the Y location and the number of points as with the OUTIF. Out immediate Formatted (OUTIF) DL440&DL450 Only Outputs the contents of the accumulator to a specified number of consecutive outputs. The output field devices are updated when the instruction is processed by the program scan.		
Timer, Counter, and Shift Register Instructions		
Timer (TMR) Single input incrementing timer with 0.1 second resolution (0-999.9 seconds). Fast Timer (TMRF) Single input incrementing timer with 0.01 second resolution (0-99.99 seconds). Accumulating Timer (TMRA) Two input incrementing timer with 0.1 second resolution (0-9999999.9 sec.). Time and enable/reset inputs control the timer. Accumulating Fast Timer (TMRAP) Two input incrementing timer with 0.01 second resolution (0-999999.99 sec.). Time input and enable/reset input control timer. Counter (CNT) Two input incrementing counter (0-9999). Count and reset inputs control the counter. Stage Counter (SGCNT) Single input incrementing counter (0-9999). RST instruction must be used to reset count. Up Down Counter (UDC) Three input counter (0-99999999). Up, down, and reset inputs control the counter. Shift Register (SR) Shifts data through a range of control relays with each clock pulse. The data, clock, and reset inputs control the shift register.		
Accumulator/Data Stack Load and Output Instructions		
Load (LD) Loads a 16 bit word into the lower 16 bits of the accumulator/stack. Load Double (LDD) Loads a 32 bit word into the accumulator/stack. Load Real Number (LDR) DL 450 Only Loads a real number contained in two consecutive V-memory locations or an 8-digit constant into the accumulator. Load Formatted (LDF) DL440 & DL 450 Only Loads the accumulator with a specified number of consecutive discrete memory bits. Load Address (LDA) Loads the accumulator with the HEX value for an octal constant (address). Load Accumulator indexed (LDX) Loads the accumulator with a V memory address to be offset by the value in the accumulator stack. Load Accumulator indexed from Data Constants (LD5X) DL440 & DL 450 Only Loads the accumulator with an offset constant value (ACON/NCN) from a data label area (DLBL). (Continued in next column)		
Accumulator/Data Stack Load and Output Instructions (Continued)		
Out (OUT) Copies the value in the lower 16 bits of the accumulator to a specified V memory location. Out Double (OUTD) Copies the value in the accumulator to two consecutive V memory locations. Out Formatted (OUTF) DL440 & DL 450 Only Outputs a specified number of bits (1-32) from the accumulator to the specified discrete memory locations. Out Least (OUTL) DL450 Only Copies the value in the lower 8 bits of the accumulator to the lower 8 bits of a specified V memory location. Out Most (OUTM) DL450 Only Copies the value in the upper 8 bits of the lower accumulator word (1st 16 bits) to the upper 8 bits of a specified V memory location. Output indexed (OUTX) Copies a 16 bit value from the first level of the accumulator stack to a source address offset by the value in the accumulator. Pop (POP) Moves the value from the first level of the accumulator stack to the accumulator and shifts each value in the stack up one level.		



INSTRUCTION SET

Accumulator Logic Instructions	Math Instructions	
And (AND) Logically ands the lower 16 bits in the accumulator with a V memory location. And Double (ANDD) Logically ands the value in the accumulator with two consecutive V memory locations. And Formatted (ANDF) DL440 & DL450 Only Logically ands the value in the accumulator and a specified range of discrete memory bits (1-32). And with Stack (ANDS) DL440 & DL450 Only Logically ands the value in the accumulator with the first value in the accumulator stack. Or (OR) Logically ors the lower 16 bits in the accumulator with a V memory location. Or Double (ORD) Logically ors the value in the accumulator with two consecutive V memory locations. Or Formatted (ORF) (DL440 & DL450 Only) Logically ors the value in the accumulator with a range of discrete bits (1-32). Or with Stack (ORS) (DL440 & DL450 Only) Logically ors the value in the accumulator with the first value in the accumulator stack. Exclusive Or (XOR) Performs an exclusive or of the value in the lower 16 bits of the accumulator and a V memory location. Exclusive Or Double (XORD) Performs an exclusive or of the value in the accumulator and two consecutive V memory locations. Exclusive Or Formatted (XORF) DL440 & DL450 Only Performs an exclusive or of the value in the accumulator and a range of discrete bits (1-32). Exclusive Or with Stack (XORS) DL440 & DL450 Only Performs an exclusive or of the value in the accumulator and the first accumulator stack location. Compare (CMP) Compares the value in the lower 16 bits of the accumulator with a V memory location. Compare Double (CMPD) Compares the value in the accumulator with two consecutive V memory locations or an 8-digit constant. Compare Formatted (CMPF) DL440 & DL450 Only Compares the value in the accumulator with a specified number of discrete bits (1-32). Compare with Stack (CMPS) Compares the value in the accumulator with the first accumulator stack location. Compare Real Number (CMPR) DL450 Only Compares the real number in the accumulator with two consecutive V memory locations or a real number constant.	Add (ADD) Adds a BCD value in the lower 16 bits in the accumulator with a V memory location. The result resides in the accumulator. Add Double (ADD D) Adds a BCD value in the accumulator with two consecutive V memory locations or an 8-digit constant. The result resides in the accumulator. Add Real Number (ADDR) DL450 Only Adds a real number in the accumulator with a real number constant or a real number contained in two consecutive V-memory locations. The result resides in the accumulator. Subtract (SUB) Subtract a BCD value in a V memory location from the lower 16 bits in the accumulator. The result resides in the accumulator. Subtract Double (SUBD) Subtracts a BCD value, which is either two consecutive V memory locations or a real number constant, from a value in the accumulator. The result resides in the accumulator. Subtract Real Number (SUBR) DL450 Only Subtract a real number, which is either two consecutive V memory locations or an 8-digit constant, from the real number in the accumulator. The result resides in the accumulator. Multiply (MUL) Multiplies a BCD value, which is either a V memory location or a 4-digit constant, by the value in the lower 16 bits in the accumulator. The result resides in the accumulator. Multiply Double (MULD) DL450 Only Multiplies a BCD value contained in two consecutive V memory locations by the value in the accumulator. The result resides in the accumulator. Multiply Real Number (MULR) DL450 Only Multiplies a real number, which is either two consecutive V memory locations or a real number constant, by the real number in the accumulator. The result resides in the accumulator. Divide (DIV) Divides a BCD value in the lower 16 bits of the accumulator by a BCD value which is either a V memory location or a 4-digit constant. The result resides in the accumulator. Divide Double (DIVD) DL440 & DL450 Only Divides a BCD value in the accumulator by a BCD value in two consecutive V memory locations. The result resides in the accumulator. Divide Real Number (DIVR) DL450 Only Divides a real number in the accumulator by a real number which is either two consecutive V memory locations or a real number constant. The result resides in the accumulator. (Continued in the next column)	Increment Binary (INCB) Increments a binary value in a specified V memory location by 1 each time the instruction is executed. Decrement Binary (DECB) Decrements a binary value in a specified V memory location by 1 each time the instruction is executed. Add Binary (ADDB) Adds the binary value in the lower 16 bits of the accumulator to a value which is either a V memory location or a 16 bit constant. The result resides in the accumulator. Add Binary Double (ADDBD) DL 440 & DL450 Only Adds the binary value in the accumulator to a value which is either two consecutive V memory locations or a 32 bit constant. The result resides in the accumulator. Subtract Binary (SUBB) Subtract a 16 bit binary value, which is either a V memory location or a 16 bit constant, from the lower 16 bits in the accumulator. The result resides in the accumulator. Subtract Binary Double (SUBBD) DL440 & DL450 Only Only Subtracts a 32 bit binary value, which is either two consecutive V memory locations or a 32 bit constant, from the value in the accumulator. The result resides in the accumulator. Multiply Binary (MULB) Multiplies a 16 bit binary value, which is either a V memory location or a 16 bits constant, by the lower 16 bits in the accumulator. The result resides in the accumulator. Divide Binary (DIVB) Divides the binary value in the lower 16 bits in the accumulator by a value which is either a V memory location or a 16 bit constant. The result resides in the accumulator. Add Formatted (ADDF) DL440 & DL450 Only Adds the BCD value in the accumulator to a value which is a range of discrete bits (1-32). The result resides in the accumulator. Subtract Formatted (SUBF) DL440 & DL450 Only Subtracts a BCD value which is a range of discrete bits (1-32) from the BCD value in the accumulator. The result resides in the accumulator. Multiply Formatted (MULF) DL440 & DL450 Only Multiplies a BCD value in the lower 16 bits in the accumulator by a BCD value which is a range of discrete bits (1-16). The result resides in the accumulator. (Continued below)

Math Instructions (continued)	Number of Conversion Instructions	Trigonometric Instructions
Divide Formatted (DIVF) DL440 & DL450 Only Divides the BCD value in the lower 16 bits in the accumulator by the BCD value which is a range of discrete bits (1-16). The result resides in the accumulator. Add Top of Stack (ADD S) Adds the BCD value in the accumulator with the BCD value in the first level of the accumulator stack. The result resides in the accumulator. Subtract Top of Stack (SUB S) Subtracts the BCD value in the first level of the accumulator stack from the BCD value in the accumulator. The result resides in the accumulator. Multiply Top of Stack (MUL S) Multiplies a 4-digit BCD value in the first level of the accumulator stack by a 4-digit BCD value in the accumulator. The result resides in the accumulator. Divide by Top of Stack (DIV S) Divides the 8-digit BCD value in the accumulator by the 4-digit BCD value in the first level of the accumulator stack. The result resides in the accumulator. Add Binary Top of Stack (ADDB S) DL440 & DL450 Only Adds the binary value in the accumulator with the binary value in the first accumulator stack location. The result resides in the accumulator. Subtract Binary Top of Stack (SUBB S) DL440 & DL450 Only Subtracts the binary value in the first level of the accumulator stack from the binary value in the accumulator. The result resides in the accumulator. Multiply Binary Top of Stack (MULB S) DL440 & DL450 Only Multiplies the 16 bit binary value in the first level of the accumulator stack by the 16 bit binary value in the accumulator. The result resides in the accumulator. Divide Binary Top of Stack (DIVB S) DL440 & DL450 Only Divide a value in the accumulator by the binary value in the top location of the stack. The accumulator contains the result. Increment (INC) Increments a BCD value in a specified v memory location by 1 each time the instruction is executed. Decrement (DEC) Decrements a BCD value in a specified V memory location by 1 each time the instruction is executed.	Binary (BIN) Converts the BCD value in the accumulator to the equivalent binary value. The result resides in the accumulator. Binary Coded Decimal (BCD) Converts the binary value in the accumulator to the equivalent BCD value. The result resides in the accumulator. Invert (INV) Takes the one's complement of the 32 bit value in the accumulator. The result resides in the accumulator. Ten's Complement (BCDCPL) Takes the ten's complement of the BCD value in the accumulator. The result resides in the accumulator. ASCII to HEX (ATH) DL440 & DL450 Only Converts a table of ASCII values to a table of hexadecimal values. HEX to ASCII (HTA) DL440 & DL450 Only Converts a table of hexadecimal values to a table of ASCII values. Segment (SEG) Converts a 4-digit HEX number in the accumulator to a corresponding bit pattern for interfacing to seven segment displays. The result resides in the accumulator. Gray code to BCD (GRAY) DL440 & DL450 Only Converts a 16 bit GRAY code value in the accumulator to a corresponding BCD value. The result resides in the accumulator. Shuffle digits (SFLDGT) DL440 & DL450 Only Shuffles a maximum of 8 digits, rearranging them in a specified order. The result resides in the accumulator. Binary to Real Number (BTOR) DL450 Only Converts the binary value in the accumulator into a real number. The result resides in the accumulator. Real to Binary (RTOB) DL450 Only Converts the real number in the accumulator into a binary value. The result resides in the accumulator. Radian Real Conversion (RADR) DL450 Only Converts the real degree value in the accumulator to the equivalent real number in radians. The result resides in the accumulator. Degree Real Conversion (DEGR) DL450 Only Converts the real radian value in the accumulator to the equivalent real number of degrees. The result resides in the accumulator.	Square Root Real (SQRT R) DL450 Only Takes the square root of the real number stored in the accumulator. The result resides in the accumulator. Sine Real (SINR) DL450 Only Takes the sine of the real number stored in the accumulator. The result resides in the accumulator. Cosine Real (COSR) DL450 Only Takes the cosine of the real number stored in the accumulator. The result resides in the accumulator. Tangent Real (TANR) DL450 Only Takes the tangent of the real number stored in the accumulator. The result resides in the accumulator. Arc Sine Real (ASINR) DL450 Only Takes the inverse sine of the real number stored in the accumulator. The result resides in the accumulator. Arc Cosine Real (ACOSR) DL450 Only Takes the inverse cosine of the real number stored in the accumulator. The result resides in the accumulator. Arc Tangent real (ATANR) DL450 Only Takes the inverse tangent of the real number stored in the accumulator. The result resides in the accumulator.

INSTRUCTION SET

Bit Operation Instructions	Table Instructions	Table Instructions (Continued)
Sum (SUM) Counts the number of bits in set to "1" in the accumulator. The HEX result resides in the accumulator. Shift Left (SHFL) Shifts the bits in the accumulator a specified number of places to the left. Shift Right (SHFR) Shifts the bits in the accumulator a specified number of places to the right. Rotate Left (ROTL) Rotates the bits in the accumulator a specified number of places to the left. Rotate Right (ROTR) Rotates the bits in the accumulator a specified number of places to the right. Set Bit (SETBIT) DL450 Only Sets a single bit (to a 1) in a V-memory location. Reset Bit (RSTBIT) DL450 Only Resets a single bit (to a 0) in a V-memory location. Encode (ENCO) Encodes the bit position set to 1 in the accumulator, and returns the appropriate binary representation in the accumulator. Decode (DECO) Decodes a 5 bit binary value (0-31) in the accumulator by setting the appropriate bit position to 1 in the accumulator.	Fill (FILL) Fills a table of specified V memory locations with a value which is either a V memory location or a 4-digit constant. Find (FIND) DL440 & DL450 Only Finds a value in a V memory table and returns the table position, containing the value, to the accumulator. Find Greater Than (FDGT) DL440 & DL450 Only Finds a value in a V memory table which is greater than the specified search value. The table position containing the value is returned to the accumulator. Find Block (FINDB) DL450 Only Finds a block of data values in a V memory table and returns the starting address of the table containing the values to the accumulator. Move (MOV) DL440 & DL450 Only Moves the values from one V memory table to another V memory table. Table To Destination (TTD) DL440 & DL450 Only Moves a value from the top of a V memory table to a specified V memory location. The table pointer increments each scan. Remove From Bottom (RFB) DL440 & DL450 Only Moves a value from the bottom of a V memory table to a specified V memory location. The table pointer decrements each scan. (Continued in next column)	Source To Table (STT) DL440 & DL450 Only Moves a value from a specified V memory location to a V memory table. The table pointer increments each scan. Remove From Table (RFT) DL440 & DL450 Only Pops a value from the top of a V memory table and stores it in a specified V memory location. The values in the V memory table are shifted up each time a value is moved. Add To Top of Table (ATT) DL440 & DL450 Only Pushes a value from a specified V memory location onto the top of a V memory table. All other values in the V memory table are shifted down each time a value is pushed onto the table. Table Shift Left (TSHFL) DL450 Only Shifts a specified number of bits to the left in a V-memory table. Table Shift Right (TSHFR) DL450 Only Shifts a specified number of bits to the right in a V-memory table. Move Block (MOVBLK) DL450 Only copies a specified number of words from a Data Label Area of program memory (ACON, NCON) to a V-memory area. Move Memory Cartridge/Load Label (MOVMC/DLDBL) DL440 & DL450 Only copies data between V memory and program ladder memory.
Program Control Instructions	Interrupt Instructions	Message Instructions
Goto/Label (GOTO/LBL) DL440 & DL450 Only Skips (does not execute) all instructions between the GOTO and the corresponding label (LBL) instruction. For/Next (FOR/NEXT) DL440 & DL450 Only Executes the logic between the FOR and NEXT instructions a specified number of times. Goto Subroutine/Subroutine Return Conditional/Subroutine Return (GTS/SBR w/RTC or RT) DL440 & DL450 Only When a GTS instruction is executed, the program jumps to the SBR (subroutine). The subroutine is terminated with an RT instruction (unconditional return). An RTC (conditional return) can be used in conjunction with the RT. When a conditional/unconditional return is executed, the program continues from the instruction after the calling GTS instruction. Master Line Set/Master Line Reset (MLS/MLR) Allows the program to control sections of ladder logic by forming a new power rail. The MLS marks the beginning of a power rail and the MLR marks the end of the power rail control.	Interrupt Routine/Interrupt Conditional/Interrupt Return (INT/IRTC/IRT) When a hardware or software interrupt has occurred, the interrupt routine will be executed. The INT instruction is the beginning of the interrupt routine. The interrupt routine is terminated with an IRT instruction (unconditional interrupt return). An IRTC (conditional interrupt return) can be used in conjunction with the IRT. When a conditional/unconditional interrupt return is reached, the execution of the program continues from the instruction where the program execution was prior to the interrupt. Enable Interrupt (ENI) Enables hardware and software interrupts to be acknowledged. Disable Interrupt (DISI) Disables hardware and software interrupts from being acknowledged.	Fault/Data Label (FAULT/DLDBL) DL440 & DL450 Only Displays a V memory value or a Data label constant to the handheld programmer or personal computer using DirectSOFT. Fault (FAULT) DL430 Only Display a V memory value to the handheld programmer or personal computer using DirectSOFT. Numerical Constant/ASCII constant (NCON/ACON) DL440 & DL450 Only Stores constants in numerical or ASCII form for use with other instructions. Print Message (PRINT) DL450 only Prints the embedded text or text / data variable message to the specified communications port. Maximum message length is 255 words.
Clock/Calendar Instructions	CPU Control Instructions	Intelligent I/O Instructions
Date (DATE) DL440 & DL450 Only Sets the date (year, month, day, day of the week) in the CPU calendar using two consecutive V memory locations. Time (TIME) DL440 & DL450 Only Sets the time (hour, seconds, and minutes) in the CPU using two consecutive V memory locations.	No Operation (NOP) Inserts a no operation coil at specified program address. End (END) Marks the termination point for the normal program scan. An End instruction is required at the end of the main program body. Stop (STOP) Changes the operational mode of the CPU from Run to Program (Stop). Break (BREAK) DL440 & DL450 Only Changes the operational mode of the CPU from Run to the Test Program mode. Reset Watchdog Timer (RSTWT) Resets the CPU watchdog timer.	Read from Intelligent Module (RD) Reads a block of data (1-128 bytes max.) from an intelligent I/O module. Write to Intelligent Module (WT) Writes a block of data (1-128 bytes max.) to an intelligent I/O module.
Network Instructions	RLL PLUS Programming Instructions	Drum Instructions
Read from network (RX) Reads a block of data from another CPU on the network. Write to network (WX) Writes a block of data from the master device to a slave device on the network.	Initial stage (ISG) The initial stage instruction is used for a starting point for user application program. The ISG instruction will be active on power up and PROGRAM to RUN transitions. Stage (SG) Stage instructions are used to create structured programs. They are program segments which can be activated or deactivated with control logic. Jump (JMP) Normally open coil that deactivates the active stage and activates a specified stage when there is power flow to the coil. Not Jump (NJMP) Normally closed coil that deactivates the active stage and activates a specified stage when there is no power flow to the coil. Converge Stages (CV) DL440 & DL450 Only Converge stages are a group of stages that when all stages are active the associated converge jump(s) (CVJMP) will activate another stage(s). One scan after the CVJMP is executed, the converge stages will be deactivated. Converge Jump (CVJMP) DL440 & DL450 Only Normally open coil that deactivates the active CV stages and activates a specified stage when there is power flow to the coil. Block Call/Block/Block End (BCALL w/BLK and BEND) DL440 & DL450 Only BCALL is a normally open coil that activates a block of stages when there is power flow to the coil. BLK is the label which marks the beginning of a block of stages. BEND is a label used to mark the end of a block of stages.	Timed Drum with Discrete Outputs (DRUM) DL450 Only Time driven drum with up to 16 steps and 16 discrete output points. Output status is written to the appropriate output during each step. Specify a time base per count (in milliseconds). Each step can have a different number of counts to trigger the transition to the next step. Also define preset step as destination when reset occurs. Time & Event Drum with Discrete Outputs (EDRUM) DL450 Only Time and/or event driven drum with up to 16 steps and 16 discrete output points. Output status is written to the appropriate output during each step. Specify a time base per count (in milliseconds). Each step can have a different number of counts and an event to trigger the counting. Once the time has expired, a transition to the next step occurs. Also define preset step as destination when reset occurs. Time & Event Drum with Discrete Outputs and Output Mask (MDRMD) DL450 Only Time and/or event driven drum with up to 16 steps and 16 discrete output points. Actual output status is the result of a bit-by-bit AND between the output mask and the bit mask in the step. Specify a time base per count (in milliseconds). Each step can have a different number of counts and an event to trigger the counting. Once the time has expired, a transition to the next step occurs. Also define preset step as destination when reset occurs. Time & Event Drum with Word Output & Output Mask (MDRMW) DL450 Only time and/or event driven drum with up to 16 steps and a single V-memory output location. Actual output word is the result of a bit-by-bit AND between the word mask and the bit mask in the step. Specify a time base per count (in milliseconds). Each step can have a different number of counts and an event to trigger the counting. Once the time has expired, a transition to the next step occurs. Also define preset step as destination when reset occurs.

DL405 PLC

Part Number	TI/Simatic	Page
DL405 CPUs		
D4-430	PPX:430-CPU	544
	425-CPU	
D4-430 CPU, 6.5K words total memory, (3.5K ladder - EEPROM, 3.0K V-memory), RLL/RLLPLUS programming, built-in RS232C programming port and aux RS232C/422 port, internal 110/220 VAC power supply (memory cartridge cannot be used to expand memory).		
D4-440	PPX:435-CPU	544
D4-440 CPU, 22.5K words total memory, (15.5K ladder - RAM, UVPR0M, or EEPROM, 7.0K V-memory) RLL/RLLPLUS programming, built-in RS232C programming port and auxiliary RS232C/RS422 port, internal 110/220 VAC power supply (requires memory cartridge)		
D4-440DC-1	PPX:435DC-CPU	537
D4-440DC-1 CPU, 22.5K words total memory, (15.5K ladder - RAM, UVPR0M, or EEPROM, 7.0K V-memory) RLL/RLLPLUS programming, built-in RS232C programming port and auxiliary RS232C/RS422 port, internal 24 VDC power supply (requires memory cartridge)		
D4-440DC-2	PPX:435DC1-CPU	537
D4-440DC-2 CPU, 22.5K words total memory, (15.5K ladder - RAM, UVPR0M, or EEPROM, 7.0K V-memory) RLL/RLLPLUS programming, built-in RS232C programming port and auxiliary RS232C/RS422 port, internal 125 VDC power supply (requires memory cartridge)		
D4-450		540
D4-450 CPU, 30.8K words total memory. 7.5K flash ladder memory on board or use optional memory cartridge for up to 15.5K ladder (RAM, UVPR0M, or EEPROM cartridges available). RLL/RLLPLUS programming including support for up to 16 PID loops and floating point math. Built-in communication ports including an RS232C programming port and auxiliary RS232C/RS422 ports. Internal 110/220 VAC power supply (memory cartridge is optional). NOTE: If the D4-450 is replacing a CPU in an existing system, and the system has specialty modules with an F4 part number, (CoPros, SDN, etc.) please contact our Technical Services group before ordering. These modules may require an upgrade to operate with the D4-450. (Does not apply to analog modules.)		
D4-450DC-1		537
D4-450DC-1 CPU, 30.8K words total memory. 7.5K flash ladder memory on board or use optional memory cartridge for up to 15.5K ladder (RAM, UVPR0M, or EEPROM cartridges available). RLL/RLLPLUS programming, with support for up to 16 PID loops and floating point math. Built-in comm ports including an RS232C programming port and auxiliary RS232C/RS422 ports, internal 24 VDC power supply (memory cartridge is optional).		
D4-450DC-2		537
D4-450DC-2 CPU, 30.8K words total memory. 7.5K flash ladder memory on board or use optional memory cartridge for up to 15.5K ladder (RAM, UVPR0M, or EEPROM cartridges available). RLL/RLLPLUS programming, with support for up to 16 PID loops and floating point math. Built-in comm ports including an RS232C programming port and auxiliary RS232C/RS422 ports, internal 125 VDC power supply (memory cartridge is optional).		
D3-D4-BAT		
DL330/340/DL405 CPU replacement battery		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		
DL405 Memory Cartridges		
D4-RAM-1	PPX:G-03M	544
CMOS RAM cartridge with battery, maximum program storage 7.5K		
D4-RAM-2		544
CMOS RAM cartridge with battery, maximum program storage 15.5K		
D4-UV-1	PPX:G-14M	544
UVPR0M cartridge, maximum program storage 7.5K		
D4-UV-2		544
UVPR0M cartridge, maximum program storage 15.5K		
D4-EE-2		544
EEPROM cartridge, maximum program storage 15.5K		
D4-MC-BAT	PPX:MC-BATT	
CMOS RAM Cartridge replacement battery		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		
DL405 Expansion Units and Cables		
D4-EX	PPX:405-IOEX	557
Local base expansion unit, includes 110/220 VAC power supply, requires local I/O expansion cable D4-EXCBL-1 or D4-EXCBL-2		
D4-EXDC	PPX:405DC-IOEX	557
Local base expansion unit, includes 24 VDC power supply, requires local I/O expansion cable D4-EXCBL-1 or D4-EXCBL-2		
D4-EXDC-2		557
Local base expansion unit, includes 125 VDC power supply, requires local I/O expansion cable D4-EXCBL-1 or D4-EXCBL-2		
D4-EXCBL-1		
Base expansion cable, 3.08 ft. (1m)		
D4-EXCBL-2	PPX:U-10J	
Base expansion cable, 1.54 ft. (0.5m)		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.



DL405 PLC

Part Number	TI/Simatic	Page
DL405 I/O Bases		
D4-04B-1	PPX:U-04B	556
<i>4 slot local or expansion base; allows specialty modules in expansion bases when used with D4-450 CPU.</i>		
D4-06B-1	PPX:U-06B	556
<i>6 slot local or expansion base; allows specialty modules in expansion bases when used with D4-450 CPU.</i>		
D4-08B-1	PPX:U-08B	556
<i>8 slot local or expansion base; allows specialty modules in expansion bases when used with D4-450 CPU.</i>		
D4-USER-M		
<i>DL405 CPUs are covered in the DL405 User Manual. Order manual separately.</i>		
Note: These bases are compatible with the listed TI/Simatic part number when the grounding jumper is installed.		
DL405 DC Input Modules		
D4-08ND3S	PPX:U-50N	586
<i>8 pt. input module 24-48 VDC, sink/source, 8 commons (isolated), removable terminal</i>		
D4-16ND2	PPX:U-05N	586
<i>16 pt. 12-24 VDC current sourcing input module, 2 commons (isolated), removable terminal</i>		
D4-16ND2F	PPX:U-05NH	587
<i>16 pt. 12-24 VDC current sourcing input module, fast response (1 ms), 2 commons (isolated), removable terminal</i>		
D4-32ND3-1	PPX:U-08N	588
<i>32 pt. 24 VDC current sinking/sourcing input module, 4 commons (isolated). Requires one connector, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)</i>		
D4-32ND3-2	PPX:U-38N	588
<i>32 pt. 5-12 VDC sinking/sourcing input module, 4 commons (isolated). Requires one connector, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)</i>		
D4-64ND2		589
<i>64 pt. 20-28 VDC sourcing input module, 8 commons (isolated). Requires two connectors, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)</i>		
D4-USER-M		
<i>DL405 CPUs are covered in the DL405 User Manual. Order manual separately.</i>		
DL405 AC Input Modules		
D4-08NA	PPX:U-20N	590
<i>8 pt. 110-220 VAC input module, 2 commons (isolated), removable terminal</i>		
D4-16NA	PPX:U-25N	590
<i>16 pt. 110 VAC input module, 2 commons (isolated), removable terminal</i>		
D4-16NA-1		591
<i>16 pt. 220 VAC input module, 2 commons (isolated), removable terminal</i>		
D4-USER-M		
<i>DL405 CPUs are covered in the DL405 User Manual. Order manual separately.</i>		
DL405 AC/DC Input Modules		
D4-16NE3	PPX:U-55N	591
<i>16 pt. 12-24 VAC/DC current sinking/sourcing input module, 2 commons (isolated), removable terminal</i>		
F4-08NE3S	405-8HDCN	592
<i>8 pt. 90-150 VAC/DC current sinking/sourcing isolated input module, 8 commons, removable terminal</i>		
D4-USER-M		
<i>DL405 CPUs are covered in the DL405 User Manual. Order manual separately.</i>		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.

DL405 PLC

Part Number	TI/Simatic	Page
DL405 DC Output Modules		
D4-08TD1	PPX:U-12T	593
8 pt. 12-24 VDC current sinking output module, 2 commons (internally connected), 2A/point, 5A/common, removable terminal		
F4-08TD1S	405-8HDCT	593
8 pt. 24-150VDC current sinking isolated output module, 4 commons (isolated), 2A/point, 12A/module, removable terminal		
D4-16TD1	PPX:U-15T	594
16 pt. 5-24 VDC current sinking output module, 2 commons (internally connected), 0.5A/point, 3A/common, removable terminal		
D4-16TD2	PPX:U-55T	594
16 pt. 12-24 VDC current sourcing output module, 2 commons (isolated), 0.5A/point, 3A/common, removable terminal		
D4-32TD1	PPX:U-18T	595
32 pt. 5-24 VDC current sinking output module, 4 commons (isolated), 0.2A/point, 1.6A/common. Requires one connector, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)		
D4-32TD1-1	PPX:U-38T	596
32 pt. 5/15 VDC current sinking output module, 4 commons (isolated), 0.2A/point, 1.6A/common. Requires one connector, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)		
D4-32TD2	PPX:U-58T	596
32 pt. 12-24 VDC current sourcing output module, 4 commons (isolated), 0.2A/point, 1A/common. Requires one connector, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)		
D4-64TD1		597
64 pt. 5-24 VDC current sinking output module, 8 commons (isolated). Requires two connectors, sold separately. NOTE: Recommended pre-wired Ziplink connector cable for this I/O Module is part number ZL-4CBL4#; where # designates either 0.5, 1, or 2 meter cable lengths. Accessory cable connector module for ZL-4CBL4# cable is part number ZL-CM40. (Or build a custom cable with D4-IO3264R, D4-IO3264S or D4-IOCBL-1.)		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		
DL405 AC Output Modules		
D4-08TA	PPX:U-20T	598
8 pt. 18-220 VAC output module, 2 commons (isolated), 2A/point, 5A/common, removable terminal		
D4-16TA	PPX:U-25T	598
16 pt. 18-220 VAC output module, 2 commons (isolated), 0.5A/point, 3A/common, removable terminal		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		
DL405 Relay Output Modules		
D4-08TR	PPX:U-01T	599
8 pt. 5-30 VDC or 5-250 VAC output module, 8 Form A (SPST) relays, 2 commons (isolated), 2A/point, 5A/common, removable terminal.		
F4-08TRS-1	405-9RLY-I	599
8 pt. 12-30 VDC or 12-250 VAC isolated output module, 4 Form A (SPST) and 4 Form C (SPDT) relays, 8 commons (isolated), 10A/point, 40A/module, removable terminal.		
F4-08TRS-2	405-8RLY-I	600
8 pt. 12-30 VDC or 12-250 VAC isolated output module, 4 Form A (SPST) relays and 4 Form C (SPDT) relays, 8 commons (isolated), 5A/point, 40A/module, replaceable fuses, removable terminals.		
D4-16TR	PPX:U-05T	600
16 pt. 5-30 VDC or 5-250 VAC output module, 8 Form A (SPST) relays, 2 commons (isolated), 1A/point, 5A/common, removable terminals.		
D4-USER-M		
DL405 CPUs are covered in the DL405 User Manual. Order manual separately.		
DL405 Analog Modules		
F4-04AD		601
4 channel analog input module, 12 bit resolution, ranges: 0 - 5V, -5V to +5V, 1 - 5V, 0 - 10V, -10V to +10V, 4 - 20 mA, 0 - 20 mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-04ADS	405-4ADC-S	602
4 channel isolated analog input module, 12 bit resolution, ranges: 0 - 5V, 0 - 10V, 1 - 5V, -5V to +5V, -10V to +10V, 0 - 20mA, 4 - 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-08AD	405-8ADC	603
8 channel analog input module, 12 bit resolution, ranges: 4 to 20mA, 1 to 5V, 0 to 20mA, 0 to 5V, 0 to 10V, -5V to +5V, -10V to +10V. Designed to operate with 24 VDC user-supplied power supply.		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.



DL405 PLC

Part Number	TI/Simatic	Page
DL405 Analog Modules con't		
F4-16AD-1		604
16 channel analog input module, 12 bit resolution, range: 4 to 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-16AD-2		605
16 channel analog input module, 12 bit resolution, ranges: 0-5V, 0-10V. Designed to operate with 24 VDC user-supplied power supply.		
D4-02DA	PPX:U-01DA	606
2 channel analog output module, 12 bit resolution, ranges: 1 to 5V, 0 to 10V, 4 to 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-04DA	405-4DAC-2	607
limited availability		
4 channel analog output module, 12 bit resolution, ranges: 4 to 20 mA, 0 to 5V, 0 to 10V, -5V to +5V, -10V to +10V. Not recommended for new development; use F4-04DA-1 or F4-04DA-2. Designed to operate with 24 VDC user-supplied power supply.		
F4-04DA-1		608
4 channel analog output module, 12 bit resolution, range: 4 to 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-04DA-2		609
4 channel analog output module, 12 bit resolution, ranges: 0 to 5V, 0 to 10V, -5V to +5V, -10V to +10V. Designed to operate with 24 VDC user-supplied power supply.		
F4-04DAS-1		612
4 channel analog output module, 16 bit resolution, isolated, range: 4 to 20mA current sourcing. Designed to operate with either 12 VDC or 24 VDC user-supplied power supply.		
F4-04DAS-2		613
4 channel analog output module, 16 bit resolution, isolated, range: 0-5V, 0-10V. Designed to operate with 24 VDC user-supplied power supply.		
F4-08DA-1		610
8 channel analog output module, 12 bit resolution, range: 4 to 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-08DA-2		611
8 channel analog output module, 12 bit resolution, range: 0-5V or 0-10V. "Designed to operate with 24 VDC user-supplied power supply.		
F4-16DA-1		610
16 channel analog output module, 12 bit resolution, range: 4 to 20mA. Designed to operate with 24 VDC user-supplied power supply.		
F4-16DA-2		611
16 channel analog output module, 12 bit resolution, range: 0-5V or 0-10V. Designed to operate with 24 VDC user-supplied power supply.		
F4-08RTD		616
8 channel RTD input module, 1 degree C resolution, supports: Pt100, jPt100, Cu10, Cu25, and Pt1000. zno user power supply required.		
F4-08THM		614
8 channel differential thermocouple module, built-in cold junction compensation, linearization, and burn-out indication. .1°C resolution. Can replace all other THM modules; thermocouple type selection is set by jumpers (supports J, E, K, R, S, T, B, N, C). Also supports 0-5VDC, -5 to +5VDC, 0-156mVDC, -156 to +156mVDC at 16-bit resolution. Designed to operate with 24 VDC user-supplied power supply.		
F4-08THM-J	405-8THM-n	615
J type 8 channel differential thermocouple module, built-in cold junction compensation, linearization, and burn-out indication. Direct indication in degrees C or degrees F over the full range. (Additional thermocouple types and millivolt ranges available as special order.) Designed to operate with 24 VDC user-supplied power supply.		
F4-08THM-K	405-8THM-n	615
K type 8 channel differential thermocouple module, built-in cold junction compensation, linearization, and burn-out indication. Direct indication in degrees C or degrees F over the full range. (Additional thermocouple types and millivolt ranges available as special order.) Designed to operate with 24 VDC user-supplied power supply.		
D4-ANLG-M		
All DL405 Analog I/O modules, including the Thermocouple Input, are covered in the DL405 Analog I/O Manual. Order separately.		
DL405 Remote I/O		
D4-RM	PPX:405-LIC	562
Remote I/O Master module, remote I/O system is one master (D4-RM) and up to seven slaves (D4-RS) non-removable terminals, uses shielded twisted pair (24 AWG minimum)		
D4-RS	PPX:405-RIC	562
Remote I/O slave unit (used with D4-RM), includes 110/220 VAC power supply, uses shielded twisted pair (24 AWG minimum)		
D4-RSDC	PPX:405DC-RIC	562
Remote I/O slave unit (used with D4-RM), includes 24 VDC power supply, uses shielded twisted pair (24 AWG minimum)		
D4-REMIO-M		
DL405 Remote I/O components are covered in the DL405 Remote I/O Manual. Order separately.		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.

DL405 PLC

Part Number	TI/Simatic	Page
DL405 Slice Remote I/O		
D4-SM	PPX:U-03RM	564
<i>Slice I/O master module, Slice I/O system is one master (D4-SM) and 15 slice I/O slaves (D4-SS-xx) max, uses DL405 CPU system power, no external power supply needed</i>		
D4-SS-88	PPX:U-03RS-NT1	565
<i>Slice I/O slave with 8 pt. 12-24 VDC current sourcing inputs and 8 pt. 5-24 VDC current sinking outputs, 0.5A/point, non-removable terminals, uses shielded twisted pair (24 AWG minimum). Designed to operate with 24 VDC user-supplied power supply.</i>		
D4-SS-106	PPX:U-03RS-NT2	566
<i>Slice I/O slave with 10 pt. 12-24 VDC current sourcing inputs and 6 pt. 5-24 VDC current sinking outputs, 0.5A/point, non-removable terminals, uses shielded twisted pair (24 AWG minimum). Designed to operate with 24 VDC user-supplied power supply.</i>		
D4-SS-16T	PPX:U-03RS-T1	568
<i>Slice I/O slave with 16 pt. 5-24 VDC current sinking outputs, 0.5A/point, non-removable terminals, uses shielded twisted pair (24 AWG minimum). Designed to operate with 24 VDC user-supplied power supply.</i>		
D4-SS-16N	PPX:U-03RS-N1	567
<i>Slice I/O slave with 16 pt. 12-24 VDC current sourcing inputs non-removable terminals, uses shielded twisted pair (24 AWG minimum). Designed to operate with 24 VDC user-supplied power supply.</i>		
D4-SLICE-M		
<i>DL405 Slice I/O components are covered in the DL405 Slice I/O Manual. Order separately.</i>		
DL405 SDS I/O		
F4-SDS		572
<i>SDS Network Master module, smart distributed system</i>		
F4-SDS-M		
<i>SDS Network Master is covered in the DL405 SDS Manual. Order separately.</i>		
DL405 Communications and Networking		
H4-ECOM		560
<i>Ethernet Communication Module, master/slave on a Ethernet 10Base-T network at 10 Megabaud, cable not included.</i>		
H4-ECOM-F		560
<i>Ethernet Communication Module, master/slave on an Ethernet Fiber Optic network at 10 Megabaud, cable not included.</i>		
H24-ECOM-M		
<i>Ethernet Communications Manual includes all H2-ECOM modules. Order manual separately.</i>		
H4-ECOM-START		561
<i>Ethernet Starter Kit, includes: H4-ECOM Ethernet 10 Base-T module and manual, PCI Ethernet Adapter card and 10 ft. cable, Demo Software on CD-ROM.</i>		
D4-DCM	PPX:U-01DM	558
<i>Data Communication Module, master/slave on a Direct NET Network, slave on a MODBUS RTU Network, RS232C/RS422 communications, cable not included.</i>		
D4-DCM-M		
<i>DL405 Data Communication Manual. Order manual separately.</i>		
F4-SDN	405-SDN	573
<i>Shared Data Network Module, provides high speed communications between DL405 CPU systems. Each F4-SDN on the ShareNET network can read/write to other F4-SDN's on the network in real time.</i>		
F4-SDN-M		
<i>Shared Data Network Manual. Order separately.</i>		
F4-MAS-MB	405-1NCM	574
<i>MODBUS Network Master module, MODBUS RTU Protocol, provides block read/write and high speed table driven polling, up to 115,200 baud, cable not included.</i>		
F4-MAS-MBR		574
<i>MODBUS Network Master module, MODBUS RTU Protocol, provides block read/write and high speed table driven polling, port 1 up to 115.2K baud, port 2 is a built-in leased line radio modem up to 1200 baud, cable not included.</i>		
F4-MASMB-M		
<i>MODBUS Master Manual. Order separately.</i>		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.



DL405 PLC

Part Number	TI/Simatic	Page
DL405 Communications and Networking con't		
F4-SLV-MB	405-1NIM	575
<i>MODBUS Network Slave module, up to 115.2K baud, cable not included</i>		
F4-SLV-MBR	405-1NIM-RM	575
<i>MODBUS Network Slave module, port 1 up to 115.2K baud, port 2 is a built-in leased line radio modem up to 1200 baud, cable not included</i>		
F4-SLV-MB-M		
<i>MODBUS Slave Interface Manual. Order separately.</i>		
FA-UNICON		1112
<i>Universal RS232C to RS422/RS485 convertor. Converts RJ11/RJ12 RS232C port to an RS422/RS485 port. Power directly from the PLC base 24VDC supply or an external power supply. Includes cable. Includes manual with product.</i>		
FA-ISONET		1111
<i>Isolated RS232C to RS422/RS485 convertor. Works with all PLC families. Helps reduce network data problems caused by noisy environments. Powered directly from the 5V pins on most CPU ports, from the PLC base 24VDC power supply, or from an external power supply. Includes cable and DIN rail mounting kit. Includes manual with product.</i>		
DL405 CoProcessors		
F4-CP128-1	405-15ABM	576
<i>Overdrive CoProcessor™ module, 128K battery backed RAM, 26Mhz clock, Port 1: RS232C/RS422/RS485 (115.2K baud max.), Port 2: RS232C/RS422/RS485 (57.6K baud max.), Port 3: RS232C (19.2K baud max.) uses unused RTS/CTS lines from Port 1. Commander programming software for Windows included on CD-ROM.</i>		
F4-CP128-R	405-15ABM-RM	576
<i>CoProcessor™ module, 128K battery backed RAM, 16Mhz clock, Port 1: RS232C/RS422/RS485 (115.2K baud max.), Port 2: 300/1200/2400 baud radio modem, Port 3: RS232C (9600 K baud max.) uses unused RTS/CTS lines from Port 1. Commander programming software for Windows included on CD-ROM.</i>		
F4-CP512-1	405-51ABM	576
<i>Overdrive CoProcessor™ module, 512K battery backed RAM, 26Mhz clock, Port 1: RS232C/RS422/RS485, maximum baud 115.2K, Port 2: RS232C/RS422/RS485, maximum baud 19.2K, Port 3: RS232C, maximum baud 9600 uses unused RTS/CTS lines from Port 1. Commander programming software for Windows included on CD-ROM.</i>		
F4-CP128-T	405-12ABM-TM	576
<i>Overdrive CoProcessor™ module, 128K battery backed RAM, 16Mhz clock, Port 1: RS232C/RS422/RS485, maximum baud 115.2K, Port 2: RS232C or full-duplex, 300/1200/2400 baud telephone modem, Port 3: RS232C, maximum baud 9600 on unused RTS/CTS lines from Port 1. Commander programming software for Windows included on CD-ROM.</i>		
F4-CP-M		
<i>CoProcessor manual, packaged with FA-BASIC-M manual. Order separately.</i>		
DL405 Specialty Modules		
H4-ERM		569
<i>NEW! Ethernet Remote Master Module, master Ethernet remote I/O on a 10Base-T network at 10 Megabaud, cable not included. Can be installed in a local base, with a D4-430, D4-440 or D4-450 in the CPU location, or in a local expansion base (D4-450 based system only). Ethernet cable connects to H2/4-EBCs directly or via Ethernet hub(s).</i>		
H4-ERM-F		569
<i>NEW! Ethernet Remote Master Module, master Ethernet remote I/O on a Fiber Optic network at 10 Megabaud, cable not included. Can be installed in a local base, with a D4-430, D4-440 or D4-450 in the CPU location, or in a local expansion base (D4-450 based system only). Ethernet cable connects to H2/4-EBC-Fs directly or via Ethernet hub(s).</i>		
H24-ERM-M		
<i>Ethernet I/O Controller Manual includes all H2-ERM modules. Order manual separately.</i>		
H4-EBC		570
<i>Ethernet Base Controller for DL405 Base, supports discrete and analog I/O only. 10Base-T connections to PC-based controllers supporting IP/IPX protocol.</i>		
H4-EBC-F		570
<i>Ethernet Base Controller for DL405 Base, supports discrete and analog I/O only. Fiber Optic connections to PC-based controllers supporting IP/IPX protocol.</i>		
H24-EBC-M		
<i>Manual includes all H2-EBC modules. Order manual separately.</i>		
Notes: If you are purchasing the above products as part of a system with no DL205 CPU, and do not require a D2-USER-M manual, you should order the D2-INST-M manual, which covers installation and I/O specifications of DL205 base and I/O products.		
F4-16PID	405-16PID	578
<i>PID CoProcessor module, 16 loops, sample rates to 0.1 sec. position/velocity, alarming (includes programming software)</i>		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.

DL405 PLC

Part Number	TI/Simatic	Page
DL405 Specialty Modules con't		
F4-16PID-M		
<i>DL405 PID CoProcessor manual. Order separately.</i>		
F4-4LTC		580
<i>4 Loop Temperature Controller, 4 independent temperature loops, RTD or thermocouple inputs (jumper selectable) and solid-state relay outputs. Includes (1) F4-CT current transformer.</i>		
F4-4LTC-M		
<i>DL405 4 Loop Temperature Controller manual. Order separately.</i>		
F4-CT		580
<i>Current Transformer for use with F4-4LTC to detect heater burnout.</i>		
F4-8MPI	405-8MPI	582
<i>8 pt. direct input from magnetic pickups, flow totalization, instantaneous flow rate, indicated volume and gross volume calculations in engineering units. K factor and other parameters stored in non-volatile V-memory.</i>		
F4-8MPI-M		
<i>DL405 Magnetic Pulse Input Manual. Order separately.</i>		
D4-INT	PPX:U-01NI	583
<i>8 pt. interrupt input module, provides up to 8 prioritized hardware interrupts to the CPU (.067 ms/pt.), inputs not used for interrupts can be used as normal inputs.</i>		
D4-INTR-M		
<i>DL405 Interrupt Input Manual. Order separately.</i>		
H4-CTRIO		412
check for availability		
<i>NEW! DL405 High Speed Counter Module, 8 DC sink/source inputs 9-30VDC, 4 isolated sink/source DC outputs, 5-30VDC, 1A per point. Inputs supported: 2 quadrature encoder counters up to 100KHz, or 4 single channel counters up to 100KHz, and 4 high speed discrete inputs for Reset, Inhibit, or Capture. Outputs supported: 4 independently configurable high speed discrete outputs or 2 channels pulse output control, 20Hz-25KHz per channel, pulse and direction or cw/ccw pulses.</i>		
H24-CTRIO-M		
<i>DL205/405 High Speed Counter Interface Manual for H2-CTRIO and H4-CTRIO. Order manual separately.</i>		
D4-HSC	PPX:U-01Z	584
<i>High Speed Counter module, quadrature or incrementing/decrementing counter encoding, 7 control inputs, 4 control outputs, count rates to 100KHz and has rate function.</i>		
D4-HSC-M		
<i>DL405 High Speed Counter manual for D4-HSC. Order separately..</i>		
D4-16SIM	PPX:U-05S	592
<i>8/16 pt. (selectable) input simulator module, for program development/debug. Covered in DL405 User Manual.</i>		
D4-INST-M		
<i>DL405 Installation and I/O Manual. Covers installation and wiring, plus specifications of all discrete I/O modules.</i>		
DL405 Programming		
PC-PGMSW		680
<i>DirectSOFT32™, Version 4.0 or higher, Windows PC programming and documentation software, programs DL05/06/105/205/305/405 systems, includes software on CD-ROM and manual. (Order programming cable separately.) 32-bit application, requires Windows 98/2000/NT or Windows XP.</i>		
D4-DSCBL		685
<i>12 ft. (3.66m) RS232 shielded PC programming cable for the 15-pin port on the DL405 CPUs. 9-pin D-shell female connector to 15-pin D-shell male connector. For programming over the DL405 25-pin port, use D3-DSCBL-2.</i>		
D3-DSCBL-2	PPX:VPU200-3605	685
<i>12 ft. (3.66m) RS232 shielded PC programming cable for the DL330 & DL330P CPUs. An RS232 Data Communications Unit is also required to use this cable. 9-pin D-shell female connector to 25-pin D-shell male connector. Can also be used to connect the bottom port of a DL405 or D3-350 CPU, or to DL205/DL305/DL405 DCM modules.</i>		
D2-DSCBL		685
<i>12 ft. (3.66m) RS232 shielded PC programming cable for DL05, DL06, DL105, DL205, D3-350, and D4-450 CPUs. 9-pin D-shell female connector to an RJ12 6P6C connector.</i>		
D4-HPP-1	PPX:S-10P	546
<i>RLLPLUS handheld programmer, provides programming, testing and monitoring for all DL405 CPUs, including the D4-450 CPU.</i>		
D4-HPP-U		
<i>Upgrade older DL405 Handheld Programmers to firmware V5.01 or newer to program the D4-450 units. Requires disassembly of the D4-HPP for installation.</i>		
D4-HPCBL-1	PPX:S-30JP	546
<i>DL405 handheld programmer extension cable, 9.24 ft. (3m)</i>		
D4-HPCBL-2	PPX:S-15JP	546
<i>Handheld programmer Extension cable 4.6ft. (1.5m)</i>		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.



DL405 PLC

Part Number	TI/Simatic	Page
DL405 Programming con't		
D4-CASCBL	PPX:S-08JR	546
<i>Cassette Interface cable for D4-HPP-1 (DL405 handheld programmer)</i>		
D4-HP-M		
<i>DL405 Handheld Programmer manual. Order separately.</i>		
DL405 Spare Parts and Accessories		
D4-ACC-1		549
<i>CPU screw/cover kit. Contains 10 spare screws for power strip terminals, 2 power strip terminal jumpers, and plastic covers for the power strip terminals, 15-pin top port, and 25-pin bottom port.</i>		
D4-ACC-2		549
<i>Spare terminal screws for DL405 8pt. I/O modules (quantity 16)</i>		
D4-ACC-3		549
<i>Spare terminal screws for DL405 16pt. I/O modules (quantity 16)</i>		
D4-CPUKEY		
<i>Spare keys for DL405 CPU keyswitch, package of 2</i>		
D4-FUSE-1		549
<i>5A (250 VDC) fast blow spare fuses for D4-16TA (quantity 5)</i>		
D4-FUSE-2		549
<i>10A spare fuses for F4-08TRS-2 (quantity 5)</i>		
D4-8IOCON		549
<i>8 point I/O module terminal blocks (quantity 5)</i>		
D4-16IOCON		549
<i>16 point I/O module terminal blocks (quantity 5)</i>		
D4-IOCVR		549
<i>I/O module plastic covers (quantity 5)</i>		
D4-FILL	PPX:U-DMY	549
<i>Filler module, used to cover empty base slots</i>		
D4-IO3264S		
<i>32/64 point module solder type connector (quantity 2). For pre-wired cable utilizing these specialty connectors, use ZL-4CBL4# found in the Ziplink Connection System section of the catalog.</i>		
D4-IO3264R		
<i>32/64 point module ribbon type connector (quantity 2). For pre-wired cable utilizing these specialty connectors, use ZL-4CBL4# found in the Ziplinks Connection System section of the catalog.</i>		
D4-IOCBL-1		
<i>I/O cable for 32 or 64 point modules. Pre-wired D4-IO3264S connector and cable with pigtail, 3m length</i>		
FA-CABKIT		1114
<i>Universal cable kit for all CPUs (with RS232C ports) and personal computers. Comes with four pre-wired D-Sub to modular adapters, which can connect most RS-232C ports using a single unshielded 7ft. (2.1m) cable (included). Includes manual with product. Note: Does not include 15-pin connector for bottom port of D2-250 CPU.</i>		
FA-24PS		1177
<i>24VDC power supply, 1.2A, open frame. Comes with DIN rail mounting kit.</i>		
DL405 and Related Manuals		
D4-ANLG-M		
<i>All DL405 Analog I/O modules, including the Thermocouple Input, are covered in the DL405 Analog I/O Manual. Order separately.</i>		
D4-DCM-M		
<i>DL405 Data Communication Manual. Order manual separately.</i>		
D4-HP-M		
<i>DL405 Handheld Programmer manual. Order separately.</i>		
D4-HSC-M		
<i>DL405 High Speed Counter manual for D4-HSC. Order separately.</i>		
D4-INTR-M		
<i>DL405 Interrupt Input Manual. Order separately.</i>		
D4-INST-M		
<i>DL405 Installation and I/O Manual. Covers installation and wiring, plus specifications of all discrete I/O modules.</i>		
D4-REMIO-M		
<i>DL405 Remote I/O components are covered in the DL405 Remote I/O Manual. Order separately.</i>		
D4-SLICE-M		
<i>DL405 Slice I/O components are covered in the DL405 Slice I/O Manual. Order separately.</i>		

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.

DL405 PLC

Part Number**TI/Simatic****Page**

DL405 and Related Manuals con't

D4-USER-M

DL405 CPUs are covered in the DL405 User Manual. Order manual separately.

DA-DNET-M

DirectNET Protocol Manual for DL05/DL06/DL205/DL305/DL405

F4-8MPI-M

DL405 Magnetic Pulse Input Manual. Order separately.

F4-16PID-M

DL405 PID CoProcessor manual. Order separately.

F4-4LTC-M

DL405 4 Loop Temperature Controller manual. Order separately.

F4-CP-M

CoProcessor manual, packaged with FA-BASIC-M manual. Order separately.

F4-MASMB-M

MODBUS Master Manual. Order separately.

F4-SDN-M

Shared Data Network Manual. Order separately.

F4-SDS-M

SDS Network Master is covered in the DL405 SDS Manual. Order separately.

F4-SLV-MB-M

MODBUS Slave Interface Manual. Order separately.

H24-ECOM-M

Ethernet Communications Manual includes all H2-ECOM modules. Order manual separately.

H24-EBC-M

Manual includes all H2-EBC modules. Order manual separately.

Notes: Our manuals are sold separately, except for those accompanying software products or if otherwise specified. Please put the manual part number on your order.