7 Steps to Specifying a DL205 System

The following 7 steps will help you specify a DL205 PLC system. They are also covered in more detail on the pages that follow. Your first priority when designing a system should be safety. Please make sure that all of the components in your system will operate within the product's environmental and operating specifications. This catalog is intended to provide abbreviated product descriptions, benefits and prices. It is not intended to be a substitute for the product manuals.

Before you begin selecting products for your DL205 PLC system, be sure to evaluate all of your application needs and any future growth potential.

STEP 1 — Review the DL205 family of products

The DL205 family offers a wide variety of products. Please review the complete product offering.

STEP 2 — Select a CPU, programming tool and cable

The DL205 family offers a traditional CPUs: the D2-262. Please take the time to understand the features and specifications of the CPU (i.e. built-in communications ports protocols, instructions, etc.).

To program the DL205 CPUs, choose between the Windows-based DirectSOFT programming software and PC cable or handheld programmer. CPU-slot Server base controllers are also introduced in this step.

STEP 3 — Additional communications ports needed?

If your application requires more than the built-in CPU communications ports, then select the H2-ECOM100 Ethernet communications module, or the D2-DCM serial communications module. These modules add more ports for networking or connection to an HMI, etc.
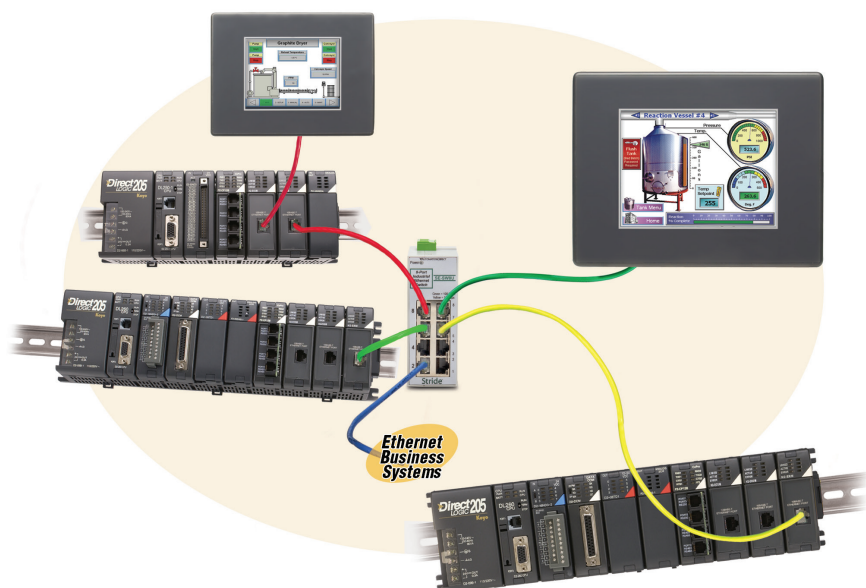
7 Steps to Specifying a DL205 System

STEP 4 Select the discrete, analog and specialty I/O modules

Since there are several different types of I/O and specialty modules available for the DL205 system, it is important to review the module specifications in detail when selecting them for your system. The hardware specifications for the modules are described at the end of the DL205 section, starting with the specialty modules and followed by the discrete and analog I/O modules.

STEP 5 Choose an I/O configuration method

The DL205 offers several configurations of I/O. Choose among local I/O, local expansion I/O and remote I/O. A DL205 system can be developed using a combination of the configuration arrangements. It is important to understand the octal addressing scheme and I/O module placement restrictions that are described in this step.

Example: Local expansion I/O

STEP 6 Check the power budget

It is very important to verify that the selected CPU and I/O modules will operate within the base power budget. Tables list the power supplied and consumed by each DL205 device. This step also describes base dimensions and mounting requirements.
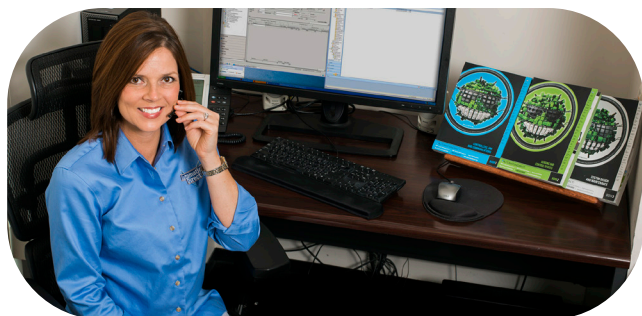
Max. current required

Current required

Current supplied

Remaining current available
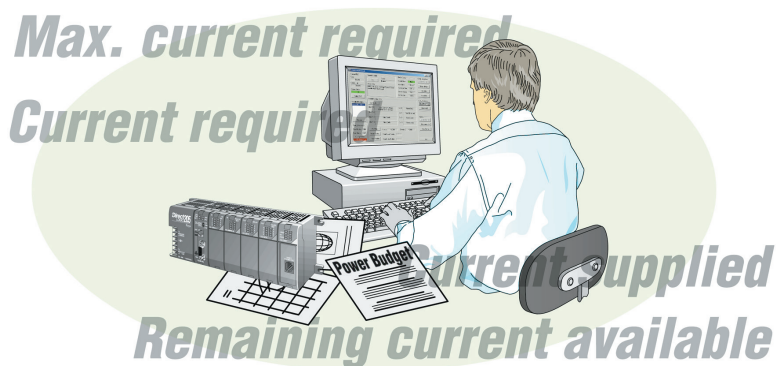
STEP 7 Place your order!

Place your order either online at www.automationdirect.com, by calling 1-800-633-0405 or by faxing your order to 1-770-889-7876. See the Ordering section in this catalog for details.

Four ways to order:
- Online
- Email
- Phone
- FAX

Step 1: Review the DL205 Product Family

CPUs

- D2-262 – 30.4K words total memory
  - 2 communications ports
  - 16 built-in PID loops with auto-tuning

Programming tools

- *Direct*SOFT Programming Software for Windows
  - Handheld Programmer (D2-HPP)

Bases

- 3-slot base (includes power supply)
  - 110/220 VAC (D2-03B-1)
  - 12/24 VDC (D2-03BDC1-1)
- 4-slot base (includes power supply)
  - 110/220 VAC (D2-04B-1)
  - 12/24 VDC (D2-04BDC1-1)
- 6-slot base (includes power supply)
  - 110/220 VAC (D2-06B-1)
  - 12/24 VDC (D2-06BDC1-1)
  - 125VDC (D2-06BDC2-1)
- 9-slot base (includes power supply)
  - 110/220 VAC (D2-09B-1)
  - 12/24 VDC (D2-09BDC1-1)
  - 125VDC (D2-09BDC2-1)

Local expansion modules

- D2-262 CPU, using D2-0*B-1 or D2-0*BDC*-1 only
- Base expansion module (D2-EM)
- Expansion base controller module (D2-CM)
- Expansion base cable (D2-EXCBL-1)

Discrete input modules

- **DC input**
  - 8-pt. 12-24 VDC sink/source (D2-08ND3)
  - 16-pt. 24VDC sink/source (D2-16ND3-2)
  - 32-pt. 24VDC sink/source (D2-32ND3)
  - 32-pt. 5-12 VDC sink/source (D2-32ND3-2)
- **AC input**
  - 8-pt. 110VAC (D2-08NA-1)
  - 16-pt. 110VAC (D2-16NA)
  - 8-pt. 220VAC (D2-08NA-2)

Discrete output modules

- **DC output**
  - 4-pt. 12-24 VDC sink (D2-04TD1)
  - 8-pt. 12-24 VDC sink (D2-08TD1)
  - 8-pt. 12-24 VDC source (D2-08TD2)
  - 16-pt. 12-24 VDC sink (D2-16TD1-2)
  - 16-pt. 12-24 VDC source (D2-16TD2-2)
  - 16-pt. 24VDC sink (Fault protected) (F2-16TD1P)
  - 16-pt. 24VDC source (Fault protected) (F2-16TD2P)
  - 32-pt. 12-24 VDC sink (D2-32TD1)
  - 32-pt. 12-24 VDC source (D2-32TD2)
- **AC output**
  - 8-pt. 18-220 VAC (D2-08TA)
  - 8-pt. 20-125 VAC (F2-08TA)
  - 12-pt. 18-110 VAC (D2-12TA)
- **Relay output**
  - 4-pt. 4A/pt (Isolated) (D2-04TRS)
  - 8-pt. 1A/pt (D2-08TR)
  - 8-pt. 10A/pt. (F2-08TR)
  - 8-pt. 7A/pt (Isolated) (F2-08TRS)
  - 12-pt. 1.5 A/pt (D2-12TR)

Combination discrete modules

- 4-pt. 24VDC in/4pt Relay Out (D2-08CDR)

Analog modules

- **Analog input**
  - 4-ch. in, 12 bit, current (F2-04AD-1)
  - 4-ch. in, 12 bit, voltage (F2-04AD-2)
  - 8-ch. in, 12 bit, current (F2-08AD-1)
  - 8-ch. in, 12 bit, voltage (F2-08AD-2)
- **Analog output**
  - 2-ch. out, 12 bit, current (F2-02DA-1)
  - 2-ch. out, 16 bit, current (Isolated) (F2-02DAS-1)
  - 2-ch. out, 12 bit, voltage (F2-02DA-2)
  - 2 -ch. out, 16 bit, voltage (Isolated) (F2-02DAS-2)
  - 8-ch. out, 12 bit, current (F2-08DA-1)
  - 8-ch. out, 12 bit, voltage (F2-08DA-2)
- **Combination analog in/out**
  - 4-ch. in/2-ch. out, 12 bit, current (F2-4AD2DA)
  - 8-ch. in/4-ch. out, 16 bit, current (F2-8AD4DA-1)
  - 8-ch. in/4-ch. out, 16 bit, voltage (F2-8AD4DA-2)
- **Temperature input**
  - 4-ch. in, RTD (F2-04RTD)
  - 4-ch. in, Thermocouple (F2-04THM)

Communications/ networking modules

- Ethernet Communications Module (H2-ECOM100)
- Serial Data Communications Module (D2-DCM)

Remote I/O modules

- **Ethernet**
  - Ethernet Remote Client Module (H2-ERM100)
  - Ethernet Base Controller (server) (H2-EBC100)

Specialty modules

- Basic CoProcessor (F2-CP128)
- 8-pt. Input Simulator (F2-08SIM)
- Counter I/O (H2-CTRIO2)
- Counter Interface (D2-CTRINT)*****

CPU-slot Server controllers

- Ethernet Base Controller (H2-EBC100)

Operator interface

- See the *C-more* and HMI sections in this catalog for a complete line of compatible text and touch panels and configuration software.

Connection systems

- See the Terminal Blocks and Wiring Solutions section in this catalog for information on **DIN***nector* terminal blocks, *ZIP*Link connection systems and other connection accessories for use with the DL205 system.

*NOTE: D2-262 CPU does not support the D2-CTRINT module.

Step 2: Select the CPU, Programmer and Cable

DL205 Family CPUs

There are many things to consider when choosing a CPU, most of which depend on your particular application. The facing page provides a comparison between the CPUs. This section provides a quick summary of the key features for each CPU.

System Capacity

System capacity is the ability of the CPU to accommodate a variety of applications. 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.

If you think you may exceed 256 local I/O points, the D2-262 CPU will support up to four additional bases.

The D2-262 supports Ethernet and serial Remote Client modules used when building a remote I/O network. Port 2 on the D2-262 can also serve as a remote I/O client.

Performance

For applications that require fast scan times, additional communications or advanced instructions the D2-262 CPU performs even the most basic of math or data instructions, and will provide better overall performance.

D2-262

Programming and Diagnostics

Our CPUs offer an incredible array of instructions and diagnostic features that can save you many hours of programming and debug time. From basic Boolean contact logic to PID and floating point math, we have it covered! The table 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. If you already have DirectSOFT and/or a Handheld Programmer, you may have to upgrade the software/firmware to accommodate the D2-262 CPU.

Built-in CPU Communications

Every DL205 CPU provides at least one built-in RS-232 communication port. Either CPU will perform equally well when using an operator interface. The CPU has two built-in communication ports. For the most flexibility, it has built-in *Direct*NET Server support capability through the top and bottom ports, and *Direct*NET/Modbus RTU Client/Server support on the bottom port. The bottom port supports baud rates of 2400 to 38.4K. The D2-262 provides support for ASCII IN/OUT communications as well.

If you require more than two ports, we also offer an Ethernet Communications Module that can be used to quickly add a communication port to a DL205 system with the D2-262 CPU. A D2-DCM module can be added to provide an additional serial communications port.

D2-262 CPU Specifications

D2-262 CPU Specifications	
System Capacity	
Total memory available (words)	30.4
Ladder memory (words)	15872 Flash
V-memory (words)	14592
Battery backup	Yes
Total CPU memory I/O pts. available (actual I/O pts. depend on I/O configuration method selected)	8192 (1024 X + 1024 Y + 2048 CR + 2048 GX + 2048 GY)
Local I/O (pts.)	256
Local Expansion I/O (pts.)	1280 (4 exp. bases max.) (Including local I/O)
Serial Remote I/O (pts.)	8192 max. (Including local & exp. I/O)
Remote I/O channels	8 (7+1 CPU port)
I/O per remote channel	2048
Ethernet Remote I/O	Yes
Discrete I/O pts.	8192 (Including local and exp.I/O)
Analog I/O channels	Map into V-memory
Remote I/O channels	Limited by power budget
I/O per remote channel	16,384 (16 fully expanded H4-EBC Servers using V-memory and bit-of-word instructions)
Performance	
Contact execution (Boolean)	0.61 µs	0.1 µs
Typical scan (1K Boolean)	1.9 ms	1.0 ms
Programming and Diagnostics	
RLL Ladder Style	Yes
RLL^{PLUS}/Flowchart Style (Stages)	Yes/1024
Run time editing	Yes
Supports Overrides	Yes
Variable/fixed scan	Variable
Instructions	231
Control relays	2048
Timers	256
Counters	256
Immediate I/O	Yes
Subroutines	Yes
For/Next loops	Yes
Timed Interrupt	Yes
Integer Math	Yes
Floating-point Math	Yes
Trigonometric functions	Yes
Table Instructions	Yes
PID	Yes, 16 loops
Drum Sequencers	Yes
Bit of Word	Yes
ASCII Print	Yes
Real-time clock/calender	Yes
Internal diagnostics	Yes
Password security	Multi-level
System and user error log	Yes
Communications	
Built-in ports	Port 1 RS-232 Port 2 RS-232/422/485
K-sequence (proprietary protocol)	Yes
*Direct*NET™	Yes
Modbus RTU Client/Server	Yes
ASCII communications	IN/OUT
Maximum baud rate	38.4K port 2

D2-262 Key Features
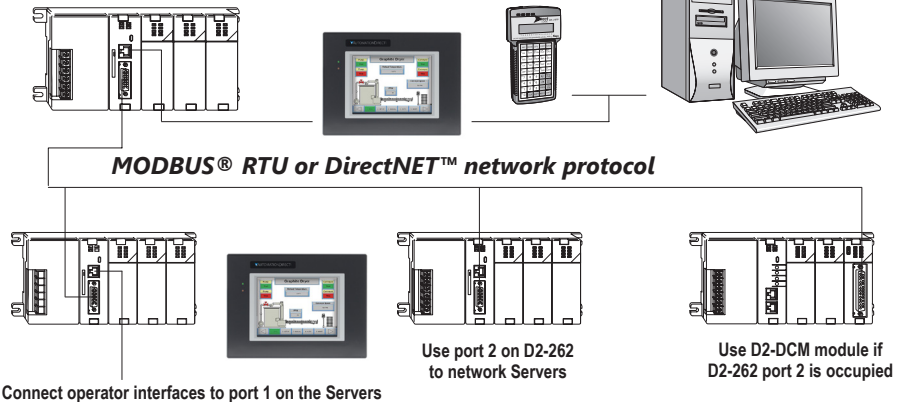
D2-262 CPU

D2-262 $412.00

D2-262: Our most powerful DL205 CPU

Our D2-262 CPU provides all the capabilities of the D4-450 and D4-454 CPUs, plus several additional features rarely found in a PLC of this size. With such an incredible array of features, you may be able to replace PLCs costing hundreds (or thousands) more.

DirectSOFT is required to program the D2-262. If using a handheld programmer (H2-HPP), version 2.10 of the handheld programmer firmware is required. Here are a few key features about the D2-262 CPU

D2-262 can serve as network Client **Easily connect programming devices or HMI to CPU ports**

MODBUS® RTU or DirectNET™ network protocol

Connect operator interfaces to port 1 on the Servers

Use port 2 on D2-262 to network Servers

Use D2-DCM module if D2-262 port 2 is occupied

Powerful built-in CPU communications

Each D2-262 CPU offers two communications ports that provide a vast array of communication possibilities. The top RJ-12 RS-232 port can be used for connection to a *C-more* operator interface panel or as a single K-sequence or DirectNET Server. The 15-pin bottom port (port 2) supports RS-232 or RS-422/RS485. This port offers several different protocol options such as:

- K-sequence
- *Direct*NET Client/Server
- Modbus RTU Client/Server
- ASCII In/Out Communications

Port 2 can also serve as a remote I/O Client. The D2-262 supports the Ethernet Communication module and Data Communication Module for additional communications ports.
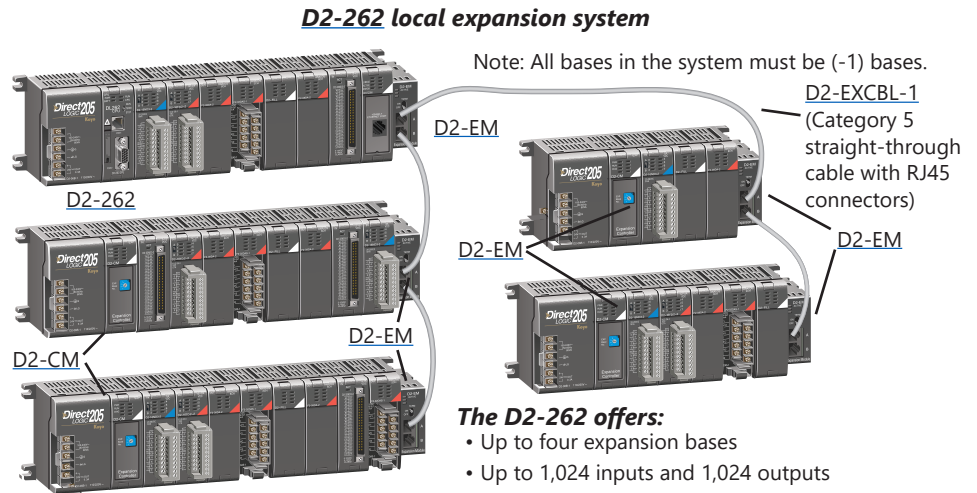
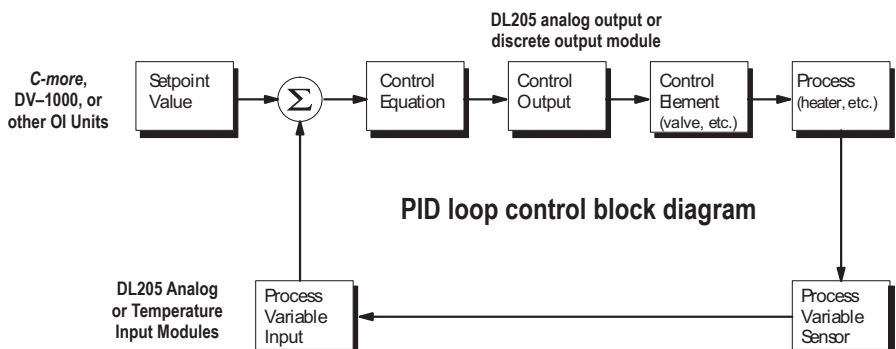# D2-262 Key Features

Local expansion I/O

The D2-262 supports local expansion up to five total bases (one CPU base and four expansion bases). Expansion bases are commonly used when there are not enough slots available in the CPU base, when the base power budget will be exceeded, or when placing an I/O base at a location away from the CPU base (but within the expansion cable limits). All local and expansion I/O points are updated on every CPU scan. Each local expansion base requires the D2-CM module in the CPU slot. The local CPU base requires the D2-EM Expansion Module, as well as each expansion base. For more information on local expansion, refer to the Expansion Modules pages later in this section.

D2-262 local expansion system

Note: All bases in the system must be (-1) bases.

D2-EM

D2-262

D2-CM

D2-EM

D2-EM

D2-EXCBL-1 (Category 5 straight-through cable with RJ45 connectors)

D2-EM

The D2-262 offers:
• Up to four expansion bases
• Up to 1,024 inputs and 1,024 outputs
• Up to 30m (98ft) total expansion system cable

16 PID loops with auto-tuning

The D2-262 CPU can process up to 16 PID loops directly in the CPU. You can select from various control modes including automatic, manual, and cascade. There are also a wide variety of alarms including Process Variable, Rate of Change, and Deviation. The loop operation parameters (Process Variable, Setpoint, Setpoint Limits, etc.) are stored in V-memory, which allows easy access from operator interfaces or HMIs. Setup is accomplished with easy-to-use setup menus and monitoring views in DirectSOFT programming.

The auto-tuning feature is easy to use and can reduce setup and maintenance time. Basically, the CPU uses the auto-tuning feature to automatically determine near optimum loop settings.

PID loop control block diagram

D2-262 Key Features

Full array of instructions

The right instruction can greatly simplify your programming task and can save hours of programming time.

The D2-262 supports over 280 powerful instructions, such as:

- Four types of drum sequencers
- Leading / trailing edge triggered one-shots
- Bit-of-word manipulation
- Floating point conversions
- Trigonometric functions
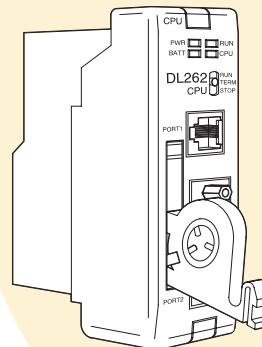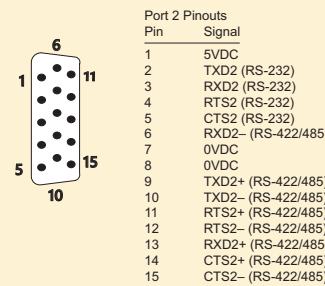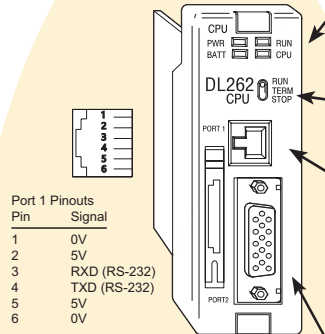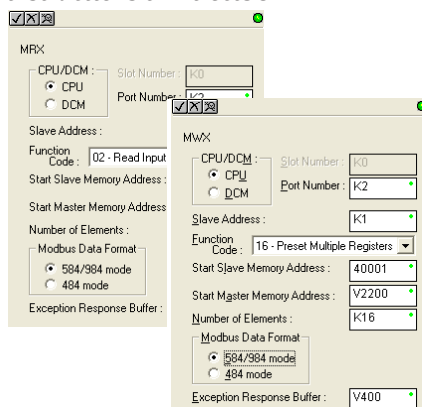- Table instructions
- ASCII IN/OUT instructions

For a complete list of instructions supported by all DL205 CPUs, see the end of this section.

Modbus RTU instructions

The D2-262 CPU supports easy-to-use Modbus Read/Write instructions that expand our existing Modbus network instruction capabilities. The MRX or MWX instructions allow you to enter native Modbus addressing in your ladder program with no need to perform octal-to-decimal conversion. We added Function codes 05, 06 and the ability to read Server Exception Codes. These flexible instructions allow the user to select the following parameters within one instruction window:

- 584/984 or 484 Modbus data type
- Server node (0-247)
- Function code
- Modbus starting Client / Server memory address
- Number of bits
- Exception code starting address

Examples of MRX and MWX instructions in DirectSOFT

Port 1 Pinouts

Pin	Signal
1	0V
2	5V
3	RXD (RS-232)
4	TXD (RS-232)
5	5V
6	0V

Port 2 Pinouts

Pin	Signal
1	5VDC
2	TXD2 (RS-232)
3	RXD2 (RS-232)
4	RTS2 (RS-232)
5	CTS2 (RS-232)
6	RXD2– (RS-422/485)
7	0VDC
8	0VDC
9	TXD2+ (RS-422/485)
10	TXD2– (RS-422/485)
11	RTS2+ (RS-422/485)
12	RTS2– (RS-422/485)
13	RXD2+ (RS-422/485)
14	CTS2+ (RS-422/485)
15	CTS2– (RS-422/485)

ZIPLink communications adapter modules

ZIPLink cables and communications adapter modules offer fast and convenient screw terminal connection for the bottom port of the D2-262 CPUs. The adapter modules are RS232/422/485 compatible and are offered with or without indicating LEDs and surge protection. See the Terminal Blocks and Wiring Solutions section in this catalog for more information.

ZL-CMA15L shown

CPU Status Indicators

RUN	ON	CPU is in RUN mode
	OFF	CPU is in PROGRAM mode
BATT	ON	Battery backup voltage is low
	OFF	Battery backup voltage is OK or disabled
CPU	ON	CPU internal diagnostics detects error
	OFF	CPU is OK
PWR	ON	CPU power good
	OFF	CPU power failure

Mode Switch

RUN	Puts CPU into RUN mode
TERM	Allows peripherals (HPP, *Direct*SOFT) to select the mode of operation
STOP	Forces CPU out of RUN mode

Port 1

Protocols	K-sequence Server, *Direct*NET™ Server, Modbus RTU Server
Devices	Can connect w/HPP, *Direct*SOFT, *C-more*, O/I panels, or any *Direct*NET Client
Specs.	6P6C phone jack connector RS-232 9,600 baud Fixed address Odd parity only 8 data bits one start, one stop asynchronous, half-duplex, DTE

Port 2

Protocols	K-sequence Server, *Direct*NET Client/ Server, Modbus RTU Client/Server, ASCII IN/OUT, Remote I/O Client
Devices	Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, other O/I panels, any *Direct*NET or Modbus RTU Client or Server, or ASCII devices
Specs.	HD15 connector RS-232, RS-422/485* 2400/4800/9600/19.2K/38.4K baud Odd, even, or no parity Selectable address (1-90, HEX 1 – 5A) 8 data bits, one start, one stop Asynchronous, Half-duplex, DTE

Battery (Optional)

D2-BAT-1	Coin type, 3.0V Lithium battery, 560mA, battery number CR2354

Note: Batteries are not needed for program backup. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage.
*RS485 for Modbus protocol only

On-board memory

The D2-262 has 15.5K words of flash memory on board for your program plus 14.2K words of data registers. With flash memory, you don't have to worry about losing the program due to a bad battery.

Built-in remote I/O connection

The bottom port on the D2-262 can be used as a Client for serial remote I/O networks.

D2-262 Key Features

ASCII communications instructions

The D2-262 CPU supports several easy-to-use instructions that allow ASCII strings to be read into and written from the PLC communications ports.

Raw ASCII: Port 2 can be used for either reading or writing raw ASCII strings, but not for both.

Embedded ASCII characters: The D2-262 can decipher ASCII embedded within a supported protocol (K-Sequence, *Direct*Net, Modbus, Ethernet) via the CPU ports or D2-DCM.

Here's how the D2-262 can receive ASCII input strings:

• **ASCII IN (AIN) -** This instruction configures port 2 for raw ASCII input strings with parameters such as fixed and variable length ASCII strings, termination characters, byte swapping options, and instruction control bits. Use barcode scanners, weight scales, etc. to write raw ASCII input strings into port 2 based on the (AIN) instruction's parameters.

• Write embedded ASCII strings directly to V-memory from an external HMI or similar Client device via a supported communications protocol using the CPU ports, H2-ECOM100 or D2-DCM. The AIN instruction is not used in this case.

• If a D2-262 PLC is a Client on a network, the Network Read instruction (RX) can be used to read embedded ASCII data from a Server device via a supported communications protocol using port 2, H2-ECOM100 or D2-DCM. The RX instruction places the data directly into V-memory.

Here's how the D2-262 can write ASCII output strings:

• **Print from V-memory (PRINTV)** - Use this instruction to write raw ASCII strings out of port 2 to a display panel or a serial printer, etc. The instruction features the starting V-memory address, string length, byte swapping options, etc. When the instruction's permissive bit is enabled, the string is written to port 2.

• **Print to V-memory (VPRINT)** - Use this instruction to create pre-coded ASCII strings in the PLC (i.e. alarm messages). When the instruction's permissive bit is enabled, the message is loaded into a pre-defined V-memory address location. Then the (PRINTV) instruction may be used to write the pre-coded ASCII string out of port 2. American, European and Asian Time/Date stamps are supported.

• **Print Message (PRINT) -** This existing instruction can be used to create pre-coded ASCII strings in the PLC. When the instruction's permissive bit is enabled, the string is written to port 2. The VPRINT/PRINTV instruction combination is more powerful and flexible than the PRINT instruction.

• If a D2-262 PLC is a Client on a network, the Network Write instruction (WX) can be used to write embedded ASCII data to an HMI or Server device directly from V-memory via a supported communications protocol using port 2, H2-ECOM100 or D2-DCM.

Example of AIN instruction in DirectSOFT

Additional instructions that help manage the ASCII strings

The following instructions can be very helpful in managing the ASCII strings within the CPU's V-memory:

• **ASCII Find (AFIND)** - Finds where a specific portion of the ASCII string is located in continuous V-memory addresses. Forward and reverse searches are supported.

• **ASCII Extract (AEX)** - Extracts a specific portion (usually some data value) from the ASCII find location or other known ASCII data location.

• **Compare V-memory (CMPV)** - This instruction is used to compare two blocks of V-memory addresses and is usually used to detect a change in an ASCII string. Compared data types must be of the same format (i.e. BCD, ASCII, etc.).

• **Swap Bytes (SWAPB)** - Usually used to swap V-memory bytes on ASCII data that was written directly to V-memory from an external HMI or similar Client device via a communications protocol. The AIN and AEX instructions have a built-in byte swap feature.

Example of VPRINT instruction in DirectSOFT

DL205 Programming Tools and Cables

Selecting a programming device

There are two tools for programming the DL205 CPUs: *Direct*SOFT PC-based programming software and the D2-HPP handheld programmer.
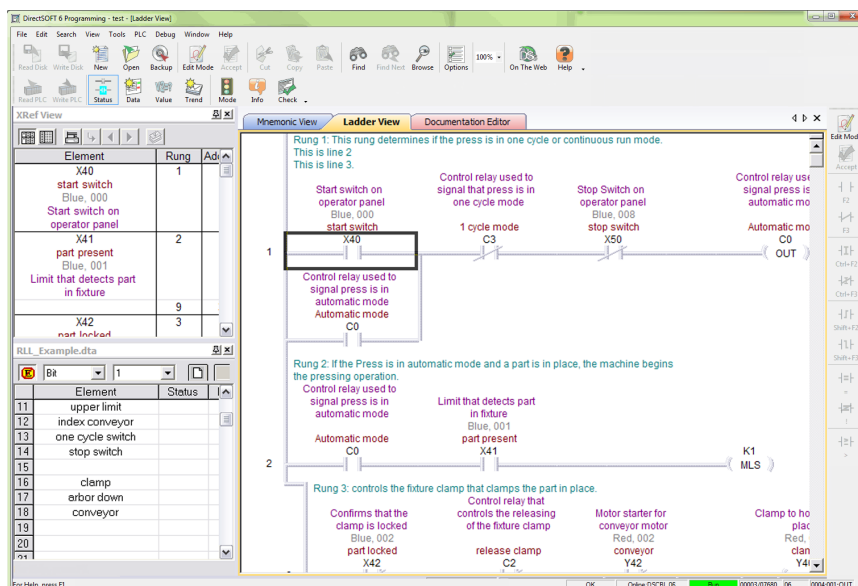
DirectSOFT programming software

Our powerful Windows-based programming package makes it easy for you to program and monitor your DL205 PLC system. See the *Direct*LOGIC Overview Section DL in this catalog for detailed information on *Direct*SOFT.

*Direct*Soft Part Number	Price	Description
PC-DSOFT6	$462.00	Programs all *Direct*LOGIC PLC CPUs; offers IBox intelligent instructions
PC-DS100	Free	Free version of *Direct*SOFT; programs all *Direct*LOGIC PLC CPUs; limited to 100 word program
Note: D2-262 CPU requires *Direct*SOFT version 6.3 or later		

DL205 programming cables

Choose the proper cable to connect the DL205 CPU to your PC running DirectSoft.

CPU	Port	Cable	Price
D2-262	Top port	**D2-DSCBL**	$41.50
	Bottom port	**D2-DSCBL-1**	$80.00
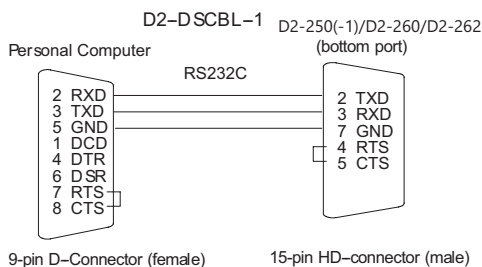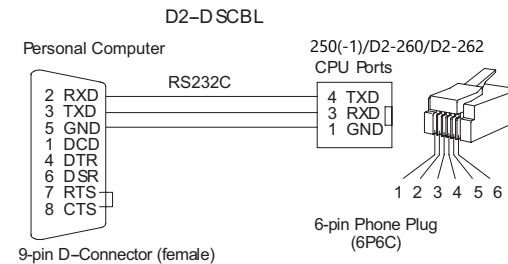
Handheld programmer

The D2-HPP handheld programmer connects to an RJ12 phone jack port on any of the DL205 CPUs. The handheld unit contains a zero force insertion socket that can be used to store programs on an optional EEPROM. Can be used with DL05, DL06, DL105, and DL205 models.

Pin labeling conforms to IBM DTE and DCE standards

D2–DSCBL

Personal Computer | 250(-1)/D2-260/D2-262 CPU Ports

RS232C

2 RXD	4 TXD
3 TXD	3 RXD
5 GND	1 GND
1 DCD	
4 DTR	
6 DSR	
7 RTS	
8 CTS	

9-pin D–Connector (female)

1 2 3 4 5 6

6-pin Phone Plug (6P6C)

D2–DSCBL–1

Personal Computer | D2-250(-1)/D2-260/D2-262 (bottom port)

RS232C

2 RXD	2 TXD
3 TXD	3 RXD
5 GND	7 GND
1 DCD	4 RTS
4 DTR	5 CTS
6 DSR	
7 RTS	
8 CTS	

9-pin D–Connector (female)

15-pin HD–connector (male)

D2-HPP
Handheld programmer, cable included (DV-1000CBL)
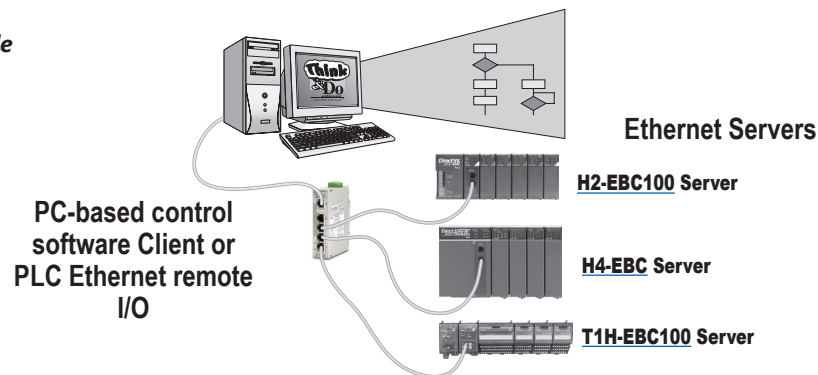
DL205 CPU-Slot Server Controllers

Overview

There are currently four Server "base controllers" or "Server I/O controllers" available for the DL205 hardware.

This allows you to use industry proven DL205 I/O for general purpose distributed applications.

The controller modules are plugged into the CPU slot of any size DL205 base. The Server controllers must be connected to a network Client controller module or to a PC running PC-based control, HMI or SCADA software.

Example of Ethernet Server Network using Ethernet Base Controller Modules

H2-EBC100
Ethernet Base Controller Module

Ethernet Servers

PC-based control
software Client or
PLC Ethernet remote
I/O

H2-EBC100 Server

H4-EBC Server

T1H-EBC100 Server

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Step 3: Additional Communications Ports Needed?

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 so, then choose between the H2-ECOM100 Ethernet communications module or the D2-DCM serial data communications module. Both modules' specifications and communications details are covered later in this section.

H2-ECOM100 Ethernet network

PCs running *Direct*Soft PLC programming software, DSData or HMI software

Stride Ethernet Switch (see the Communications Products section)

D4-454

H4-ECOM100

D2-262

H2-ECOM100
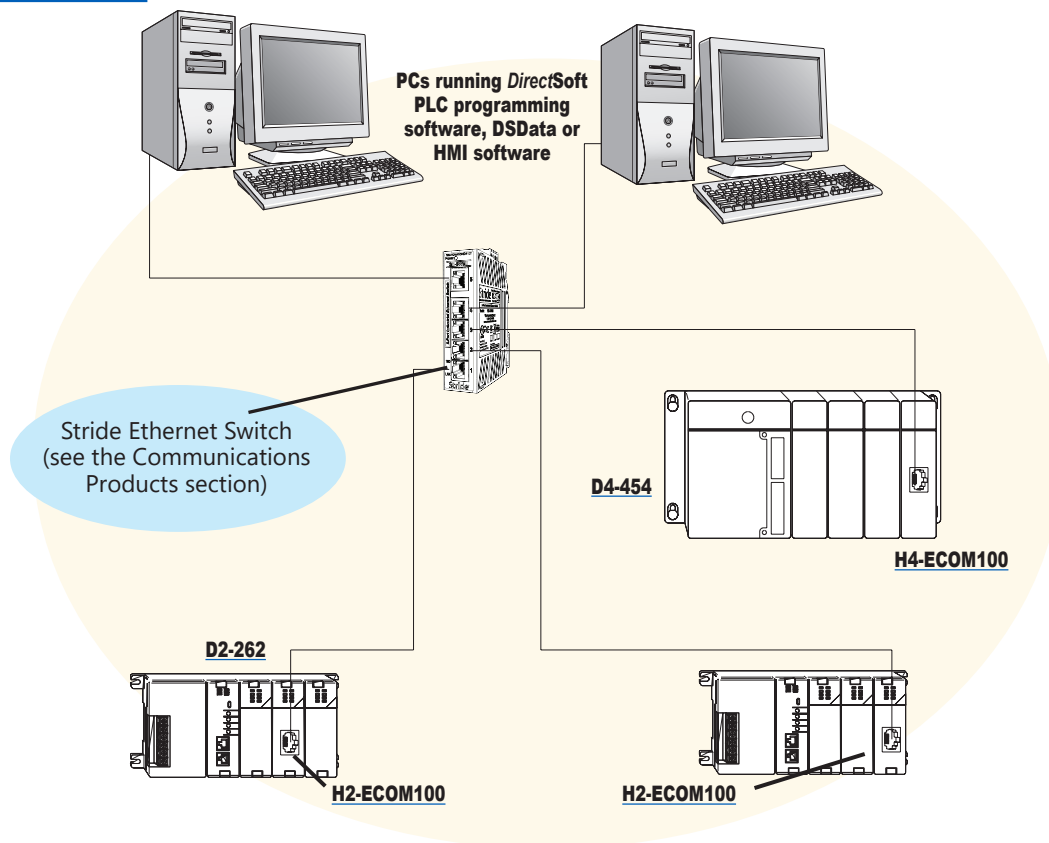
H2-ECOM100

The H2-ECOM100 can be used for:
• High-speed peer-to-peer networking of PLCs (any PLC can initiate communications)
• CPU programming with *Direct*SOFT Programming Software
• High-speed data acquisition via HMI or other HMI software
• Virtually unlimited number of network nodes
• Very easy to setup

Ethernet networking with the H2-ECOM100

The D2-262 CPU supports the H2-ECOM100 Ethernet communications module. Any PLC on an ECOM network can initiate communications with another PLC or use *Direct*Soft to program any PLC on the network. This is the fastest data transfer rate we offer for HMI or other Windows-based software. When monitoring your PLC, you will notice much faster updates using the ECOM module. The H2-ECOM100 module supports the industry standard 10 or 100Base-T with an RJ45 port. 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.

D2-DCM serial network

DCM as Client

Connect the D2-DCM to our MDM-TEL serial modem (see the Communication Products section)

RS232 to RS422 Converter

D2–DCM Server

DL–405 CPU (bottom port)

DL-305 Server

Peer-to-peer network

DCM as Peer

DCM as Peer
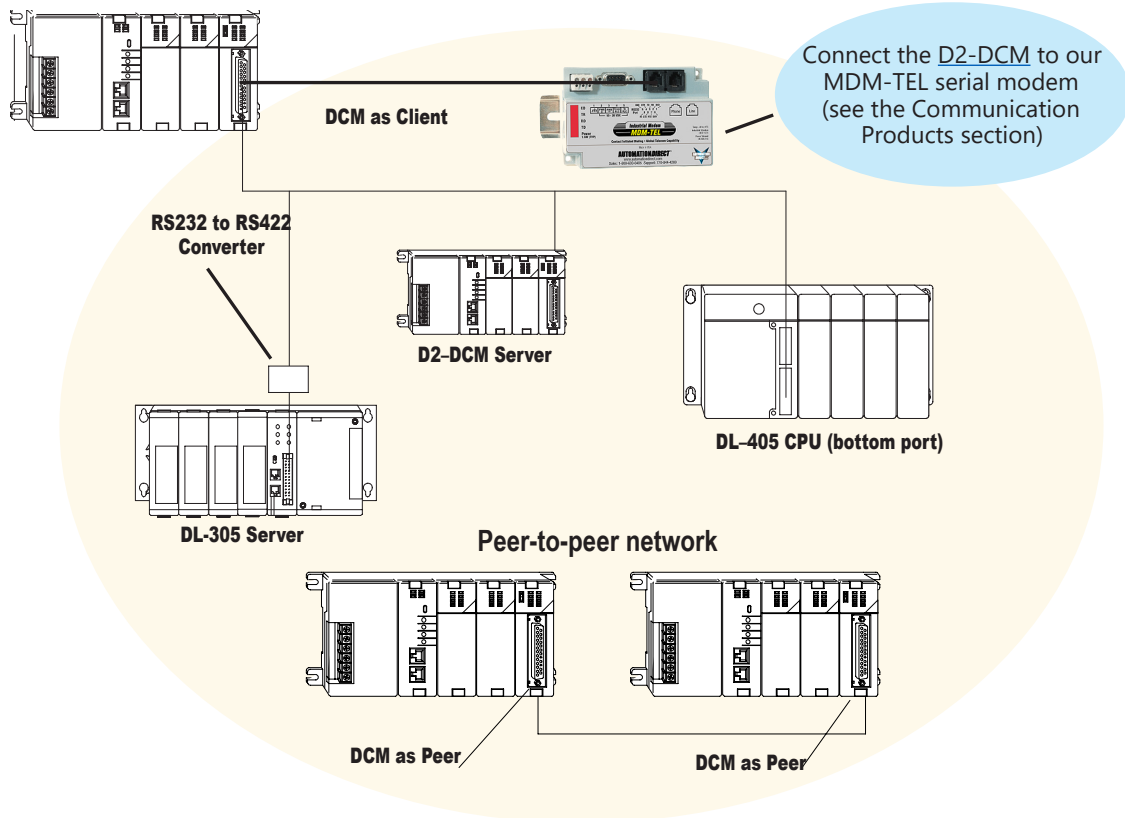
The D2-DCM can be used for:
• *Direct*Net networking of PLCs (only one DCM or PC can serve as Client)
• Peer-to-peer networking of two DCM modules (each can serve as a Client or Server)
• CPU programming with *Direct*SOFT Programming Software
• Data acquisition via HMI, DSData Server, or other HMI software
• A Server on a Modbus RTU network
• Connection to a serial modem (MDM-TEL)

Serial networking with the D2-DCM

The D2-262 CPU supports the D2-DCM Data Communications Module, which can serve as a *Direct*Net Client/Server, *Direct*Net peer, or a Modbus RTU Server. The D2-DCM supports both RS-232 and RS-422. You can program the CPU through the DCM locally, or if a PC is the RS-422 Client, you can use *Direct*Soft to program any PLC on the network.

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Step 4: 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 module 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 field devices? Do you need a sinking or sourcing DC 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 the environmental specifications that globally apply to the DL205 system (CPUs, bases, and I/O modules). Be sure the modules you choose are operated within these environmental specifications.

Specifications and ratings

Storage temperature*
 -4ºF – 158ºF (-20ºC to 70ºC)
Ambient operating temperature**
32ºF – 131ºF (0º to 55ºC)
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
* Storage temperature for the Handheld Programmer is –4º to 158ºF (-20º to 70ºC)
** Operating temperature for the Handheld Programmer is 32º to 122ºF (0º to 50ºC)

This logo is placed by each I/O module that supports *ZIP*Link connection systems. (The I/O modules are listed at the end of this section.) See the Terminal Blocks and Wiring section for details on *ZIP*Links.

Review I/O hardware specifications

The hardware specifications for every DL205 module are described later in this section.

Take time to understand the specification charts, the derating curves and the wiring diagrams. The module specifications should help you determine if this module is right for your application.

Factors affecting field termination

DL205 modules use three types of field terminations. They include a low density removable terminal block (used on modules with eight or fewer points), a high density removable terminal block (European style terminal block available on modules with 12 to 16 points), and a 40-pin connector (for modules with 32 points). The module diagrams indicate the connector type that is on the module. You can also use our super fast and inexpensive *ZIP*Link I/O connector systems.

Module types and suggested AWG range

4 point
16* - 24 AWG
8 point
16* - 24 AWG
12 point
16* - 24 AWG
16 point
16* - 24 AWG
32 point
Ribbon and Solder-style Connectors
* Note: 16 AWG Type TFFN or Type MTW can be used on 8 pt. modules. Other types of 16 AWG may be acceptable, but it really depends on the thickness of the wire insulation. If the insulation is too thick and you use all the I/O points, then the plastic terminal cover may not close properly.
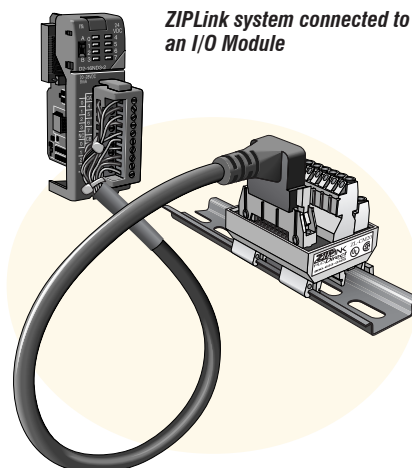
ZIPLink system connected to an I/O Module

Need spare parts?

Sometimes it is helpful to have extra I/O module connectors or spare fuses. The DL205 spare parts and accessories are listed below:

- D2-FILL – Filler module for empty slots
- D2-8IOCON – 8-pt. I/O terminal blocks
- D2-16IOCON – 16-pt. I/O terminal blocks
- D2-IOCVR – Spare terminal block covers
- D2-FUSE-1 – Fuses for D2-12TA
- D2-FUSE-3 – Fuses for D2-04TD1, D2-04TRS, D2-08TR, D2-08CDR
- D2-FUSE-4 – Fuses for D2-12TR
- D2-ACC-1 – Base power terminal strip screws
- D2-ACC-2 – Spare terminal screws for 4-pt. and 8-pt. I/O modules
- ZL-D24-CON-X – Solder-type connector for 32-pt. and 64-pt. modules
- **DIN***nectors* and ***ZIP*Links** — Refer to the Terminal Blocks and Wiring section of this catalog for the complete line of products available.

DIN*nectors* terminal blocks

DIN*nectors* are DIN-rail mounted connectors or terminal blocks. They provide a means of connecting and identifying two or more wires. All **DIN***nectors* are UL, CSA, VDE, SEV, RINA and IEC approved. For more information, refer to the Terminal Blocks and Wiring section.

*ZIP*Link connection systems

*ZIP*Links consist of PLC interface cables and connector modules that offer "plug and play" capability by plugging one end of the *ZIP*Link cable into an I/O module and the other end into the *ZIP*Link connector module. This eliminates the tedious process of wiring PLC I/O terminals to terminal blocks individually. For more information, refer to Wiring Solutions in this section or see the Terminal Blocks and Wiring Solutions section in this catalog.

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I/O Availability

I/O Availability Table		
PLC CPU / CPU-Slot Controller	*D2-2622*	*H2-EBC100*
Discrete Modules		
DC Sink/Source In	✓	✓
DC Output	✓	✓
AC Input	✓	✓
AC Output	✓	✓
Relay Out	✓	✓
DC In / Relay Out	✓	✓
Analog Modules		
Analog Current In	✓	✓
Analog Voltage In	✓	✓
Analog Current Out	✓	✓
Analog Voltage Out	✓	✓
Analog Isolated Current Out	✓	✓
Analog Isolated Voltage Out	✓	✓
Combination Analog	✓	✓
Temperature Input	✓	✓
Speciality Modules		
Local Expansion	✓	
Communications	✓	
Remote I/O	✓	
CoProcessor	✓	
Counter I/O (H2-CTRIO2)	✓	✓
*Counter Interface (D2-CTRINT)**		

Sinking and sourcing for DC field devices

If you are using a DC type of field device, then you should consider 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 sinking/sourcing appendix for a complete explanation on how this affects your system selection.

Analog module selection tips

If you're going to control the speed of an AC inverter or drive with the DL205 analog module, make sure you select either the current sourcing F2-02DAS-1 or voltage sourcing F2-02DAS-2 isolated analog output module. Complete module specifications are listed later in this section.

If you need to operate within a 12VDC environment, the analog module part numbers that end with (-L) will operate at 12VDC. Most of the other modules require 24VDC.

H2-CTRIO2 vs. D2-CTRINT high-speed counter module

Select the H2-CTRIO2 instead of the D2-CTRINT* if your application requires:

- More than one quadrature encoder
- More than two single up counters
- Compatibility with the WinPLC
- High-speed inputs or outputs > 5 kHz
- Output operations on the module based on counts without interacting with the CPU

The H2-CTRIO2 is configured using "CTRIO Workbench", 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

*NOTE: D2-262 CPU does not support the D2-CTRINT module.

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Step 5: Choose an I/O Configuration

I/O configurations

The DL205 system offers local I/O, local expansion and remote I/O system configurations. A DL205 system can use a combination of the configuration arrangements. The tables, along with the configuration diagrams, list the number of I/O points, bases, etc. that are available with each configuration.

I/O bases

I/O bases are used for local I/O, local expansion or remote I/O configurations. The (-1) bases are required for local I/O expansion that is supported by the CPUs. The (-1) bases can be used with all DL205 CPUs (Older, non-(-1) bases can be used if local expansion is not required). There are four DL205 base sizes (3, 4, 6, and 9-slot), each of which has a built-in power supply.

Local I/O

The D2-262 CPU supports local I/O and local expansion bases. All local I/O points are updated on every CPU scan. The I/O count limits are determined by the number of available I/O slots, the I/O module point density, and the power budget available for the system.

Local expansion

The D2-262 supports local expansion up to five total bases (one CPU base and four expansion bases). Expansion bases are commonly used when there are not enough slots available in the CPU base, or when the base power budget will be exceeded. Each local expansion base requires the D2-CM module in the CPU slot. The local CPU base requires the D2-EM Expansion Module, as well as each expansion base. The modules are connected using the D2-EXCBL-1. When using expansion bases, discrete I/O are updated synchronously with each scan, while analog I/O are asynchronous with the scan.

Ethernet remote I/O

The DL205 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 Client module (H2-ERM100) is placed in an I/O slot of the local CPU base. Ethernet Base Controller (EBC) modules serve as the remote Server units and are placed in the CPU slot of one or more remote bases. You can use standard DL205 modules in the remote bases. The Remote

Servers are connected to the Client 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.

Each H2-ERM100 module can support up to: 16 H2-EBC100 systems, 16 Terminator I/O EBC systems, 16 fully expanded H4-EBC systems, or any combination of these.

The PLC, ERM and EBC Server 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 for configuring the ERM and its remote Servers.

It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its Servers. 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 Server I/O and the speed of the I/O network. Ensure ERM networks, multiple ERM networks and ECOM/office networks are isolated from one another.

Local and Local Expansion I/O Configurations

Local I/O configurations

Local I/O Configuration

CPU	Total I/O	Max. Inputs	Max. Outputs
D2-262	256	256	256

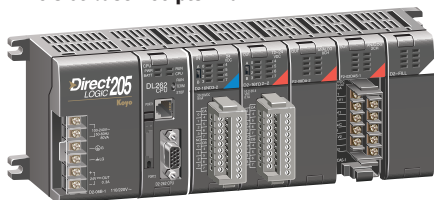*Four I/O base configurations to select from*
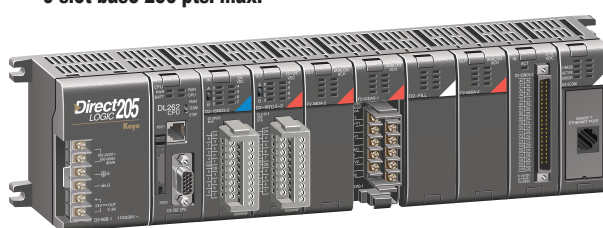
3-slot base 64-pts. max.

4-slot base 96-pts. max.

6-slot base 160-pts. max.

9-slot base 256-pts. max.

Local expansion I/O configurations using D2-EM and D2-CM modules

D2-262 local expansion system

The D2-262 support local expansion, up to five total bases (one CPU base and four expansion bases). All bases in an expansion system must be (-1) bases. The CPU base can be located at any point in the expansion system layout. The maximum total expansion system cable length is 30m (98ft). For more information, refer to the Expansion Module specification pages later in this section.

D2-262 CPU

D2-EM

D2-CM

Do not use Ethernet hubs to connect the modules.

D2-CM
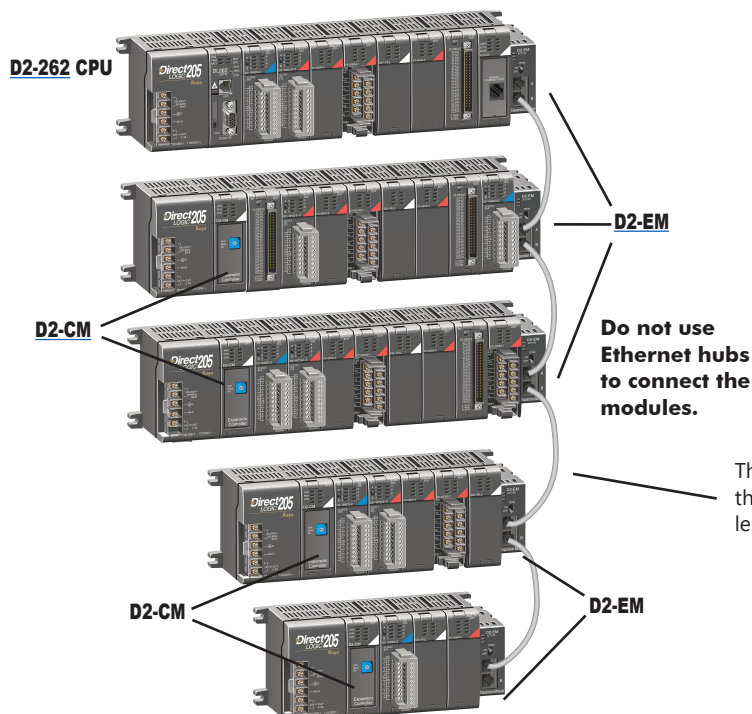
D2-EM

Local Expansion I/O Configuration

CPU	# of Exp. Bases	Total I/O	Max. Inputs	Max. Outputs
D2-262	4	1280	1024	1024

The D2-EXCBL-1 is a Category 5 straight-through cable that connects the D2-EM modules together. The cable can be user made in custom lengths up to 30m depending upon the configuration.

Remote I/O Configurations
Ethernet remote I/O configuration using H2-ERM100 and EBC Servers
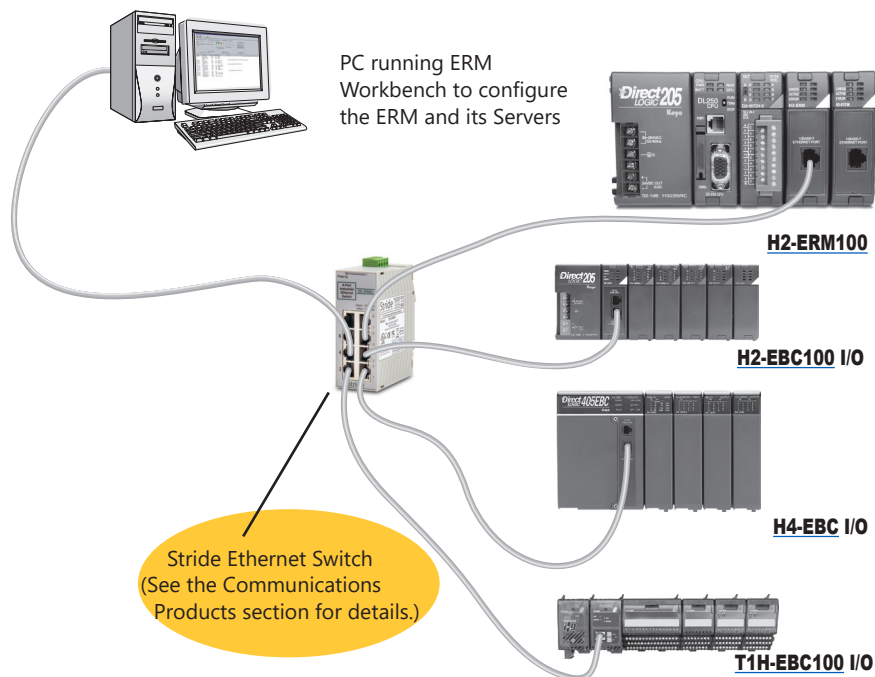
PC running ERM Workbench to configure the ERM and its Servers

H2-ERM100

H2-EBC100 I/O

H4-EBC I/O

T1H-EBC100 I/O

Stride Ethernet Switch (See the Communications Products section for details.)

Specifications	H2-ERM100
Communications	10/100Base-T Ethernet
Data Transfer Rate	100 Mbps
Link Distance	100 meters (328 ft)
Ethernet Port	RJ45
Embedded Web Server	HTTP (unsecure)
Ethernet Protocols	TCP/IP, IPX, Modbus TCP/IP, DHCP, HTML (unsecure) configuration

Ethernet Remote I/O Configuration					
CPU	Max. # of Channels	Max. # of Servers/ Channel	Discrete I/O pts.	Analog I/O	Remote I/O pts / Channel
D2-262	Limited by power budget	16 Servers (H2-EBC100, H4-EBC or T1H-EBC100)	8192	Map into available memory registers	16,384 [1]

[1] 16,384 I/O pts. can be achieved with 16 fully expanded H4-EBC Servers using V-memory and bit-of-word instructions.

Note: It is highly recommended that a dedicated Ethernet remote I/O network be used for the ERM and its Servers. 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 Server I/O and the speed of the I/O network. Ensure ERM networks, multiple ERM networks and ECOM/office networks are isolated from one another.

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I/O Addressing Schemes

DL205 I/O addressing scheme

You may have used other PLC systems prior to trying *Direct*LOGIC products. One of the key differences between various PLC systems is the I/O module addressing. This section will show you how we address the individual I/O points in a DL205 system.

Octal addressing

The DL205 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 or 16 points, depending on the modules being used. We have designated "X" for inputs and "Y" for outputs.

Note: Four-point modules consume eight points, but only the first four points are actually used by the module. Twelve-point modules consume 16 points, but only 12 points are used. The first six points are used, then two points are skipped, then the next six points are used, and the last two are skipped.

Automatic addressing

The DL205 CPUs automatically examine local I/O modules to establish the correct I/O addressing on power-up. The D2-262 CPU automatically examines I/O modules in expansion bases as well. The modules don't have to be grouped by type and can typically be mixed in any order. However, there are restrictions placed on some specialty modules or combinations of modules (see the next page). The diagram to the right shows sample addresses for a simple system that contains a few discrete I/O modules.

Manual addressing

The D2-262 CPU allows 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 need to change slightly to accommodate a special request (i.e. adding or removing I/O modules from a system). Manual addresses are based on 16-point boundaries.

Remote I/O addressing

Remote I/O allows you to assign addresses manually. You can choose the data type for the remote points. Ethernet remote I/O (H2-ERM100) allows you to map the analog I/O channels directly into V-memory (16-bit words) while mapping the discrete I/O points into input/output bit memory (Xs & Ys). Serial remote I/O allows you to assign one starting address for all of the input modules and one starting address for the output modules.

Leaving empty slots

You may be tempted to leave empty slots for future expansion. This is perfectly acceptable, but it is very important that you understand the implications of placing a module in the empty slot at a later time.

Since the CPU automatically assigns the I/O addresses, it is possible to cause problems by adding a module to the system. Examine the example system shown below. If you added an input module to the empty slot, the new input addresses would start after the existing input addresses, so no problems would occur. However, if you added an output to the empty slot, your remaining output addresses would change. Therefore, you would have to edit your RLL program to reflect the address changes. The manual addressing feature is especially useful when adding an I/O module between existing I/O modules or removing a module.

You should always add extra modules to the right of existing modules of the same type to avoid any re-addressing of your I/O points.
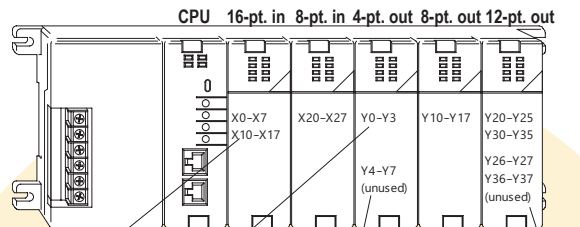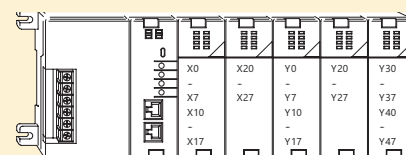

Inputs start at X0   Outputs start at Y0   4-pt. module has four points unused   12-pt. module skips points and has four unused points
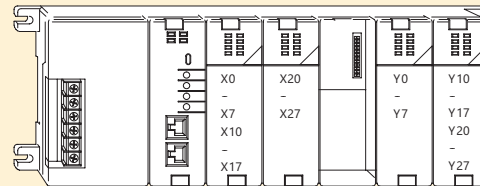
I/O base with a slot left empty. The examples below show the addressing changes if an input or an output module is added to the system.
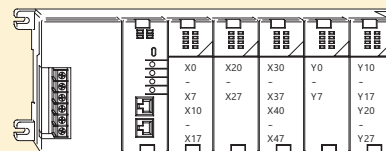
Add Input module. Addresses follow existing, so no program modification is required.

Add output module. Addresses are re-numbered and program modification is required.

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Module Placement and I/O Usage Tables

Verify planned I/O module locations

There are very few I/O module placement restrictions in the DL205 family. In general, any mix of analog and discrete module types can be used in any local, expansion or remote base. However, there are a few situations with the analog and specialty modules that warrant some special considerations. Reference the Module Placement Restrictions table to the right for the DL205.

Analog I/O with expansion bases

When using an analog module in an expansion base, the analog update time to the CPU will be asynchronous to the scan time.

I/O point usage

The table to the right indicates the number of I/O points consumed by each module. Use this information to ensure you stay within the maximum I/O count of the I/O system you have chosen.

Module Placement Restrictions

Module/Unit	Local CPU Base	Local Expansion	Remote Base
CPUs	CPU slot only		
DC Input	✓	✓	✓
AC Input	✓	✓	✓
DC Output	✓	✓	✓
AC Output	✓	✓	✓
Relay Output	✓	✓	✓
Analog Input & Output	✓	✓	✓
Local Expansion[1] (D2-262)			
Base Expansion Unit (D2-EM)	✓	✓	
Base Controller Unit (D2-CM)		CPU slot only	
Remote I/O			
Remote Client	✓		
Remote Server Unit			CPU slot only
Ethernet Remote Client	✓		
CPU Device			
Ethernet Base Controller	CPU slot only		
DeviceNET	CPU slot only		
SDS	CPU slot only		
Specialty modules			
Counter Interface (D2-CTRINT)[3]	Slot 0 only		
Counter I/O (H2-CTRIO2)[2]	Any slot except Slot 0		
Simulator	✓	✓	✓
Data Communications	Any slot except Slot 0		
Ethernet Communications	Any slot except Slot 0		
Basic CoProcessor	Any slot except Slot 0		

1 When used in expansion bases, the analog update is asynchronous to the PLC.
2 H2-CTRIO2 will not work in slot 0 when used with the D2-262. The H2-CTRIO2 is not supported in expansion bases at this time.
3 D2-262 does not support the D2-CTRINT module.

I/O Module Point Usage

DC INPUT		RELAY OUTPUT		SPECIALTY MODULES	
D2-08ND3	8 in	D2-04TRS	8* out	D2-CM	None
D2-16ND3-2	16 in	D2-08TR	8 out	F2-08SIM	8 in
D2-32ND3	32 in	F2-08TR	8 out	D2-CTRINT	8 in 8 out
D2-32ND3-2	32 in	F2-08TRS	8 out	H2-CTRIO2	None
		D2-12TR	16** out	D2-DCM	None
				H2-EBC100	None
AC INPUT				H2-ECOM100	None
D2-08NA-1	8 in	**COMBINATION**		F2-CP128	None
D2-08NA-2	8 in				
D2-16NA	16 in	D2-08CDR	8 in*/8 out*		
DC OUTPUT		**ANALOG**			
D2-04TD1	8* out	F2-04AD-1	16 in		
D2-08TD1	8 out	F2-04AD-2	16 in	**REMOTE I/O**	
D2-08TD2	8 out	F2-08AD-1	16 in		
D2-16TD1-2	16 out	F2-08AD-2	16 in		
D2-16TD2-2	16 out	F2-02DA-1 & 1L	16 out	H2-ERM100	None
F2-16TD1P	16 in/16 out	F2-02DA-2 & 2L	16 out		
F2-16TD2P	16 in/16 out	F2-4AD2DA	16 in/16 out		
D2-32TD1	32 out	F2-8AD4DA-1	32 in/32 out		
D2-32TD2	32 out	F2-8AD4DA-2	32 in/32 out		
		F2-02DAS-1	32 out		
AC OUTPUT		F2-02DAS-2	32 out		
		F2-08DA-1	16 out		
D2-08TA	8 out	F2-08DA-2	16 out		
F2-08TA	8 out	F2-04RTD	32 in		
D2-12TA	16** out	F2-04THM	32 in		

* 4-pt. modules consume eight points. Only the first four points are used.
** 12-pt. modules consume 16 points. The first six points are assigned, two are skipped, and then the next six points are assigned. For example, a D2-12TA installed in slot 0 would use Y0-Y5, and Y10-Y15. Y6-Y7, and Y16-Y17 would be unused.

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Step 6: Check the Power Budget

Managing your power resource

When determining the types and quantity of I/O modules you will be using, it is important to remember there is a defined amount of power available from the base power supply.

The chart on the next page indicates the power supplied and used by each DL205 device. The adjacent chart shows an example of how to calculate the power used by your particular system. These charts should make it easy for you to determine if the devices you have chosen will operate 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 may be able to resolve the problem by using local expansion or remote I/O bases.

DL205 power supply specifications

The table below lists base power supply specifications, including maximum inrush current and maximum power consumed from your power source.

Power budget example

The example on the right shows how to calculate the power budget for the DL205 system. The examples are constructed around a single 9-slot base using the devices shown. It is recommended you construct a similar table for your DL205 system. Follow the steps to the right to determine your power budget.

1. Using a chart similar to the one below, fill in column 2.

2. Using the tables on the next page, enter the current supplied and used by each device (columns 3 and 4). Devices which fall into the "Other" category (Row D) are devices such as the operator interface and the handheld programmer, which also have power requirements, but do not directly plug into the base.

3. Add the current used by the system devices (columns 3 and 4) starting with the CPU slot 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 power supply does not need to supply all the external power. If you need more than the 300mA supplied, you can add an external 24V power supply. This will help keep you within your power budget for external power.

A	Column 1	Column 2	Column 3	Column 4
		Device Type	*5VDC (mA)*	*External Power 24 VDC (mA)*
B	**CURRENT SUPPLIED**			
	Base	9 slot	2,600	300
C	**CURRENT REQUIRED**			
	CPU SLOT	D2-262 (CPU)	336	0
	SLOT 0	D2-16ND3-2	100	0
	SLOT 1	D2-16ND3-2	100	0
	SLOT 2	D2-16NA	100	0
	SLOT 3	D2-08NA-1	50	0
	SLOT 4	D2-16TD1-2	200	80
	SLOT 5	D2-08TA	250	0
	SLOT 6	D2-08TA	250	0
	SLOT 7			
D	**OTHER**			
	Operator interface	EA9-	150	0
	Handheld programmer	D2-HPP	200	0
E	Maximum Current Required		1736	80
F	Remaining Current Available		2600-1730=870	300-80=220

Power Supply Specifications			
Specification	**AC Powered Bases**	**24 VDC Powered Bases**	**125 VDC Powered Bases**
Part Numbers	D2-03B-1, D2-04B-1, D2-06B-1, D2-09B-1	D2-03BDC1-1, D2-04BDC1-1, D2-06BDC1-1, D2-09BDC1-1	D2-06BDC2-1, D2-09BDC2-1
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10Mq at 500VDC		
Input Voltage Range	85-132 VAC (110 range) 170-264 VAC (220 range) 47-63Hz	10.2-28.8 VDC (24VDC), with less than 10% ripple	100-264 VDC (125VDC), with less than 10% ripple
Auxiliary 24 VDC Output	300mA max.	None	300mA max.
Maximum Inrush Current	30A	10A	20A
Maximum Power	80VA	25W	30W

STEP 1 2 3 4 5 6 HERE 7

Power Requirements

These charts help determine your power requirements

This section shows the amount of power supplied by each of the base power supplies and the amount of power consumed by each DL205 device. The Power Consumed charts list how much INTERNAL power from each power source is required for the DL205 devices. Use this information when calculating the power budget for your system.

In addition to the internal power sources, the DL205 bases offer a 24 VDC auxiliary power supply with external power connections. This auxiliary power supply can power external devices.

Use *ZIP*Links to reduce power requirements

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

This logo is placed next to the I/O modules that are supported by the *ZIP*Link connection systems. See the I/O module specifications at the end of this section.

Power Supplied			
Device	*Price*	*5V(mA)*	*24V Auxiliary*
Bases			
D2-03B-1	$211.00	2600	300
D2-03BDC1-1	$282.00	2600	None
D2-04B-1	$230.00	2600	300
D2-04BDC1-1	$311.00	2600	None
D2-06B-1	$305.00	2600	300

Power Consumed		
Device	*5V(mA)*	*24V Auxiliary*
CPUs		
D2-262	336	0
DC Input Modules		
D2-08ND3	50	0
D2-16ND3-2	100	0
D2-32ND3	25	0
D2-32ND3-2	25	0
AC Input Modules		
D2-08NA-1	50	0
D2-08NA-2	100	0
D2-16NA	100	0
Input Simulator Module		
F2-08SIM	50	0
DC Output Modules		
D2-04TD1	60	20
D2-08TD1	100	0
D2-08TD2	100	0
D2-16TD1-2	200	80
D2-16TD2-2	200	0
F2-16TD1P	70	50
F2-16TD2P	70	50
D2-32TD1	350	0
D2-32TD2	350	0
AC Output Modules		
D2-08TA	250	0
F2-08TA	250	0
D2-12TA	350	0
Relay Output Modules		
D2-04TRS	250	0
D2-08TR	250	0
F2-08TR(S)	670	0
D2-12TR	450	0
Combination In/Out Module		
D2-08CDR	200	0

Power Consumed		
Device	*5V(mA)*	*24V Auxiliary*
Operator Interface		
C-more Micro-Graphic	210	0

Power Supplied			
Device	*Price*	*5V(mA)*	*24V Auxiliary*
Bases			
D2-06BDC1-1	$337.00	2600	None
D2-06BDC2-1	$284.00	2600	300
D2-09B-1	$328.00	2600	300
D2-09BDC1-1	$356.00	2600	None
D2-09BDC2-1	$379.00	2600	300

Power Consumed		
Device	*5V(mA)*	*24V Auxiliary*
Analog Modules		
F2-04AD-1	100	5
F2-04AD-2	110	5
F2-08AD-1	100	5
F2-08AD-2	100	5
F2-02DA-1	40	60 (note 1)
F2-02DA-2	40	60
F2-02DAS-1 F2-02DAS-2	100 100	50 / channel 60 / channel
F2-08DA-1	30	50 (note 1)
F2-08DA-2	60	140
F2-4AD2DA	60	80 (note 1)
F2-8AD4DA-1	35	100 (note 1)
F2-8AD4DA-2	35	80 (note 1)
F2-04RTD	90	0
F2-04THM	110	60
Specialty Modules		
D2-CTRINT	50*	0
D2-CM / D2-EM	100/130	0
H2-CTRIO2	275	0
D2-DCM	300	0
H2-EBC100	300	0
H2-ECOM100	300	0
F2-CP128	235	0
Remote I/O		
H2-ERM100, (-F)	300, (-F: 450)	0
Programming Devices		
D2-HPP	200	0

* Requires external 5VDC for outputs

Note 1: Add an additional 20 mA per output loop.

① ② ③ ④ ⑤ ⑥ ⑦
HERE

Dimensions and Installation

Understanding the installation requirements for your DL205 system will help ensure that the DL205 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, D2-USER-M (downloadable online), contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Environmental specifications

The Environmental Specifications table at the right lists specifications that apply globally to the DL205 system (CPUs, bases, and I/O modules). Be sure that the DL205 system is operated within these environmental specifications.

Base dimensions and mounting

Use the diagrams below to make sure the DL205 system can be installed in your application. To ensure proper airflow for cooling purposes, DL205 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 approximately 3" of space is left in front PLC surface for ease of access and cable clearances. Also, check the installation guidelines for recommended cabinet clearances.

See the Enclosures section for an enclosure that may be suitable for your application

2" 50mm min

2" 50mm min

2" 50mm min
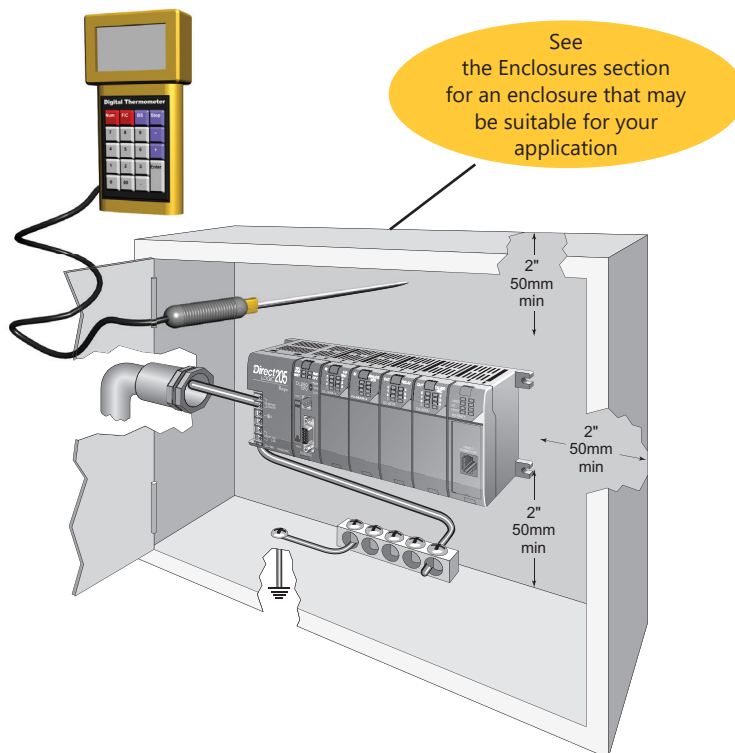
Environmental Specification	Rating
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F to 131°F (0°C to 55°C)
Ambient Humidity	30% to 95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD 810C, Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Base	A		B		C		D	
D2-03B-1, **D2-03BDC1-1**	6.77"	172mm	6.41"	163mm	5.8"	148mm	7.24"	184mm
D2-04B-1, **D2-04BDC1-1**	7.99"	203mm	7.63"	194mm	7.04"	179mm	8.46"	215mm
D2-06B-1, **D2-06BDC1-1**, **D2-06BDC2-1**	10.43"	265mm	10.07"	256mm	9.48"	241mm	10.90"	277mm
D2-09B-1, **D2-09BDC1-1**, **D2-09BDC2-1**	14.09"	358mm	13.74"	349mm	13.14"	334mm	14.56"	370mm

With **D2-DSCBL-1** on port 2 — 5.85" 148mm

With 32pt. ZipLink cable or base expansion unit cable — 4.45" 113mm

With 16pt. I/O — 3.62" 92mm

With 8pt. I/O — 2.95" 75mm

DIN rail slot (35mm)

A
C

3.54" 90mm

2.99" 76mm

B

With D2-EM base expansion module

D

OK

Airflow
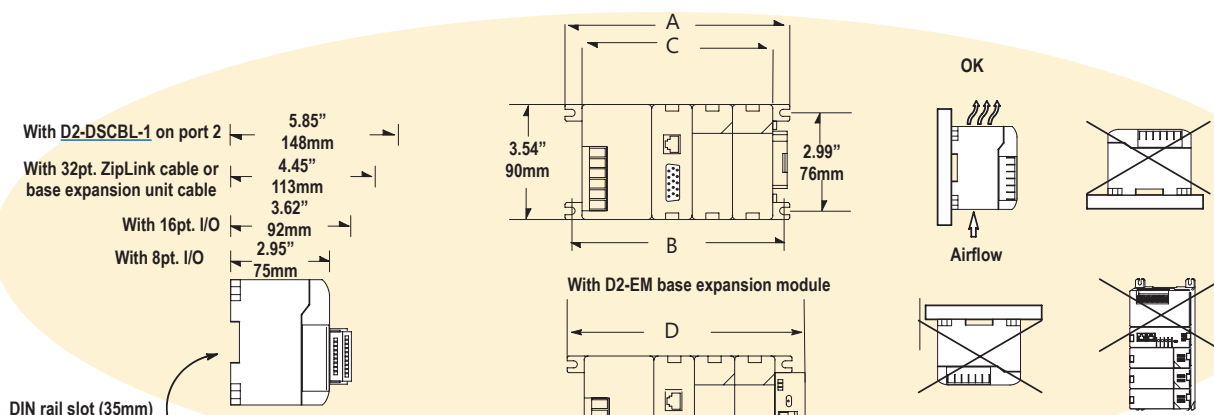
Local Expansion Modules

Base Expansion Module

D2-EM $120.00

Expansion Base Controller Module

D2-CM $98.00

Local expansion modules

The D2-262 supports local expansion up to five total bases (one CPU base + four expansion bases). Expansion bases are commonly used when there are not enough slots available in the CPU base, when the base power budget will be exceeded, or when placing an I/O base at a location away from the CPU base but within the expansion cable limits. Expansion base I/O addressing is based on the numerical order of the D2-CM rotary switch selection. The CPU recognizes the expansion bases on power-up.

D2-EM Expansion Module Specifications	
Module Type	Base expansion unit
I/O Slots Consumed	None; attaches to right side of (-1) bases
I/O Points Consumed	None
Expansion Connectors	Two 8-pin RJ45
Cable	Category 5 with RJ45 connectors (straight-through)
Maximum Cable Length	30m (98ft) total expansion system
Power Consumption	130mA @ 5VDC (supplied by base)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)

D2-CM Controller Module Specifications	
Module Type	Expansion base controller module
Modules per Base	One, CPU slot of (-1) base only
I/O Points Consumed	None
Expansion Base Number Select Switch	Rotary switch select 1-4 in any order
Power Consumption	100mA @ 5VDC (supplied by base)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)

CPU Supported / I/O Points				
CPU	# of Exp. Bases	Total I/O[1]	Max. Inputs	Max. Outputs
D2-262	4	1280	1024	1024

[1] *Includes CPU base and local expansion bases*

I/O Considerations

When using expansion bases in a PLC system, the CPU updates all discrete I/O points on every scan. However, if using analog modules in an expansion base, they are updated asynchronous to the CPU scan. Therefore, it is recommended that analog modules be placed in the CPU base.

Local expansion requires (-1) bases

Part number D2-xxB(xxx)-1 I/O bases must be used in local expansion systems. Each expansion base requires that the D2-CM module is placed in the CPU slot. The CPU base and each expansion base require the D2-EM unit that attaches to the right side of the (-1) bases.

D2-EXCBL-1 local expansion base cable

The category 5 straight-through cable D2-EXCBL-1 (1m) is used to connect the expansion modules together. If longer cable lengths are required, we recommend that you purchase commercially manufactured cables with RJ45 connectors already installed. The maximum total expansion system cable length is 30m (98ft).

Local Expansion Modules

D2-CM Expansion Base Controller Module

The D2-CM module is placed in the CPU slot of each expansion base. The rotary switch is used to select the expansion base number. The expansion base I/O addressing (Xs & Ys) is based on the numerical order of the rotary switch selection and is recognized by the CPU on power-up. Duplicate expansion base numbers will not be recognized by the CPU. An example of base I/O addressing order is shown to the right.

D2-262 expansion system

EXP. Base No.

TERM Switch ON

D2-CM #1

D2-CM #2

D2-CM #3

30m max.

D2-CM #4
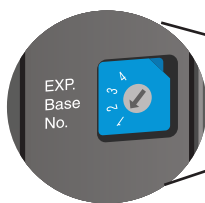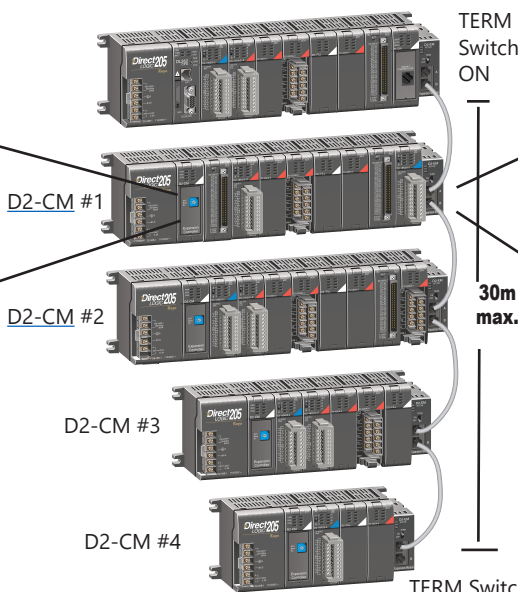
TERM Switch = ON

D2-EM Base Expansion Module

The D2-EM expansion unit is attached to the right side of each base in the expansion system. The D2-EMs on each end of the expansion system should have the TERM switch placed in the ON position. The expansion units between the end-most units should have the TERM switch placed in the OFF position. The CPU base can be located at any base position in the expansion system. It does not have to be located at one end or the other.
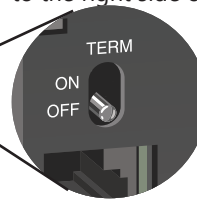
TERM
ON
OFF

D2-262 expansion system

The D2-262 supports local expansion up to five total bases (one CPU base + four expansion bases) and up to a maximum of 1280 total I/O points. All local and expansion I/O points are updated on every CPU scan. No specialty modules can be located in the expansion bases. Refer to the Module Placement Table earlier in this section for restrictions. The maximum total expansion system cable length is 30m (98ft). The red text and arrows in the example to the right indicate the I/O addressing order.

The D2-262 CPU base can be located at any base position in the expansion system.

I/O #1

TERM Switch = OFF

D2-CM #3

TERM Switch = OFF   I/O #4

TERM Switch = OFF

D2-CM #1   I/O #2

D2-CM #4

TERM Switch = ON

D2-CM #2   I/O #3

TERM Switch =ON   I/O #5

TERM Switch =ON
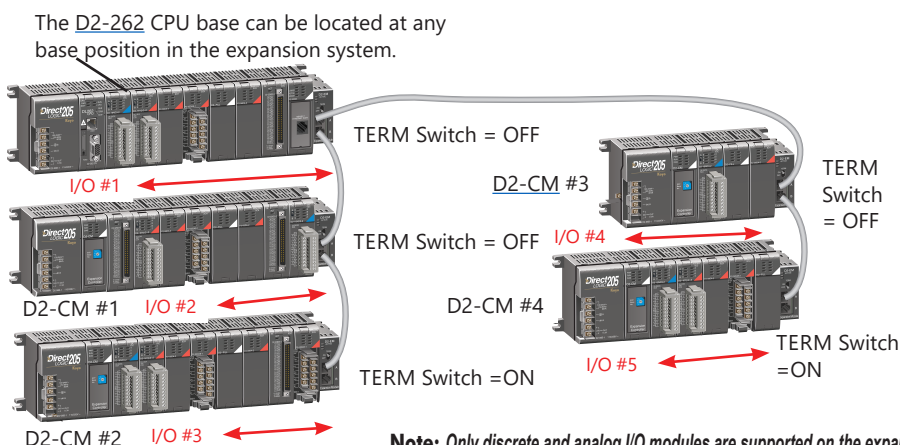
Note: *Only discrete and analog I/O modules are supported on the expansion bases. No specialty or communications modules can be used on the expansion bases at this time.*

Ethernet Remote I/O Client Modules

Overview

The Ethernet Remote Client H2-ERM100 connects D2-262 CPU systems to Server I/O over a high-speed Ethernet link.

Need a lot of I/O?

Each ERM module can support up to 16 additional H2-EBC100 systems, 16 Terminator I/O EBC systems (T1H-EBC100), 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-EBC100 analog I/O or H4-EBC 16-channel analog I/O, could exceed the buffer capacity of a single H2-ERM100 module. In these cases, an additional H2-ERM100 may be required.

Simple connections

The ERM connects to your control network using Category 5 UTP cables for cable runs up to 100 meters. Distances can be greatly extended with Ethernet/Fiber media converters like the SE-MC2U-ST.

Specifications	H2-ERM100
Communications	10/100BaseT Ethernet
Data Transfer Rate	100 Mbps
Link Distance	100m (328ft)
Ethernet Port	RJ45
Ethernet Protocols	TCP/IP, IPX, Modbus TCP/IP, DHCP, HTML (unsecure) configuration
Embedded Web Server	HTTP (unsecure)
Power Consumption	300mA @ 5VDC
Manufacturer	Host Automation Products, L.L.C.

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

Networking ERMs with other Ethernet devices

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

Software configuration

ERM Workbench is a software utility that must be used to configure the ERM and its remote Ethernet Servers.

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 and allows access to all ERM(100) I/O network parameters.

ERM Workbench Software
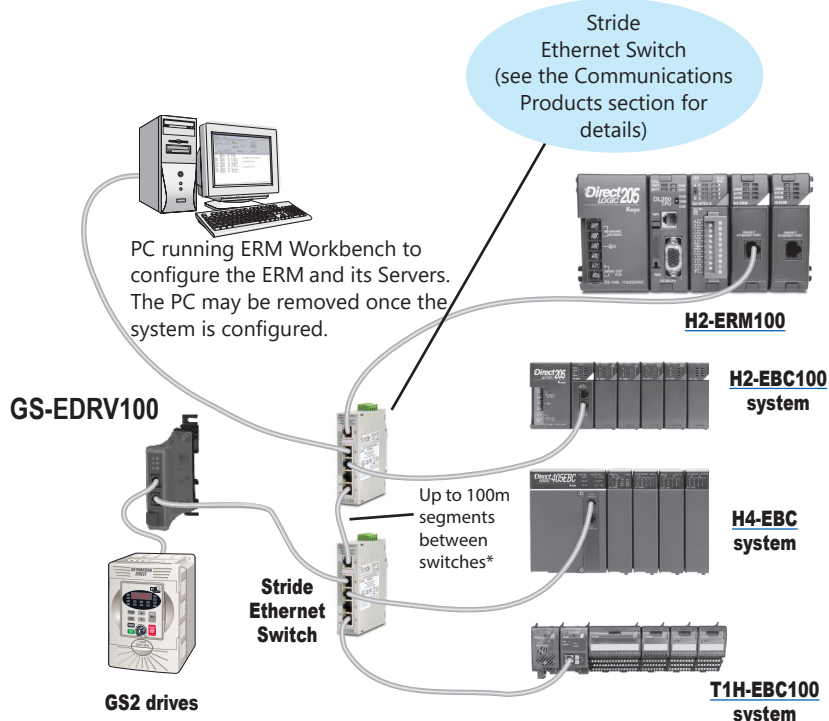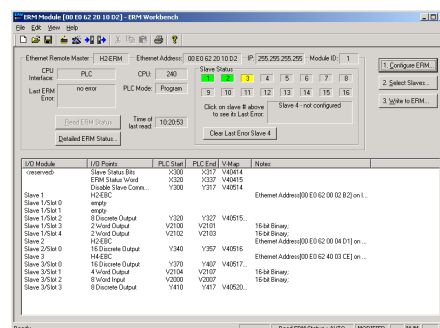
Stride Ethernet Switch (see the Communications Products section for details)

PC running ERM Workbench to configure the ERM and its Servers. The PC may be removed once the system is configured.

GS-EDRV100

H2-ERM100

H2-EBC100 system

Up to 100m segments between switches*

H4-EBC system

Stride Ethernet Switch

GS2 drives

T1H-EBC100 system

*Distances can be greatly extended with Ethernet/Fiber media converters like the SE-MC2U-ST

Ethernet Base Controller Modules

ETHERNET BASE CONTROLLER MODULES (EBC)

H2-EBC100 $492.00

Use EBCs for PC-based control and for H*-ERM100 remote I/O Servers

The H2-EBC100 Ethernet Base Controller module provide a low-cost, high-performance Ethernet link between DL205 I/O and your PC-based control system or DL205/DL405 CPUs using the H*-ERM100 module for remote I/O. The H2-EBC100 can also be used to connect your DL205 I/O to a Modbus TCP/IP client (Client). The H2-EBC100 supports industry standard 10/100BaseT Ethernet communications.

EBC modules offer:

- Lower cost on your *Direct*LOGIC I/O system compared to competitive I/O
- Virtually unlimited number of I/O points
- Deterministic I/O updates on dedicated networks
- Fast I/O updates (<1ms per base)
- On board serial port for possible operator panel, ASCII In/Out, etc. (serial port not supported when used with ERM module)

Specifications	H2-EBC100
Communications	10/100Base-T Ethernet
Data Transfer Rate	Up to 100Mbps
Link Distance	100 meters (328 ft)
Ethernet Port	RJ45
Ethernet Protocols	Do-more Ethernet remote I/O, Modbus TCP/IP, TCP/IP, UDP/IP, IPX, HTML (unsecure) configuration
Embedded Web Sever	HTTP (unsecure)
Serial Port	RJ12, K-sequence, ASCII IN/OUT, Modbus RTU, provides 5V 220mA
Max. Discrete I/O	256
Max. Analog I/O	64
Power Consumption	300mA

Stride Ethernet Switch
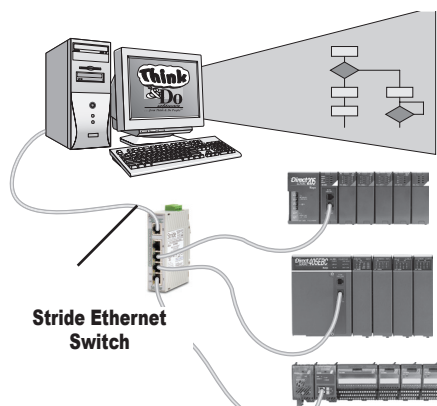
Off-the-shelf solutions

You can purchase PC-based control software that is ready to use with the H2-EBC100 module. PC-based control packages are equipped with compatible I/O device drivers, program development tools, and run-time environments. For a single-source integrated PC-based control solution that ships with everything you need to make your PC into an industrial controller, see the PC-based Control section of this catalog . Most of the software packages listed below allow you to connect serial devices, such as barcode readers, to the H2-EBC100's serial port.

The chart below identifies vendors that have PC-based Control products ready to control DirectLOGIC I/O, or have products to be released in the immediate future.

Software developers

For programmers developing custom drivers for our I/O, we offer a free Ethernet Software Development Kit (SDK). The SDK, developed and offered by Host Automation Products, L.L.C., provides a simplified API for interfacing with the H2-EBC100. 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, or go to www.hosteng.com for more information.

```
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 *pSizeofReturn-
Data
                      );
```


Easy to use, reliable and fast

The H2-EBC100 module plugs into the CPU slot of any DL205 I/O base and supports all DL205 discrete and analog I/O modules, the H2-SERIO(-4) and H2-CTRIO2 specialty modules. All EBC modules can be configured using NetEdit3, a free Windows software utility. The H2-EBC100 also supports HTML configuration.

Vendor	Product	Web Address
KEPware	KEPServerEX	www.kepware.com
Wonderware	InControl	www.wonderware.com
MDSI	OpenCNC	www.mdsi2.com

The D2-INST-M installation and I/O Manual covers information about DL205 I/O modules, power budgeting, and installation and wiring. This catalog does not cover CPU-slot controllers.

Serial Data Communications Module

DATA COMMUNICATIONS MODULE

D2-DCM $502.00
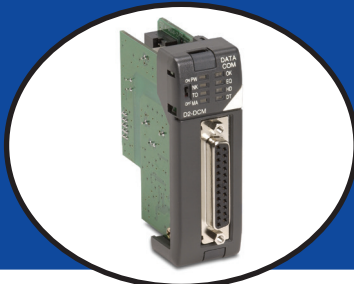
The D2-DCM Data Communications Module is used primarily for three reasons:

- Extra communications port to connect a PC, operator interface, etc.
- Network interface to *Direct*NET
- Network interface to a Modbus® network using the RTU protocol

Extra communications port

If additional communication ports are needed, they can easily be added by installing DCM modules. This allows additional connections of devices, such as operator interfaces, PCs, etc. Since the DCM does not require any programming, you can set the DCM communication parameters, connect the cables, and start transferring data. Make sure the device has a DL205 compatible driver.

*Direct*NET 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 PC. The DCM connects easily to *Direct*NET. 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 *Direct*LOGIC or compatible PLC. The DCM allows the DL205 to function as a network Client or network Server.

Specifications	
Module Type	Intelligent
Modules per CPU	7 maximum, any slot except slot 0, CPU base only
	D2-262
Communications	RS-232/422 signal levels, *Direct*NET Client/Server, K-sequence or Modbus RTU Server protocol, Baud rate selectable from 300 baud to 38.4 Kbaud, Odd or No parity, *Direct*NET HEX or ASCII mode
Recommended Cable	Belden 9729 or equivalent (for RS-422)
Field Wiring Connector	25-pin D-shell connector
Internal Power Consumption	300mA maximum at 5VDC, (supplied by base power supply)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	Koyo Electronics

Modbus RTU interface

The DCM can be used as a Server station interface to connect your DL205 system to a 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. Remember that the bottom port on the D2-262 CPU can act as a Modbus Client.

DCM as additional serial port

C-more HMI panel

Client/Server Network

Connect the DCM to our MDM-TEL serial modem (see the Communication Products section for details on the modem)

DCM as Client

RS232 to RS422 Converter

D2–DCM Server

DL–405 CPU (bottom port)

DL-305 Server
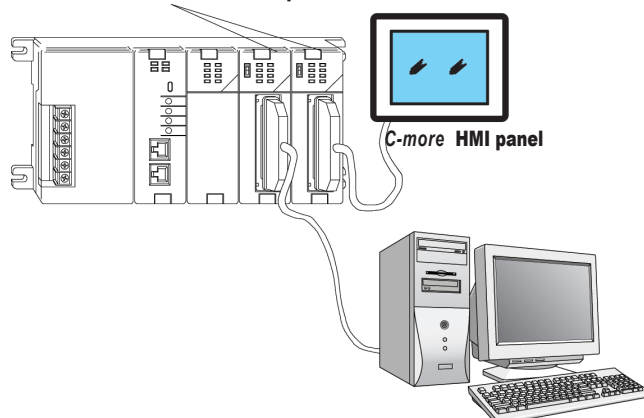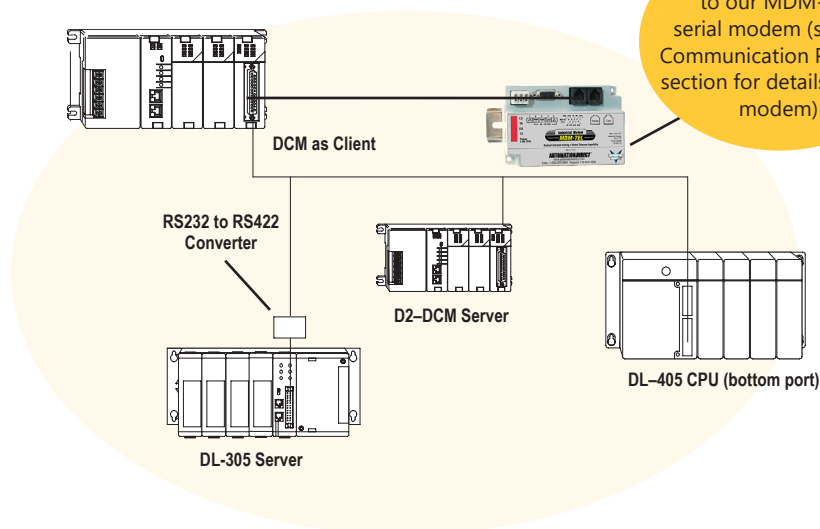
Serial Module for EBC Systems

SERIAL COMMUNICATIONS MODULE FOR EBCs

H2-SERIO $267.00

H2-SERIO-4 $267.00

H2-SERIO / H2-SERIO-4 Specifications		
	H2-SERIO	*H2-SERIO-4*
Module Type	Intelligent module for use with H2-DM1, H2-DM1E or H2-EBC100 with PC application	
Approvals	cUL Listed, file number E185989	
Number of Serial Ports per Module	3 ports: all RS-232 (RJ12 jack)	3 ports: 2 RS-232 ports (RJ12 jack) and 1 RS-422/485 (5 position terminal strip)
Signals	RS-232: CTS, RXD, TXD RTS, GND RTS transmission delay times: 5, 50, 250 and 500 ms	RS-232: CTS, RXD, TXD RTS, GND RTS transmission delay times: 5, 50, 250 and 500 ms
		RS-422 (4 wire) : TX+, TX-, RX-, RX+, GND RS-485 (2 wire): Data+, Data-, GND
Number of Modules Supported	8 per H2-DM1, H2-DM1E or H2-EBC100	
Recommended Cables	Belden 9729 or equivalent	RS-232 ports: Belden 9729 or equivalent RS-422/RS-485 terminal: 16-28 AWG solid or stranded conductor (1.5 mm^2) Wire strip length: 0.24-0.27 inches (6-7 mm); Screw torque: 1.7 in·lbs (0.2 N·m)
Protocols Supported	Serial ASCII (full-duplex) and Modbus RTU Server	
Power Consumption	80mA @ 5VDC	
Baud Rates	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	
Parity	None, odd, even	
Start and Stop Bits	1, 2	
Operating Environment	0 to 60°C (32°F to 140°F), 5% to 95% RH (non-condensing); No corrosive gases, Pollution level 2; Vibration: MIL STD 810C 514.2; Shock: MIL STD 810C 516.2	
Storage Temperature	-20 to 70°C (-4°F to 158°F)	
Firmware Note	The H2-EBC100 requires firmware version v2.1383 or later to support the H2-SERIO or H2-SERIO-4.	

H2-SERIO

H2-SERIO-4

Serial I/O modules for PC-based control

Add serial ports to your EBC-based rack system by simply plugging the H2-SERIO or H2-SERIO-4 modules into the DL205 I/O base.

The H2-SERIO module has three RS-232C ports, while the H2-SERIO-4 module has two RS-232C ports and one RS-422/485port.

Processing large amounts of serial data

While the H2-SERIO(-4) module will support virtually any serial device, processing large amounts of serial data will increase the system response time. This is important to consider when using multiple H2-SERIO(-4) modules.

Serial Modules for EBC Systems

Separate communications parameters for each port

Use the Do-More software package to set baud rate, parity, data bits, and stop bits for each serial port. Choose from 300 baud to 57.6K baud communication speeds. Do-More allows each port to be designated as a Modbus Server or a generic serial device. Each port on the H2–SERIO(-4) module is capable of full hardware handshaking.

Easy serial communications

Do-More software includes advanced string and array functions that make transmitting, receiving and manipulating serial data a snap.

Using H2-SERIO(-4) in an EBC system

Do-More versions 2.3 and later support the use of up to eight H2-SERIO(-4) modules per EBC node in a PC-based control system. The Client must be a CPU running Do-More v2.3 or later.

H2-SERIO(-4) Wiring: RS-232

RS-232

6 pin RJ12 Phone Type Jack – both por

H2-SERIO(-4) RS-232 Pin Descriptions		
1	0V	Power (-) connection (GND)
2	CTS	Clear to Send
3	RXD	Receive data (RS-232)
4	TXD	Transmit data (RS-232)
5	RTS	Request to Send
6	0V	Signal Ground (GND)
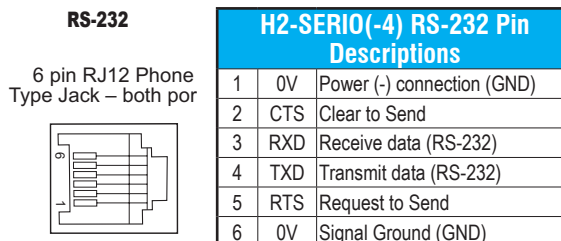
H2-SERIO-4 Wiring: RS-422/485

Set DIP switch S2 on the H2-SERIO-4 to:
1. Activate or deactivate the internal 120Ω termination resistor.
2. Select RS-422 or RS-485 operation.

RS-422

(H2-SERIO-4 contains an optional 120Ω termination resistor between RX+ and RX-; use DIP switch S2 to activate or deactivate resistor.)

* User Supplied 120Ω Termination Resistor

RS-485

(H2-SERIO-4 contains an optional 120Ω termination resistor between RX+ and RX-; use DIP switch S2 to activate or deactivate resistor.)

* User Supplied 120Ω Termination Resistor
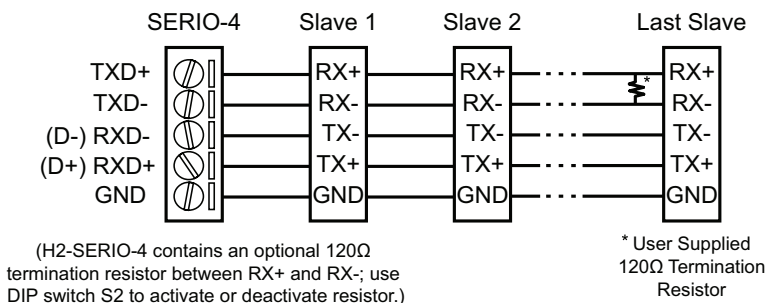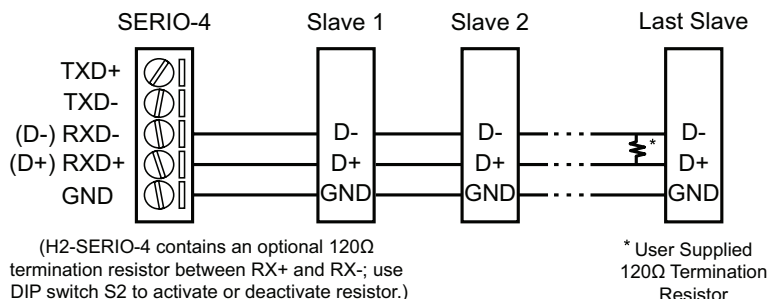
Ethernet Communications Modules

ETHERNET COMMUNICATIONS MODULE

H2-ECOM100 $450.00

Overview

Ethernet Communications Modules offer features such as:

- High-speed peer-to-peer networking of PLCs
- Fast updates with *Direct*SOFT Programming Software
- High-performance access for Human Machine Interface (HMI), ERP, MES or other Windows-based software
- Industry standard Modbus TCP Client/ Server Protocol (H2-ECOM100)
- Embedded Web Server: HTTP(Unsecure)
- Ethernet Protocols: HTML (Unsecure) configuration
- Free SDK for custom drivers
- Easy setup

The Ethernet Communication (ECOM) Modules 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 Client. Any PLC can initiate communications with any other PLC. Link your PLCs with PCs using industry standard Modbus TCP protocol connected through standard cables, hubs, and repeaters. Or, use KEPServerEX* I/O Server to link to your favorite HMI/SCADA, data historian, MES or ERP software to *Direct*LOGIC PLCs. DirectSOFT Programming Software can be used to monitor or update the program in any DirectLOGIC PLC on the network.

* KEPSeverEX may be purchased from Kepware and will support any existing applications. (https://www.kepware.com/en-us/products/kepserverex)

Simple connections

Use Category 5 UTP cables or 62.5/125 ST-style fiber optic cables depending on the requirements of your application. Inexpensive UTP cables can be run up to 100 meters between nodes. Distances can be greatly extended with Ethernet/ Fiber media converters like the SE-MC2U-ST. Fiber optic cables virtually eliminate electrical noise problems. Use repeaters to extend distances and expand the number of nodes.

Stride Ethernet switches are compatible with the ECOM modules. See the Communications Products section for information on these items.

H2-ECOM100 *IBox* communications instructions

Over 40 Communications IBox instructions are available when using the H2-ECOM100 with a D2-250-1 or D2-262 PLC and DirectSOFT6 programming software. These easy-to-use instructions allow you to:

- Enable/disable module DHCP
- Read/write module IP, Gateway and Subnet Mask addresses
- Read/write module ID, Name and Description
- Send E-mail messages
- Read/Write PLC memory to networked Hx-ECOM100 modules
- Read/Write PLC memory to networked Hx-ECOM modules

See the following page for example Communications IBox instructions.

The H2-ECOM100 supports the industry standard Modbus TCP Client/ Server Protocol

Message is sent out of port only connected to device

Message in from a device

See the Communications section for details on Ethernet Switches

Specifications	H2-ECOM100
Communications	10/100Base-T Ethernet
Data Transfer Rate	100 Mbps max.
Link Distance	100 meters (328ft)
Ethernet Port	RJ45
Ethernet Protocols	TCP/IP, IPX, Modbus TCP, DHCP, HTML (unsecure)configuration, Embedded Web Server: HTTP(unsecured) configuration
Power Consumption	300mA @ 5VDC
Manufacturer	Host Automation Products, L.L.C.

Ethernet Communications Modules

Modbus TCP support

The H2-ECOM100 supports the industry standard Modbus TCP Client/Server protocol in addition to the standard IP and IPX protocols. This allows the DL205 PLC with an H2-ECOM100 module to serve as a client (Client) or as a server (Server) on a Modbus TCP Ethernet network. The H2-ECOM100 can actively issue Modbus commands to other nodes or devices on the Modbus TCP network or simply respond to connected Modbus TCP clients.

Modbus TCP communications architecture
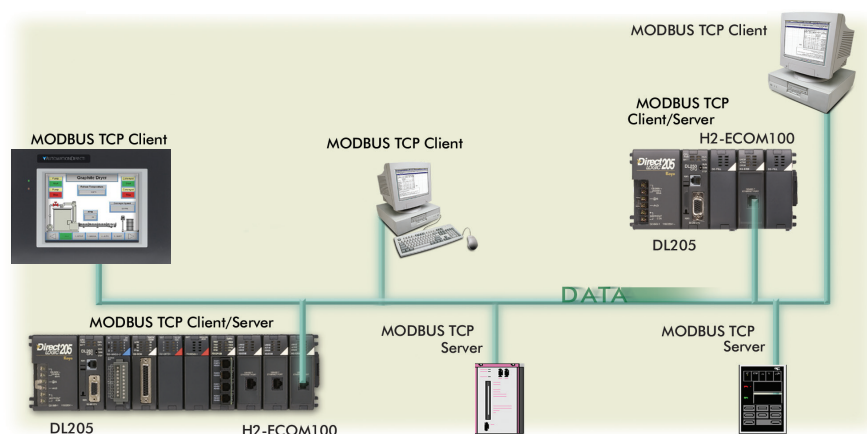
PLC-to-PLC communications

PLC-to-PLC or PLC to a Modbus TCP device communications can be accomplished using standard Read from Network (RX) and Write to Network (WX) instructions (H2-ECOM100, all H2 series ECOMs and all DirectSOFT versions). If you're using DirectSOFT programming software, a D2-262 PLC and an H2-ECOM100, you can use fill-in-the-blank IBox instructions to simplify your communications programming. The H2-ECOM100 supports the ECOM100 Configuration IBox for use with the ECRX and ECWX IBox instructions to read/write to other ECOM(100)s. All H2 series ECOM modules support the NETCFG Configuration IBox for use with the NETRX and NETWX IBox instructions to read/write to other ECOM modules (remember D2-262 and a supporting version of DirectSOFT is required). The Communications IBox instructions execute with built-in interlocking to greatly simplify communications programming.

ECOM100 Configuration IBox

ECOM100 Read Network IBox

H2-ECOM100 has e-mail capability!

The H2-ECOM100 Send EMail (ECEMAIL) IBox instruction allows the module to behave as an e-mail client and send an SMTP request to your SMTP Server to send a specified e-mail message to the e-mail addresses in the in IBox's To: field. The Body: field allows you to embed real-time data in your e-mail message. The D2-262 CPU and a supporting version of DirectSOFT is required to use the IBox instructions.

ECOM100 Send EMail IBox

NetEdit3 software

NetEdit3 Software is installed with DirectSOFT and it can be downloaded on the AutomationDirect.com website. Use NetEdit3 to configure 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. NetEdit3 uses two protocols for PC-to-PLC communications: IPX and TCP/IP. The NetEdit3 screen displays all identifiers and troubleshooting information for each module on the network. You can use NetEdit3 to adjust parameters for PLC-to-PLC communications by clicking on Advanced Settings. The network identifiers can also be changed from DirectSOFT Programming Software.

Choose your slot

The ECOM modules plug into any I/O slot (excluding slot 0) of any local DL205 I/O base. The module maintains identification data, descriptive information, and communication parameters for PLC-to-PLC communications in flash memory. Disconnect power before installing or removing any PLC module.
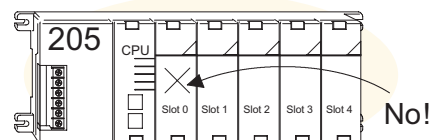
Note: Use D2-262 CPU with the ECOM modules. The D2-CM bases do not support the ECOM modules.

CoProcessor Module

TRIPLE-PORT BASIC COPROCESSOR

F2-CP128 $604.00
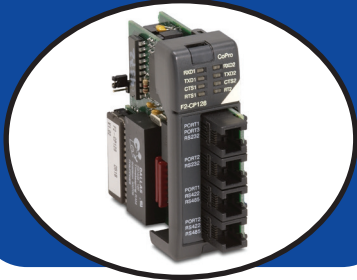
Overview

The BASIC CoProcessor Module interfaces the DL205 family of programmable controllers with bar code readers, operator interface terminals, instrumentation equipment, computers and other serial devices.

BASIC CoProcessor applications

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

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

They are also good solutions for applications requiring complex math: such as, floating point math, sine, cosine, tangent, exponential, square roots, etc.

Features

- FACTS Extended BASIC and ABM Commander for Windows software for IBM PCs makes program development fast and simple. Allows online, full-screen BASIC program editing and the ability to upload / download programs on disk. The CD-ROM includes Modbus Client and Server BASIC programs and other application examples.
- Non-volatile memory of up to 128K allows multiple program storage and execution, DL205 register expansion, and retentive data storage and retrieval.
- 26 MHz BASIC CoProcessor provides fast program execution independent of the CPU scan.
- Three buffered ports permit communication from the module to three external devices.
- The module is programmable from port 1 or 2 for complete serial port utilization without switching cables.
- A real-time clock/calendar maintains time/ date with battery backup when power outages occur. Programmable time based BASIC interrupts to 0.010 of a second.
- Direct access of up to 254 bytes of DL205 CPU memory per scan is possible. No supporting ladder logic is required.
- Floating point math solves complex formulas to eight significant digits.

Example Application

Barcode scanner

Scale
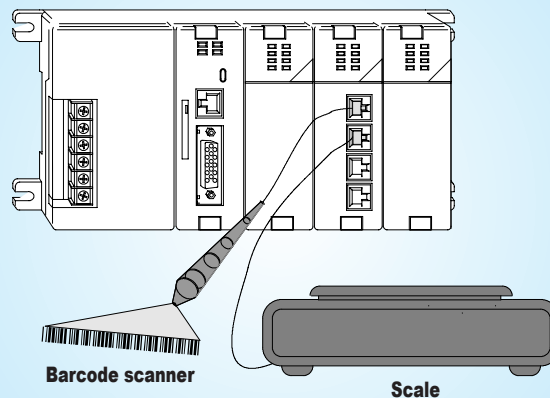
BASIC CoProcessor

Triple Port BASIC CoProcessor Module Specification	
Module Type	CoProcessor, Intelligent
Modules per CPU	Seven maximum, any slot in CPU base (except slot zero)
Communication	256 character type-ahead input buffer on all ports. Ports are independently programmed by software. Seven or eight data bits, one or two stop bits, even, odd, or no parity. XON/XOFF software flow control and RTS/CTS handshake.
F2-CP128	128K bytes of battery-backed RAM. 26MHz clock rate Port 1: RS-232/422/485, 115.2 Kbaud maximum Port 2: RS-232/422/485, 57.6 Kbaud maximum Port 3*: RS-232, 19.2 Kbaud max. * Port 3 physically located in the same RJ12 jack as Port 1 (RS-232). Port 3 uses the RTS/CTS pins on that jack. If you use these lines for other purposes (e.g. hardware handshaking on Port 1), then Port 3 cannot be used.
ABM Commander for Windows (CD included with module)	Programming /documentation software for IBM PCs comes standard. Key features include: • Shipped with each coprocessor module • Runs under Windows 98/2000 • On-line full-screen BASIC program editing (similar to GW Basic, with industrial application enhancements added for easier programming) • Internal Editor for block copy, block move, search and replace • Text upload and download BASIC programs on disk • Binary upload and download BASIC programs and data on disk • Download control statement allows multiple programs to be downloaded and saved with one download file. • CD includes Modbus Client and Server BASIC programs and other application examples
Field Termination	Four RJ12 jacks: Port 1/3 RS-232, Port 2 RS-232, Port 1 RS-422/485, Port 2 RS-422/485
Power Consumption	235mA @ 5VDC
Operating Environment	0ºC–60ºC (32ºF–140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering

DL205 High-Speed Counter I/O Module

HIGH-SPEED COUNTER I/O MODULE

H2-CTRIO2 $471.00

Overview

The High-Speed Counter I/O (CTRIO) modules are designed to accept high-speed pulse-type input signals for counting or timing applications, and is designed to provide high-speed pulse-type output signals for stepper motor control, monitoring, alarm or other discrete control functions. The H2-CTRIO2 module offers great flexibility for applications that call for precise counting or timing, based on an input event or for high-speed control output applications.

The CTRIO modules have their own microprocessor and operates asynchronously with respect to the PLC/Controller. This means that the on-board outputs respond in real time to incoming signals so there is no delay waiting for the PLC/Controller to scan I/O.

The H2-CTRIO2 module is designed to work with incremental encoders or other field devices that send pulse outputs.

H2-CTRIO2 features

The H2-CTRIO2 module offers the following I/O features:

- Eight DC sink/source inputs, 9-30 VDC
- Four isolated sink/source DC outputs, 5-36 VDC, 1A per point

Inputs supported:
- Two quadrature encoders up to 250 kHz (H2-CTRIO2), or 4 single channel counters up to 250 kHz (H2-CTRIO2) using module terminals Ch1A, Ch1B, Ch2A and Ch2B
- High-speed edge timers, dual edge timers, pulse catch, count reset, count inhibit or count capture or home search limits using module terminals Ch1C, Ch1D, Ch2C or Ch2D

Outputs supported:
- Four independently configurable high-speed discrete outputs or 2 channels pulse output control (H2-CTRIO2: 20Hz - 250kHz per channel)
- Pulse and direction or cw/ccw pulses supported for pulse output control
- Raw control of a discrete output directly from user control program

Software Configuration

All scaling and configuration is done via CTRIO Workbench, a Windows software utility program. This eliminates the need for PLC ladder programming or other interface device programming to configure the module.

CTRIO Workbench main configuration screen
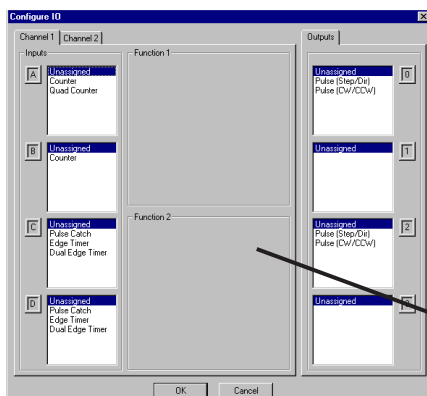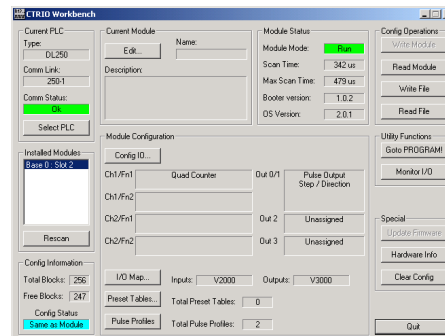
Note: CTRIO Workbench Version 2.2.0 is required to use H2-CTRIO2.

Use Configure I/O dialog to assign the CTRIO input and output functions

Typical applications

- High-speed cut-to-length operations using encoder input
- Pick-and-place or indexing functions for controlling a stepper or servo drive
- Dynamic registration for web material control
- Accurate frequency counting for speed control with onboard scaling
- PLS (Programmable Limit Switch) functions for high-speed packaging, gluing, or labeling
- Sub 10 μsec pulse-catch capability for high-speed product detection
- Functions for level or flow

Supported systems

Multiple CTRIO modules can reside in the same base provided that the backplane power budget is adequate. Depending on which CPU/interface module is used, there may be I/O base slot restrictions for the CTRIO module. Refer to the CTRIO High-Speed Counter Manual (HX-CTRIO-M) for I/O slot restrictions.

DirectLOGIC DL205 PLC
You can use the H2-CTRIO2 module with the D2-262 CPU (It is not supported in local expansion bases).

PC-based Ethernet I/O control systems
The H2-CTRIO2 module can be used in PC-based control systems using the H2-EBC100 interface module.

ERM to EBC systems
The H2-CTRIO2 module is supported in H2-EBC100 Servers in H*-ERM(100) systems. This includes the supported DL205 CPUs. The CTRIO module consumes 96 inputs and 96 outputs when used in ERM/EBC expansion bases.

DL205 High-Speed Counter
I/O Specifications

General

pulse	H2-CTRIO2
Module Type	Intelligent
Modules Per Base	Limited only by power consumption
I/O Points Used	None, I/O map directly in PLC V-memory or PC control access
Field Wiring Connector	Standard removable terminal block
Internal Power Consumption	275 mA Max at +5V from Base Power Supply, Maximum of 6 Watts (All I/O in ON State at Max Voltage/Current)
Operating Environment	32°F to 140°F (0°C to 60°C), Humidity (non-condensing) 5% to 95%
Manufacturer	Host Automation Products, L.L.C.
Isolation	1500V I/O to Logic 1000V among Input Channels and All Outputs

H2-CTRIO2 Output Specifications

Module	H2-CTRIO2
Outputs	4 pts, independently isolated, current sourcing or sinking FET Outputs: open drain and source with floating gate drive
Voltage Range	5–36 VDC
Maximum Voltage	36VDC
Output clamp Voltage	60VDC
Maximum Load Current	1.0 A at 23°C 0.5 A at 60°C
Maximum Load Voltage	36VDC
Maximum Leakage Current	100µA
Inrush Current	2A for 10ms
OFF to ON Response	Less than 1 µsec
ON to OFF Response	Less than 1 µsec
ON State V Drop	0.45 V max.
External Power Supply	For loop power only, not required for internal module function*
Overcurrent Protection	15A max
Thermal Shutdown	Tjunction = 150°C
Overtemperature Reset	Tjunction = 130°C
Duty Cycle Range	1% to 99% in 1% increments (default = 50%)
Configurable Presets a) Single b) Multiple	a) each output can be assigned one preset, or b) each output can be assigned one table of presets, one table can contain max. 128 presets, max. predefined tables = 255

Maximum Output Frequency	Velocity Mode	
	Run to Limit Mode	
	Run to Position Mode	
	Trapezoid	
	S-Curve	65 kHz
	Symmetrical S-Curve	
	Dynamic Positioning	
	Home Search	
	Free Form	
	Dynamic Velocity	
	Dynamic Positioning Plus	250 kHz
	Trapezoid Plus	
	Trapezoid with Limits	

* User supplied power source required for stepper drive configuration.

H2-CTRIO2 Input Specifications

Module	H2-CTRIO2
Inputs	8 pts sink/source 250kHz max.
Minimum Pulse Width	0.5 µsec
Input Voltage Range	9-30 VDC
Maximum Voltage	30VDC
Input Voltage Protection	Zener Clamped at 33VDC
Rated Input Current	8mA typical,12mA maximum
Minimum ON Voltage	9.0 VDC
Maximum OFF Voltage	2.0 VDC
Minimum ON Current	5.0 mA (9VDC required to guarantee ON state)
Maximum OFF Current	2.0 mA
OFF to ON Response	Less than 0.5 µsec
ON to OFF Response	Less than 0.5 µsec

H2-CTRIO2 Input Resources

Counter/Timer	4, (2 per 4 input channel group)
Resource Options	1X, 2X, or 4X Quadrature, Up or Down Counter, Edge Timer, Dual Edge Timer, Input Pulse Catch, Reset, Inhibit, Capture
Timer Range / Resolution	4.2 billion (32 bits); 1 µsec
Counter Range	±2.1 billion (32 bits or 31 bits + sign bit)

H2-CTRIO2 Output Resources

Module	H2-CTRIO2
Pulse output / Discrete outputs	Pulse outputs: 2 channels (2 outputs each channel; 20Hz-250kHz) Discrete outputs: 4 pts.
Resource Options	Pulse outputs: pulse/direction or cw/ccw Output Profiles: Trapezoid S-Curve Symmetrical S-Curve Dynamic Positioning Dynamic Velocity Home Search Free Form Dynamic Positioning Plus Trapezoid Plus Trapezoid w/Limits Velocity Mode Run to Limit Mode Run to Position Mode Discrete outputs: 4 configurable for set, reset, pulse on, pulse off, toggle, reset count functions (assigned to respond to Timer/Counter input functions) Raw mode: Direct access to discrete output from user application program
Target Position Range	±2.1 billion (32 bits or 31 bits + sign bit)

DL205 High-Speed Counter

Status Indicators

H2-CTRIO2 LED Descriptions	
OK	Module OK
ER	User Program Error
1A	Channel 1 Status
2A	Channel 2 Status
0–3	Output Status

H2-CTRIO2 LED Diagnostic Definitions		
LED OK	*LED ER*	*Description*
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-Diagnostic Failure (Blinks may be coded by counts)
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module
ON	OFF	RUN Mode

H2-CTRIO2 LED Diagnostic Definition	
1A/2A	
Blinking 7 times per second	Input is configured as Counter and is changing
Following state of input	Input is not configured as counter
0-3	
Follow actual output state: ON = output is passing current	

Installation and Wiring

The H2-CTRIO2 module has two independent input channels, each consisting of 4 optically isolated input points (pts. 1A-1D on common 1M and pts. 2A-2D on common 2M). The inputs can be wired to either sink or source current.

The module has 4 optically isolated output points (pts. Y0-Y3 with isolated commons C0-C3, respectively). The outputs must be wired so positive current flows into Cn terminal and then out of the Yn terminal (see the diagram on the following page).

Remember that the internal jumpers can be used to connect the input commons or outputs/output commons together.

The modules are configured, using CTRIO Workbench, to accommodate the user's application. The function of each input (counting, timing, reset, etc.) and output (pulse output, discrete output, etc.) is defined in the configuration of the module.

See the notes below for further details about power source considerations, circuit polarities, and field devices.
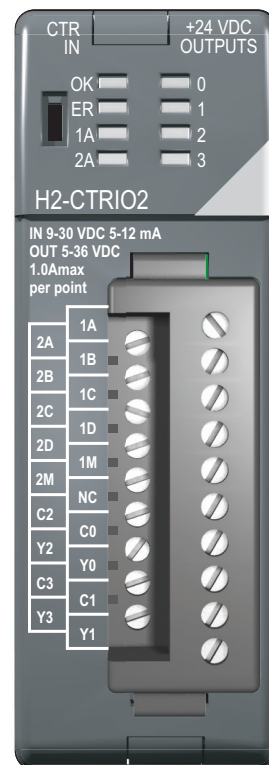
Wiring Diagram
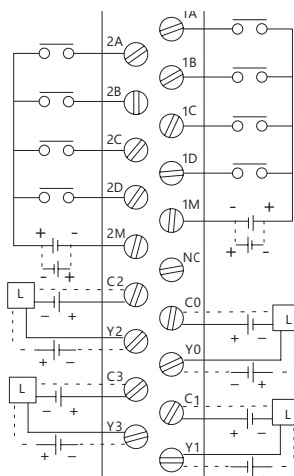
Notes:
1. *Inputs (1A, 1B, 1C, 1D and 2A, 2B, 2C, 2D) require user-provided 9-30 VDC power sources. Terminals 1M and 2M are the commons for Channel 1 and Channel 2 inputs. Maximum current consumption is 12mA per input point.*
2. *Polarity of the input power sources can be reversed. Consideration must be given, however, to the polarity of the field device. Many field devices are designed for only one polarity and can be damaged if power wiring is reversed.*
3. *Outputs have one polarity only and are powered by user-provided 5-36 VDC power sources. The maximum allowable current per output circuit is 1A.*

DL205 High-Speed Counter

Solid-state Input Wiring Device

DC type field devices are configured to either sink or source current. This affects the wiring of the device to the CTRIO2 module. Refer to the sinking/sourcing appendix in this catalog for a complete explanation of sinking and sourcing concepts.

Pulse Output Schematic

NPN Field Device (sink)

This drawing illustrates wiring that is typical for Channel 1 terminals 1A, 1B, 1C, and 1D. The same circuitry is also present at the corresponding Channel 2 terminals.

Sensing Circuit

1A

24VDC

1M

The same circuitry is present at the corresponding Channel 2 terminal.

Cn (where n=0, 1, 2, 3)
CTRIO Output
Yn
+5 to 36VDC
+
Load

+5 to 36VDC
Load
Cn (where n=0, 1, 2, 3)
CTRIO Output
Yn

PNP Field Device (source)

This drawing illustrates wiring that is typical for Channel 1 terminals 1A, 1B, 1C, and 1D. The same circuitry is also present at the corresponding Channel 2 terminals.

Sensing Circuit

24VDC

1A

1M

The same circuitry is present at the corresponding Channel 2 terminal.

Stepper/Servo Drive Wiring Example

Step Amplifier
OPTO
Pulse (or CW)
Direction (or CCW)
5-36VDC

Step Amplifier
OPTO
Pulse (or CW)
Direction (or CCW)
5-36VDC

1A
2A
1B
2B
1C
2C
1D
2D
1M
2M
NC
C2
C0
Y2
Y0
C3
C1
Y3
Y1
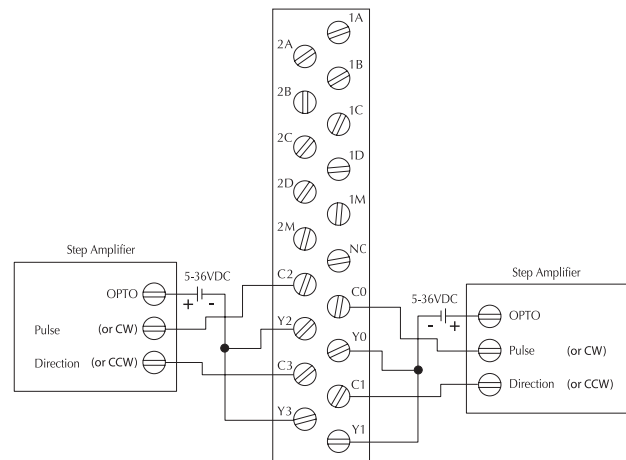
DL205 High-Speed Counter

Fill-in-the-blank configuration software

The CTRIO Workbench is the software utility used to configure the CTRIO modules and to scale signals to desired engineering units. Workbench also allows you to perform various other functions, such as switching between the CTRIO's Program mode and Run mode, monitoring I/O status and functions, and diagnostic control of module functions. The latest version of the CTRIO Workbench utility can be downloaded for free at Host Engineering's Web site: www.hosteng.com.

CTRIO Workbench configure I/O setup

The Configure I/O dialog is the location where input and output functions are assigned to the module. The choice of input and output functions determines which options are available. The input function boxes prompt you with selections for supported functions. The Workbench software automatically disallows any unsupported configurations.

CTRIO Workbench main configuration screen

Select modules from multiple networked PLCs

Save and load configurations with Read/Write File feature

Detailed snap-shot of module status and configurations

H2-CTRIO2

Configure I/O screen
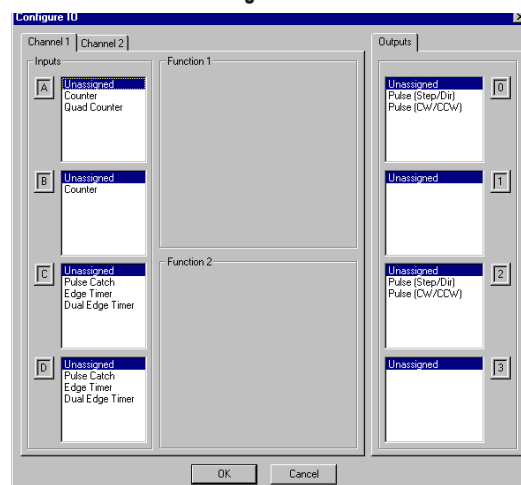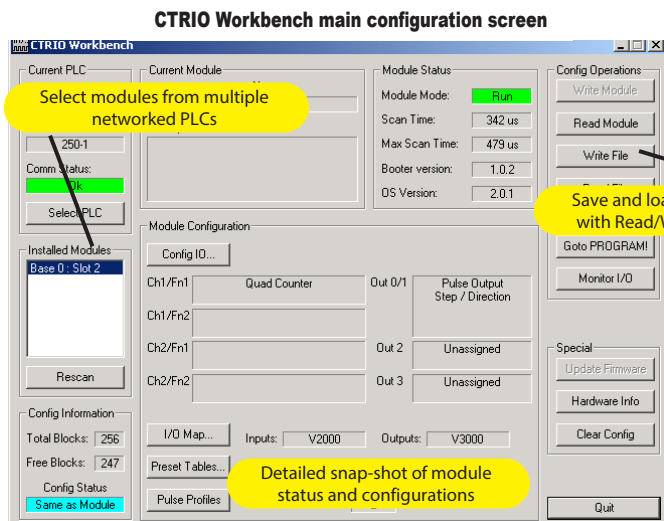
CTRIO Workbench diagnostics and monitoring

The Monitor I/O dialog is accessible from the main Workbench dialog when the module is in Run Mode. This allows for a convenient way to test and debug your configuration prior to installation. The Monitor I/O dialog is divided into three functional areas: Input Functions, Output Functions and System Functions. The data displayed under the Input Functions tab includes all input Dword parameters, status bits and the current status of each configured input and output function. The fields displayed under the Output Functions tab includes all output (D)word parameters and configuration information that can be altered during runtime and the bits that indicate successful transfers or errors. The System Functions can be used to read from or write to the CTRIO's internal registers.

CTRIO Workbench on-board scaling

Scaling raw signals to engineering units is accomplished using the Scaling Wizard. The Scaling Wizard options are different for the Counter functions as compared to the Timer functions. "Position" and "Rate" scaling are available when you select a Counter function. "Interval" scaling is available when you select a Timing function.

Monitor I/O screen

Monitor I/O dialog included for easy de-bug features
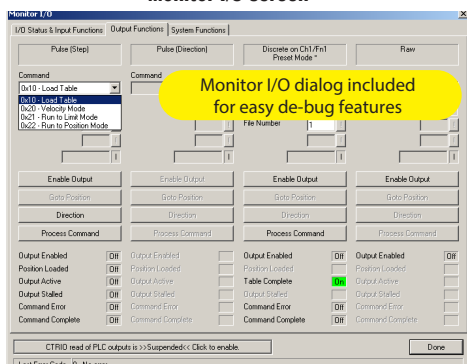
Scaling Wizard screen
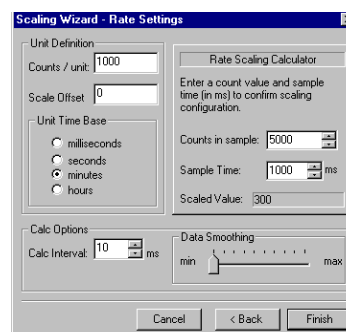
DL205 High-Speed Counter

High-speed input operations

The H2-CTRIO2 modules are capable of a wide variety of high-speed input and output operations, all within one module. With flexible 2-channel input and separate 2-channel output design, the H2-CTRIO2 modules can satisfy high-speed counting, timing, and pulse catch operations, along with high-speed discrete output or several profile choices of pulse output operations. Not all combinations of input functions and output functions are possible within the resources of the module, but the following examples are some of the most common applications for the CTRIO modules. Check out these examples and see how they relate to your high speed application needs.

High-speed counting

The CTRIO2 modules can be configured for counting functions with an encoder input (up to two quadrature encoders per module), with available connections for external reset, capture and inhibit signals. In a simple cut-to-length application as shown, the encoder provides an input position reference for the material to the module. The module's high-speed outputs are wired to the cutting device and to the clutch and/or braking device. When the count from the encoder is equal to a pre-programmed setpoint within the module, the high-speed outputs are activated to stop and cut the material to a repeatable fixed length. Additionally, the clutch/brake signal can be used as an inhibit signal so counts are not accumulated while the material is being cut.

High-speed timing

The CTRIO2 modules can be configured for timing functions based on both count or rate. Using a common configuration of a proximity switch sensing the teeth on a gear, the module is able to calculate the velocity of the gear based on the rate it receives its counts. This value can be scaled within the module to the engineering units required for the application.

High-speed cut-to-length application

- Motor Interface
- Motor control lines
- PLC with H2-CTRIO2 module
- Gearbox, clutch and brake interface
- Encoder
- H2-CTRIO2 high-speed output
- Cutter interface
- Cutter assembly
- Material to be cut to length

High-speed timing application

- Gear
- PLC with H2-CTRIO2 module
- Proximity switch
- Photoelectric switch
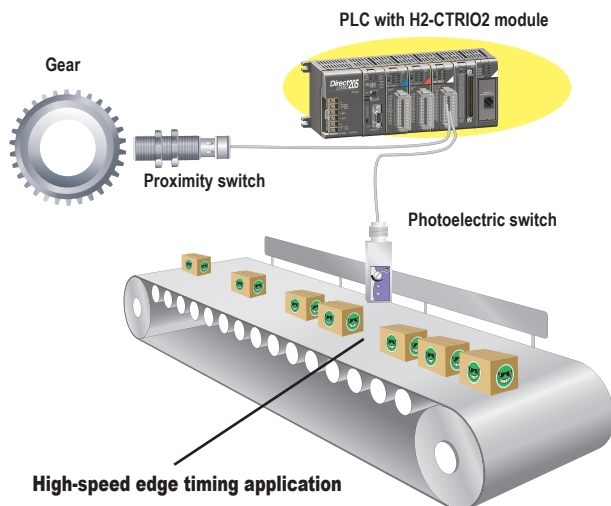
High-speed edge timing application

Using Configure I/O screen to configure H2-CTRIO2 for high-speed timing

Powerful edge timing functions - clicking on the edge button cycles through the available edge timing functions available

Using Configure I/O screen to configure CTRIO2 for high-speed counting

Point-click selections of hardwired connection for Counting, Reset, and Inhibit
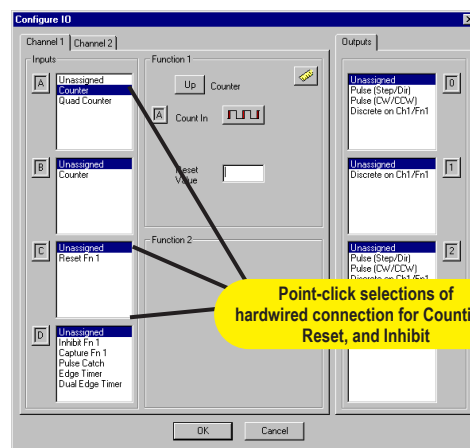
DL205 High-Speed Counter

Pulse output operations

Using Edit Pulse Profile screen to select Trapezoid pulse output profile

Fill-in-the-blank parameters allow precise tuning of the output pulse profile

PLC with H2-CTRIO2 module

Fill spout

H2-CTRIO2 pulse output signals

Stepper or servo drive

Stepper motor

Stepper motor inside housing

Circular turn table

Rotary indexing liquid fill application
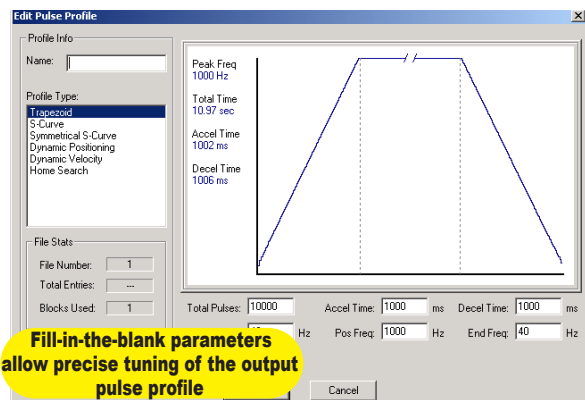
Pulse output for stepper/servo control

The H2-CTRIO2 module is capable of multiple configurations for pulse output control, most often when connected to a stepper or servo drive system. The H2-CTRIO2 module can deliver a pulse output signal up to a maximum of 250kHz, along with support for pulse-and-direction or CW/CCW pulses. The available profile choices include Trapezoid, S-Curve, Symmetrical S-Curve, Dynamic Positioning, Dynamic Velocity, Home Search, Free Form, Dynamic Positioning Plus, Trapezoid Plus and Trapezoid w/Limits. All profiles can be easily configured using the CTRIO Workbench software with fill-in-the-blank parameter fields and a graphic representation of the selected profile. Three additional profiles are available that are completely controlled by the user program (no CTRIO Workbench profile is configured). They are Velocity Mode, Run to Limit Mode, and Run to Position Mode.

Example application

In a simple rotary indexing application, as shown above, a fixed Trapezoid profile is chosen. For this application the H2-CTRIO2 module is wired to a stepper drive for pulse-and-direction. The requirement for this application is to provide a smooth movement of the rotary table to allow product to be filled into individual containers an equal distance apart. The predetermined number of pulses required for each movement is entered into the CTRIO Workbench as "Total Pulses" along with the Starting Frequency, Ending Frequency, and Positioning Frequency (speed after acceleration). The Acceleration and Deceleration parameters are entered in units of time, so no ramp-distance calculations are required. After all parameters are entered, a graphical representation of the configured profile is shown automatically. Once the configuration has been downloaded to the module, all that is needed from the PLC CPU is for the Enable Output signal to begin a movement.
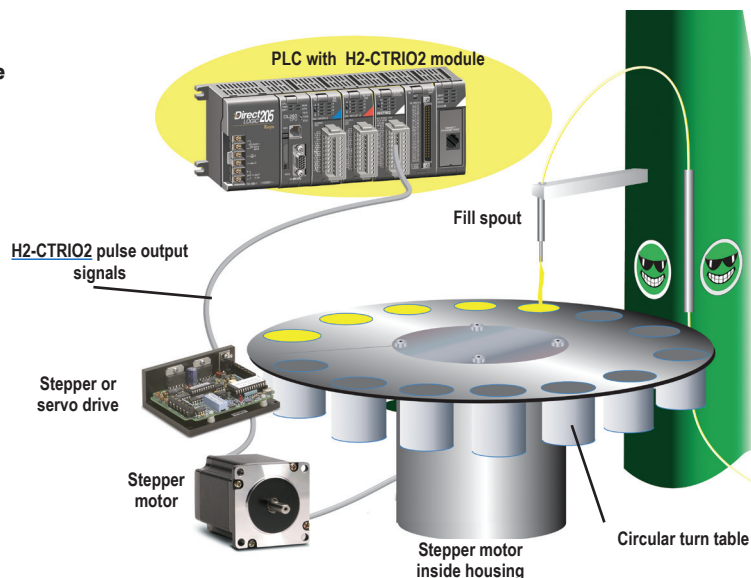
Other common pulse output applications:

- S-Curve accel/decel profile for signaling a stepper or servo drive that needs a curved acceleration and deceleration profile, i.e. for diminishing any initial "jerk" upon movement of static products, boxes on conveyors, liquids in containers on an indexer, printing registrations, etc.
- Dynamic Positioning for any run-to-a-specific-position requirement, either by a pre-programmed count of an external high-speed discrete input wired to the module. This is popular in winding or web control with any dynamic registration mark or variable speed requirement.
- Home search routines to seek a home position based on H2-CTRIO2 discrete input limit(s).

Example of S-Curve acceleration and deceleration pulse output profile

Calculate Profile displays graphical representation of output pulse profile
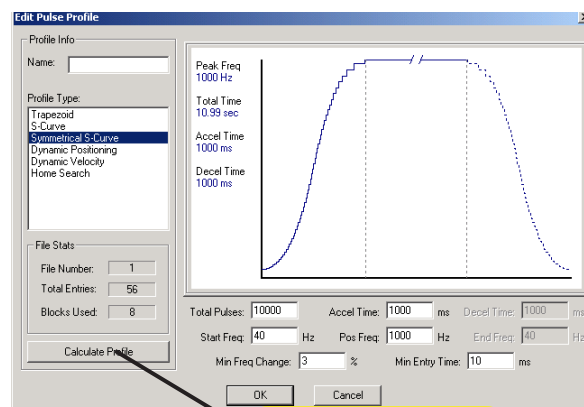
DL205 High-Speed Counter

Combining high-speed input and pulse output operations

Multihead drill machine application

Using CTRIO Workbench to configure the module for simultaneous high-speed input and high-speed pulse output operation

Proximity switch

Proximity switch

Proximity switch

Encoder

Stepper motor

PLC with H2-CTRIO2 module

Stepper or servo drive
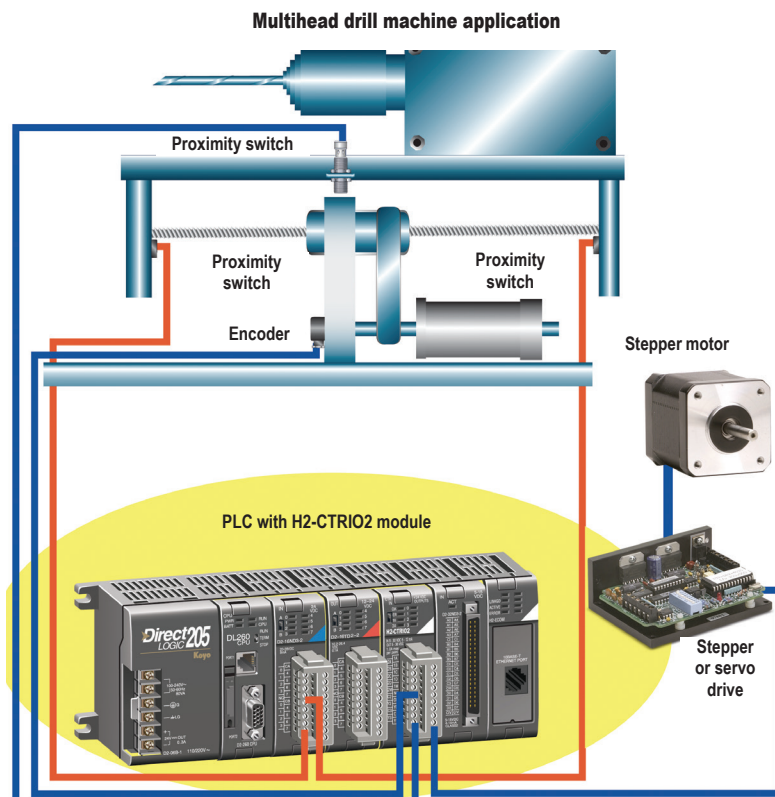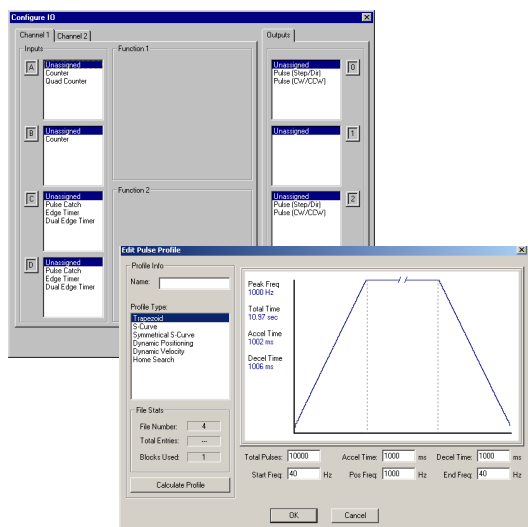
Use Encoder for Position

Three profiles available only with the CTRIO2 offer the option to Use Encoder for Position. They are Dynamic Position Plus, Trapezoid Plus and Trapezoid w/ Limits. When Use Encoder for Position is enabled, the target positions are specified in units of the encoder and the move is complete when the encoder reaches that position, not when the output has finished generating a certain number of pulses. This functionality is useful for hitting a target position more accurately with a mechanical system that slips or has excessive lash.

Example application

In the simple drill head application shown above, the H2-CTRIO2 pulse outputs are wired to a stepper or servo drive. The inputs are wired to an encoder attached to the lead screw on the movable portion of the drill head assembly. The CTRIO2 module outputs a pulse train to the drive that allows the motor to spin the lead screw, making the drill move forward into the passing material. The encoder monitors the speed and position of the drill head. Proximity switches at each end act as limit switches ensuring the drill head will not over-travel. A home sensor is positioned in the middle of the assembly which allows the PLC to reset the count.

PLC CPU program

H2-CTRIO2 pulse output profile

RLL Program
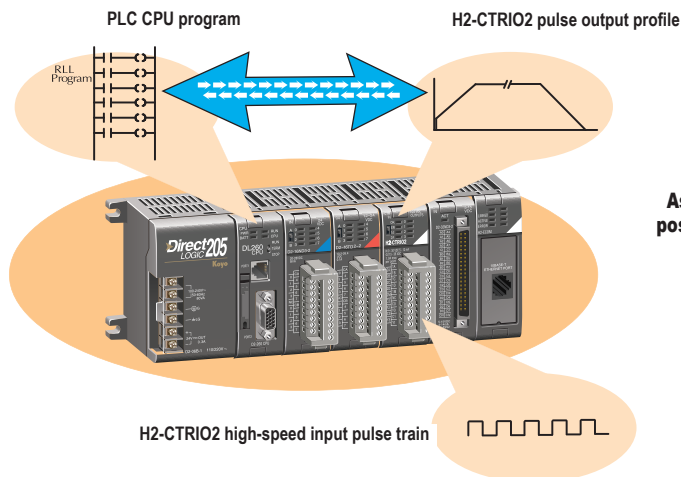
As shown in diagram on left, using an encoder to calculate the appropriate position for a move using H2-CTRIO2 is handled natively on-the-fly when "Use Encoder for Position" is enabled.

H2-CTRIO2 high-speed input pulse train

Counter Interface Module

COUNTER INTERFACE MODULE

D2-CTRINT $149.00

Note: D2-262 does not support the D2-CTRINT

Overview

The D2-CTRINT offers several modes of operation that can be used to solve simple motion and high-speed machine control applications.

The operating modes and module configuration are explained in detail in the D2-CTRIF-M High Speed Counter Manual. The high-speed input features cannot be used if the pulse output features are in use, and vice versa. Only one D2-CTRINT can be used per CPU and the module must reside in slot 0, next to the CPU. A brief description of each high-speed mode is listed below:

Mode 10: Up to two 5kHz high-speed counters offer 24 presets each. When the preset is reached, a CPU interrupt routine is executed.

Mode 20: Quadrature encoder input (up/down) for clockwise and counterclockwise position control (max. pulse range: -8,388,608 to 8,388,607).

Mode 30: Pulse outputs are programmable to follow a predetermined profile. An external interrupt can be used in conjunction with separate acceleration and deceleration profiles for positioning and velocity control supported by D2-250-1 (max. pulse range: -8,388,608 to 8,388,607 at 5K pulses per second max.).

Mode 40: Four external interrupt inputs can be used for an immediate response for high-priority events.

Mode 50: Pulse catch feature allows the CPU to read 4 inputs, each having a pulse width as small as 0.1 ms. When an input pulse is detected, the input is set ON for the next scan and then resets.

Mode 60: Input filters are configurable (0-99ms) to ensure input signal integrity. The default input mode is a 10ms filter.

Mode 40 option - A Timed interrupt can be configured for time critical events. Interrupt 0 can be scheduled on a 3ms–999ms cycle. See the next page for more information on the timed interrupt.

Counter Interface Module Features

| Mode | Module Points | | | | |
	Input 0	Input 1	Input 2	Input 3	Input 4
Mode 10: Two High Speed Up Counters	Up counter 1	Up counter 2 Filtered input	Reset counter 1	Reset counter 2	Not used
Mode 20: One Up/Down or Quadrature cntr	Phase A input (up count)	Phase B input (down count)	Counter reset	Filtered input	Not used
Mode 30: Pulse Output	Filtered input	Filtered input	Not used	CW pulse output (or Pulse output)	CCW pulse out (or Direction)
Mode 40: External Interrupts	Interrupt input (not available when using timed interrupt)	Interrupt input	Interrupt input	Interrupt input	Not used
Mode 50: Pulse Catch Inputs	Pulse input	Pulse input	Pulse input	Pulse input	Not used
Mode 60: Filtered Input	Filtered input	Filtered input	Filtered input	Filtered input	Not used

The high-speed input features cannot be used if the pulse output features are in use, and vice versa.

Input Specifications

Input	4 pts. sink/source 5 kHz max.
Minimum pulse width	100µs
Input Voltage Range	12 or 24 VDC ±15%
Maximum voltage	30VDC
Rated input current	10mA Typical 13mA Maximum
Minimum ON voltage	8.0 VDC
Maximum OFF voltage	1.0 VDC
Minimum ON Current	8.0 mA
Maximum OFF Current	1.0 mA
OFF to ON Response	Less than 30µs
ON to OFF Response	Less than 30µs

Output Specifications

Output	2 pts., current sinking 5kHz Max
Voltage range	5.0 VDC±15%
Maximum voltage	5.5 VDC
Maximum load current	30mA
Minimum load voltage	4.5 VDC
Leakage current	Less than 0.1 mA at 5.5 VDC
Inrush current	0.5 A (10ms)
OFF to ON Response	Less than 30µs
On to OFF Response	Less than 30µs
External power supply	5.0 VDC ±10%

General Specifications

Module Type	Discrete
Modules per CPU	One only in slot adjacent to CPU
I/O Points Used	8 inputs, 8 outputs
Field Wiring Connector	Standard 8 pt. removable terminal block
Internal Power Consumption	50mA from 5VDC max., (supplied by the CPU base power supply)
Operating Environment	32ºF to 140ºF (0ºC to 60ºC) humidity (non-condensing) 5% to 95%
Manufacturer	Koyo Electronics

Counter Interface Module

Wiring Diagram for Modes 10, 20, 40, 50 and 60
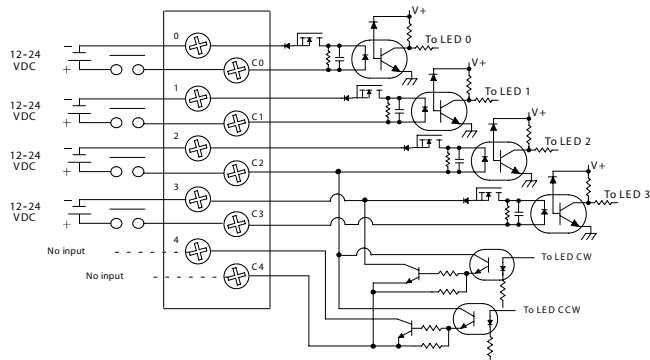
Wiring Diagram for Mode 30
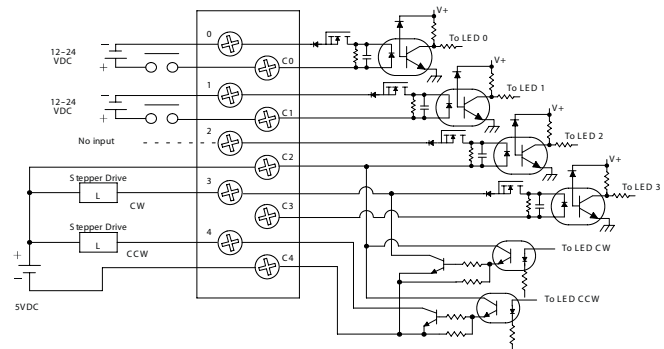
Timed Interrupt feature

There is an internal timed interrupt feature available in the D2-262 CPU. You do not need the Counter Interface module to use the timed interrupt. This cyclical interrupt allows you to easily program a time-based interrupt that occurs on a scheduled basis. The CPU's timed interrupt operates in a similar manner to the external interrupt input, but instead of the interrupt subroutine being triggered by an external event, it is now triggered by a cyclical interval of time. This interval can be programmed from 3ms to 999ms. Whenever the programmed time elapses, the CPU immediately suspends its routine scan cycle and jumps to interrupt subroutine INT 0. As with the other modes, when the subroutine execution is complete, the CPU automatically resumes its routine scan cycle starting at the exact location where it was interrupted. Since the CPU scan time and the interrupt time interval are different, the program gets interrupted at various points in the execution over time. The CPU returns to the point where it left to resume the program execution.

If you use a timed interrupt and the Counter Interface module, Input 0 cannot be used on the Counter Interface module. If you're using the timed interrupt and a standard discrete input module, then there are no limitations.

Timed Interrupt Specifications	
Timed interrupts	One (internal to CPU)
Time interval	3ms to 999ms (1ms increments)
Interrupt Subroutine	INT0

Timed interrupt operation
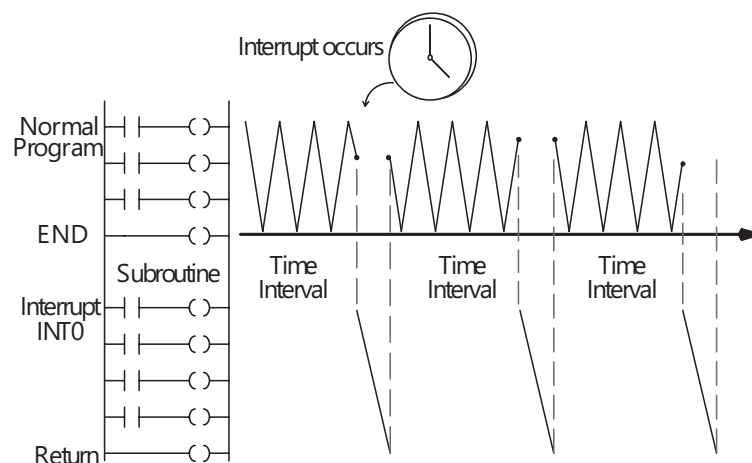
ZIPLINK™ **Wiring Solutions**

Wiring Solutions using the *ZIP*Link Wiring System

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

Solution 1: Do-more, DirectLOGIC, CLICK and Productivity Series I/O Modules to ZIPLink Connector Modules
When looking for quick and easy I/O-to-field termination, a *ZIP*Link connector module used in conjunction with a prewired *ZIP*Link
cable, consisting of an I/O terminal block at one end and a multi-pin connector at the other end, is the best solution.

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

1. Locate your I/O module/PLC

2. Select a *ZIP*Link Module

3. Select a corresponding *ZIP*Link Cable.
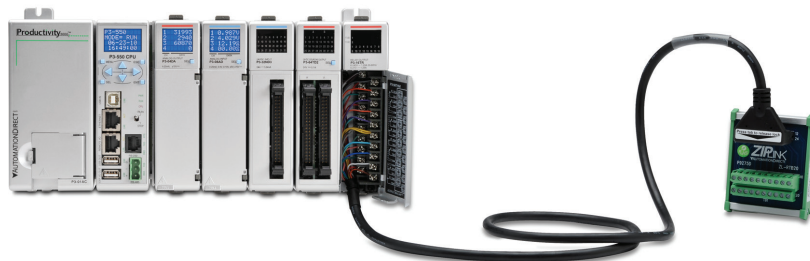
Solution 2: Do-more, DirectLOGIC, CLICK and Productivity Series I/O Modules to 3rd Party Devices
When wanting to connect I/O to another device within proximity of the I/O modules, no extra terminal blocks are necessary when using the *ZIP*Link Pigtail Cables. *ZIP*Link Pigtail Cables are prewired to an I/O terminal block with color-coded pigtail with soldered-tip wires on the other end.

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

1. Locate your PLC I/O module

2. Select a *ZIP*Link Pigtail Cable that is compatible with your 3rd party device.

Solution 3: GS Series and DuraPulse Drives Communication Cables
Need to communicate via Modbus RTU to a drive or a network of drives?

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

Using the Drives Communication selector tables located in this section,

1. Locate your Drive and type of communications

2. Select a *ZIP*Link cable and other associated hardware.

ZIPLINK™ **Wiring Solutions**

Solution 4: Serial Communications Cables

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

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

1. Locate your connector type

2. Select a cable.

Solution 5: Specialty ZIPLink Modules

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

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

1. Locate the type of application

2. Select a **ZIP**Link module.
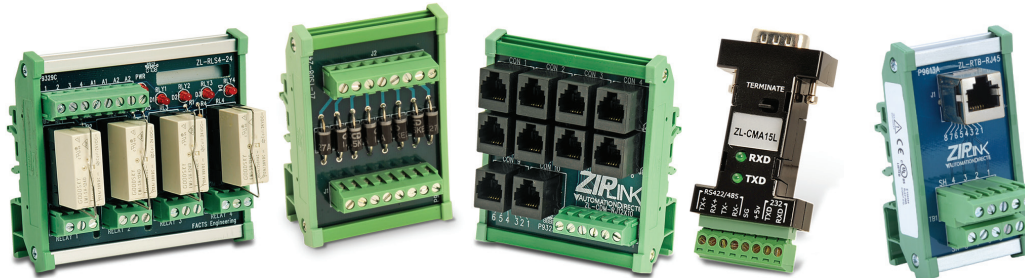
Solution 6: ZIPLink Connector Modules to 3rd Party Devices

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

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

1. Select module type

2. Select the number of pins

3. Select cable.

PLC I/O Modules to *ZIP*Link Connector Modules – Do-more!/DL205

Do-more / DL205 PLC Input Module *ZIP*Link Selector

PLC	*ZIP*Link			
Input Module	# of Terms	Component	Module Part No.	Cable Part No. †
D2-08ND3	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 *
D2-16ND3-2	19	Feedthrough		ZL-D2-CBL19 / ZL-D2-CBL19-1 / ZL-D2-CBL19-2
		Sensor	ZL-LTB16-24-1	
D2-32ND3 [1]	40	Feedthrough	ZL-RTB40 (-1)	180 deg conn: ZL-D24-CBL40 ZL-D24-CBL40-1 ZL-D24-CBL40-2
		Sensor	ZL-LTB32-24-1	
D2-32ND3-2 [1]	40	Feedthrough	ZL-RTB40(-1)	45 deg conn: ZL-D24-CBL40-X ZL-D24-CBL40-1X ZL-D24-CBL40-2X
		Sensor	ZL-LTB32-24-1	
D2-08NA-1	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
D2-08NA-2	10	Feedthrough		
D2-16NA	19	Feedthrough		ZL-D2-CBL19 *

† *X in the part number represents a 45° angle.*

Do-more/DL205 PLC Combo In/Out Module *ZIP*Link Selector

PLC	*ZIP*Link			
Combo Module	# of Terms	Component	Module Part No.	Cable Part No.
D2-08CDR	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 *

Do-more/DL205 PLC Analog Module *ZIP*Link Selector

PLC	*ZIP*Link			
Analog Module	# of Terms	Component	Module	Cable
F2-04AD-1	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
F2-08AD-1				
F2-04AD-2				
F2-08AD-2				
F2-02DA-1				ZL-D2-CBL19 ZL-D2-CBL19-1 ZL-D2-CBL19-2
F2-02DAS-1				
F2-08DA-1				
F2-02DA-2				ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
F2-02DAS-2				
F2-08DA-2				
F2-4AD2DA				
F2-8AD4DA-1	19			ZL-D2-CBL19 ZL-D2-CBL19-1 ZL-D2-CBL19-2
F2-8AD4DA-2				
F2-04RTD	Matched Only	These modules are not supported by the *ZIP*Link wiring system		
F2-04THM				

Do-more/ DL205 PLC Output Module *ZIP*Link Selector

PLC	*ZIP*Link			
Output Module	# of Terms	Component	Module Part No.	Cable Part No. †
D2-04TD1 [2]	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
D2-08TD1				
D2-08TD2				
D2-16TD1-2	19	Feedthrough		ZL-D2-CBL19 ZL-D2-CBL19-1 ZL-D2-CBL19-2
		Fuse	ZL-RFU20 [4]	
D2-16TD2-2		Feedthrough	ZL-RTB20 (-1)	
		Fuse	ZL-RFU20 [4]	
		Relay	ZL-RRL16-24-2 ZL-RRL16W-24-2 ZL-RRL16F-24-2 ZL-RRL16HDF-24-2	
F2-16TD1P		Feedthrough	ZL-RTB20 (-1)	
F2-16TD2P				
D2-32TD1 [1]	40	Feedthrough	ZL-RTB40 (-1)	180 deg conn: ZL-D24-CBL40 ZL-D24-CBL40-1 ZL-D24-CBL40-2
		Fuse	ZL-RFU40 [4]	
D2-32TD2 [1]		Feedthrough	ZL-RTB40 (-1)	45 deg conn: ZL-D24-CBL40-X ZL-D24-CBL40-1X ZL-D24-CBL40-2X
		Fuse	ZL-RFU40 [4]	
D2-08TA	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
F2-08TA				
D2-12TA	19	Feedthrough		ZL-D2-CBL19 ZL-D2-CBL19-1 ZL-D2-CBL19-2
		Fuse	ZL-RFU20 [4]	
D2-04TRS [2]	10	Feedthrough	ZL-RTB20 (-1)	ZL-D2-CBL10 ZL-D2-CBL10-1 ZL-D2-CBL10-2
D2-08TR				
F2-08TRS [2]	19	Feedthrough		ZL-D2-CBL19 *
F2-08TR [3]	10	Feedthrough		ZL-D2-CBL10 *
D2-12TR	19	Feedthrough		ZL-D2-CBL19 ZL-D2-CBL19-1 ZL-D2-CBL19-2
		Fuse	ZL-RFU20 [4]	

† *X in the part number represents a 45° angle plug*
* *Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.*
1 To make a custom cable for the 32-point modules, use: Solder-style 180° connector ZL-D24-CON or Solder-style 45° connector ZL-D24-CON-X
2 Caution: The D2-04TD1, D2-04TRS, and F2-08TRS outputs are derated not to exceed module specs 2A per point and 2A per common when used with the ZIPLink wiring system.
3 The F2-08TR outputs are derated not to exceed 2A per point and 4A per common when used with the ZIPLink wiring system.
4 Fuses (5 x 20 mm) are not included. See Edison Electronic Fuse section for (5 x 20 mm) fuse. S500 and GMA electronic circuit protection for fast-acting maximum protection. S506 and GMC electronic circuit protection for time-delay performance. Ideal for inductive circuits.
To ensure proper operation, do not exceed the voltage and current rating of ZIPLink module. ZL-RFU20 = 2A per circuit; ZL-RFU40 = 400mA per circuit.

Note: *ZIP*Link Connector Module specifications follow the Compatibility Matrix tables. *ZIP*Link Cables specifications are at the end of this *ZIP*Link section.

DC Input Modules

D2-08ND3 DC Input $80.00	
Inputs per Module	8 (sink/source)
Commons per Module	1 (2 I/O terminal points)
Input Voltage Range	10.2-26.4 VDC
Peak Voltage	26.4 VDC
ON Voltage Level	9.5 VDC minimum
OFF Voltage Level	3.5 VDC maximum
AC Frequency	N/A
Input Impedance	2.7 kΩ
Input Current	4.0 mA @ 12VDC 8.5 mA @ 24VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	50mA
OFF to ON Response	1 to 8 ms
ON to OFF Response	1 to 8 ms
Terminal Type (included)	Removable, D2-8IOCON
Status Indicator	Logic side
Weight	2.3 oz. (65g)

D2-16ND3-2 DC Input $148.00	
Inputs per Module	16 (sink/source)
Commons per Module	2 isolated (8 I/O terminal points / com)
Input Voltage Range	20-28 VDC
Peak Voltage	30VDC (10mA)
ON Voltage Level	19 VDC minimum
OFF Voltage Level	7VDC maximum
AC Frequency	N/A
Input Impedance	3.9 kΩ
Input Current	6mA @ 24VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	100mA
OFF to ON Response	3 to 9 ms
ON to OFF Response	3 to 9 ms
Terminal Type (included)	Removable, D2-16IOCON
Status Indicator	Logic side
Weight	2.3 oz. (65g)

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

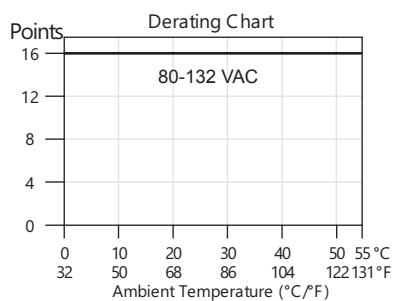See Wiring Solutions for part numbers of **ZIP**Link cables and connection modules compatible with this I/O module.

For "Sinking and Sourcing Concepts", see the Appendix section.
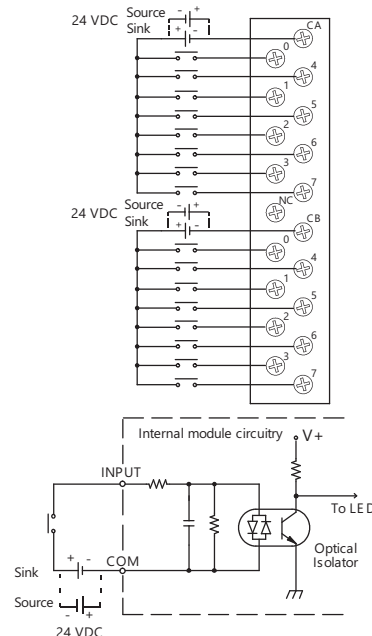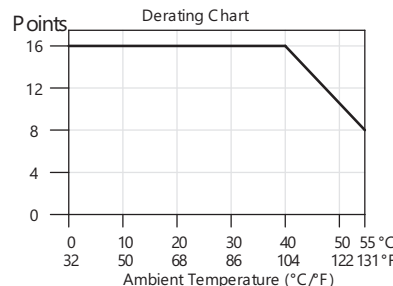
For "Sinking and Sourcing Concepts" see the Appendix section.

DC Input Modules

D2-32ND3 DC Input $185.00	
Inputs per Module	32 (sink/source)
Commons per Module	4 isolated (8 I/O terminal points / com)
Input Voltage Range	20-28 VDC
Peak Voltage	30VDC
ON Voltage Level	19VDC minimum
OFF Voltage Level	7VDC maximum
AC Frequency	N/A
Input Impedance	4.8 kΩ
Input Current	8.0 mA @ 24VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	25mA
OFF to ON Response	3 to 9 ms
ON to OFF Response	3 to 9 ms
Terminal Type (not included)	40-pin Connector[1]
Status Indicator	Module Activity LED
Weight	2.1 oz. (60g)

1 Connector sold separately.
See Terminal Blocks and Wiring for wiring options.

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

| D2-32ND3-2 DC Input $180.00	
Inputs per Module	32 (Sink/Source)
Commons per Module	4 isolated (8 I/O terminal points / com)
Input Voltage Range	4.50 to 15.6 VDC min. to max.
Peak Voltage	16VDC
ON Voltage Level	4VDC minimum
OFF Voltage Level	2VDC maximum
AC Frequency	N/A
Input Impedance	1.0 kΩ @ 5-15 VDC
Input Current	4mA @ 5VDC 11mA @ 12VDC 14mA @ 15VDC
Maximum Input Current	16mA @ 15.6 VDC
Minimum ON Current	3mA
Maximum OFF Current	0.5 mA
Base Power Required 5VDC	25mA
OFF to ON Response	3 to 9 ms
ON to OFF Response	3 to 9 ms
Terminal Type (not included)	40-pin connector[1]
Status Indicator	Module activity LED
Weight	2.1 oz (60g)

1 Connector sold separately.
See Terminal Blocks and Wiring for wiring options.

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

For "Sinking and Sourcing Concepts", see the Appendix section.

For "Sinking and Sourcing Concepts" see the Appendix section.

Simulator/AC Input Modules

F2-08SIM Input Simulator $118.00	
Inputs per Module	8
Base Power Required 5VDC	50mA
Terminal Type	None
Status Indicator	Switch side
Weight	2.65 oz. (75g)

D2-08NA-1 AC Input $110.00	
Inputs per Module	8
Commons per Module	1 (2 I/O terminal points)
Input Voltage Range	80-132 VAC
Peak Voltage	132 VAC
ON Voltage Level	75VAC minimum
OFF Voltage Level	20VAC maximum
AC Frequency	47-63 Hz
Input Impedance	12kΩ @ 60Hz
Input Current	13mA @ 100VAC, 60Hz 11mA @ 100VAC, 50Hz
Minimum ON Current	5mA
Maximum OFF Current	2mA
Base Power Required 5VDC	50mA
OFF to ON Response	5 to 30 ms
ON to OFF Response	10 to 50 ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.5 oz. (70g)

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

Derating Chart
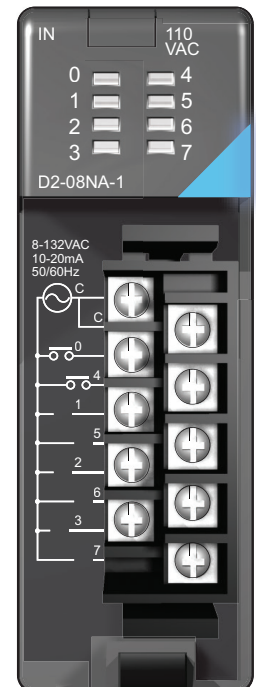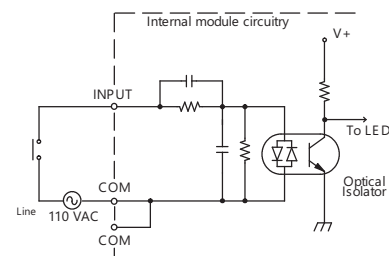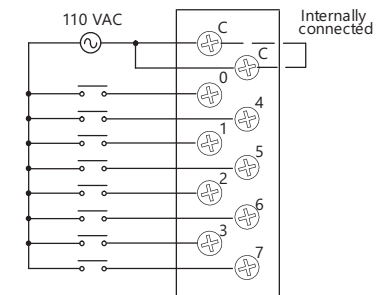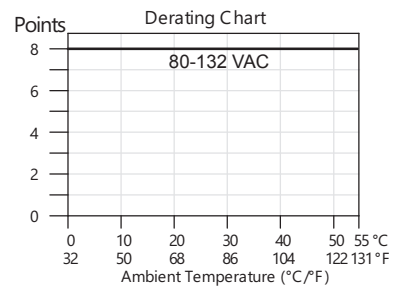
AC Input Modules

D2-08NA-2 AC Input $140.00	
Inputs per Module	8
Commons per Module	1 (2 I/O terminal points)
Input Voltage Range	170-265 VAC
Peak Voltage	265VAC
ON Voltage Level	150VAC minimum
OFF Voltage Level	40VAC maximum
AC Frequency	47-63 Hz
Input Impedance	18kΩ @ 60Hz
Input Current	9mA @ 220VAC, 50Hz 11mA @ 265VAC, 50Hz 10mA @ 220VAC, 60Hz 12mA @ 265VAC, 60Hz
Minimum ON Current	10mA
Maximum OFF Current	2mA
Base Power Required 5VDC	100mA
OFF to ON Response	5 to 30 ms
ON to OFF Response	10 to 50 ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.5 oz. (70g)

Operating Temperature	32°F to 131°F (0° to 55°C)
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Humidity	35% to 95% (non-condensing)
Atmosphere	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Insulation Withstand Voltage	1,500VAC 1 minute (COM-GND)
Insulation Resistance	10M ≃ @ 500VDC
Noise Immunity	NEMA 1,500V 1 minute SANKI 1,000V 1 minute
RFI	150MHz, 430MHz

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

Derating Chart
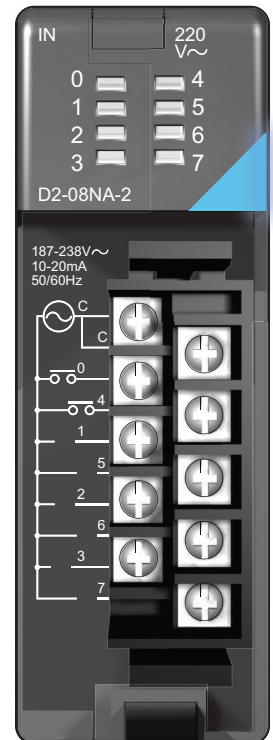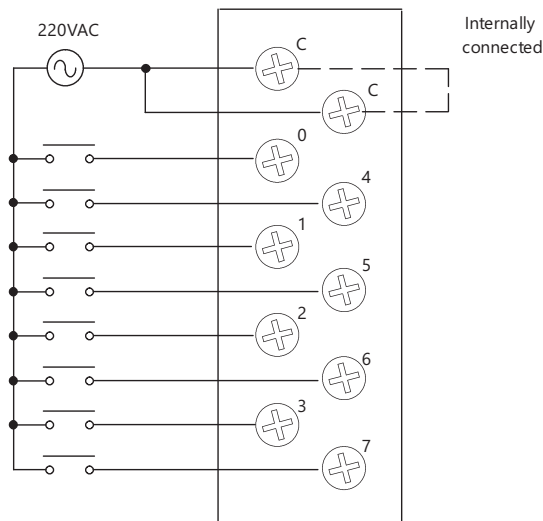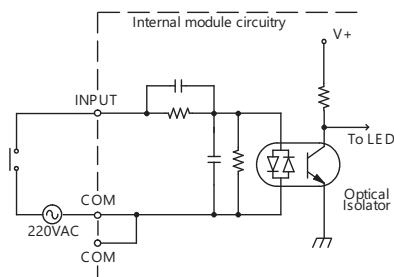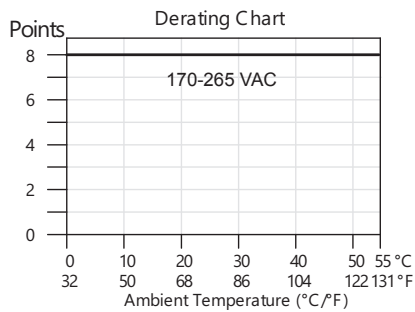
AC Input Modules

D2-16NA AC Input $194.00	
Inputs per Module	16
Commons per Module	2 (isolated)
Input Voltage Range	80-132 VAC
Peak Voltage	132VAC
ON Voltage Level	70VAC minimum
OFF Voltage Level	20VAC maximum
AC Frequency	47-63 Hz
Input Impedance	12 kΩ @ 60 Hz
Input Current	11mA @ 100VAC, 50Hz 13mA @ 100VAC, 60Hz 15mA @ 132VAC, 60Hz
Minimum ON Current	5mA
Maximum OFF Current	2mA
Base Power Required 5VDC	100mA
OFF to ON Response	5 to 30 ms
ON to OFF Response	10 to 50 ms
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	2.4 oz. (68g)

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

Note: When used with the ZIPLink wiring system, relay outputs are derated not to exceed 2 Amps per point max.

Derating Chart
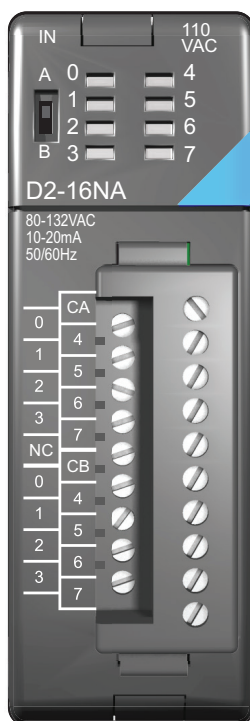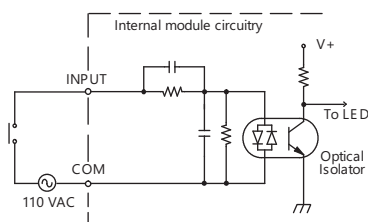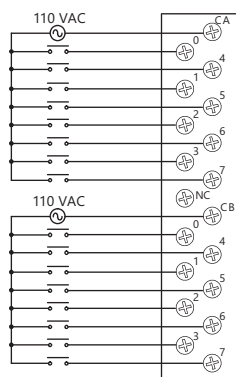
DC Output Modules

D2-04TD1 DC Output $106.00

Outputs per Module	4 (current sinking)
Output Points Consumed	8 points (only first 4 pts. used)
Commons per Module	1 (4 I/O terminal points)
Output Type	NMOS FET (open drain)
Operating Voltage	10.2-26.4 VDC
Peak Voltage	40VDC
ON Voltage Drop	0.72 VDC maximum
AC Frequency	N/A
Max Load Current (resistive)	4A/point 8A/common
Max Leakage Current	0.1 mA @ 40VDC
Max Inrush Current	6A for 100ms, 15A for 10ms
Minimum Load Current	50mA

|	
External DC Required	24VDC @ 20mA max.
Base Power Required 5VDC	60mA
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80g)
Fuses	4 (1 per point) (6.3 A slow blow, non-replaceable)

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

Derating Chart
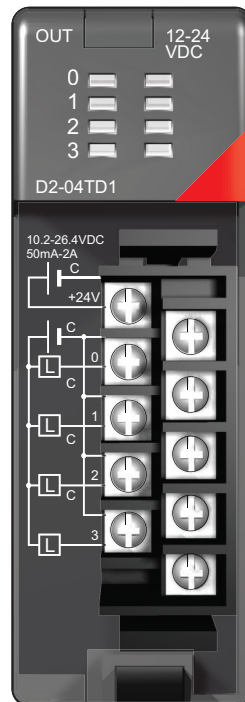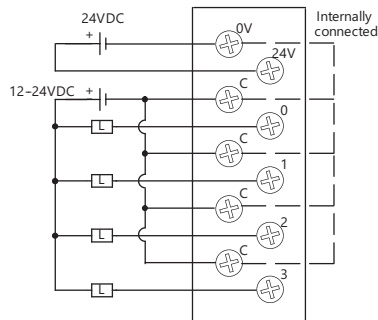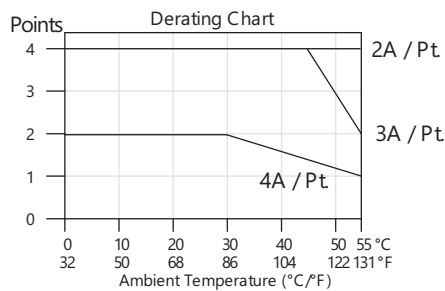
Inductive Load
### Maximum Number of Switching Cycles per Minute

Load Current	Duration of output in ON state		
	7ms	40ms	100ms
0.1A	8000	1400	600
0.5A	1600	300	120
1.0A	800	140	60
1.5A	540	90	35
2.0A	400	70	–
3.0A	270	–	–
4.0A	200	–	–

At 40mS duration, loads of 3.0 A or greater cannot be used.
At 100mS duration, loads of 2.0 A or greater cannot be used.
Find the load current you expect to use and the duration that the output is ON. The number at the intersection of the row and column represents the switching cycles per minute. For example, a 1A inductive load that is on for 100ms can be switched on and off a maximum of 60 times per minute. To convert this to duty cycle percentage use: (duration x cycles)/60. In this example,
(60 x .1)/60 = .1, or 10% duty cycle.
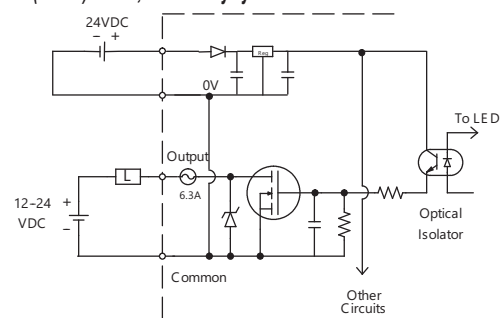
DC Output Modules

D2-08TD1 DC Output $97.00	
Outputs per Module	8 (current sinking)
Commons per Module	1 (2 I/O terminal points)
Output Type	NPN open collector
Operating Voltage	10.2–26.4 VDC
Peak Voltage	40VDC
ON Voltage Drop	1.5 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.5 mA
Max Load Current	0.3 A/point; 2.4 A/common
Max Leakage Current	0.1 mA @ 40VDC
Max Inrush Current	1A for 10ms
Base Power Required 5VDC	100mA
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.3 oz. (65g)
Fuses	1 per common 5A fast blow, non-replaceable
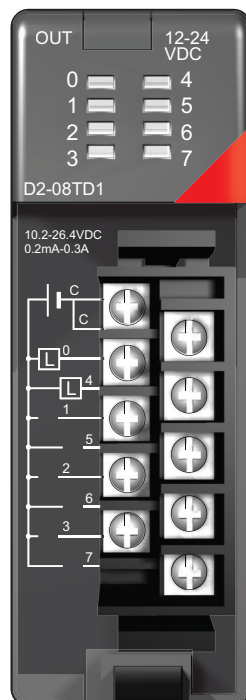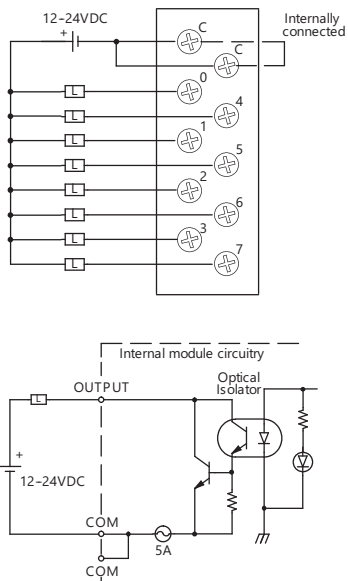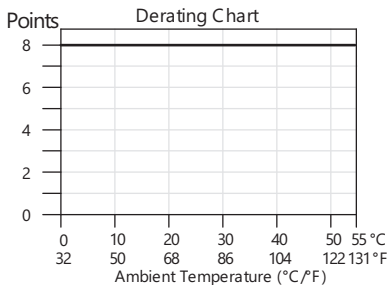
D2-08TD2 DC Output $98.00	
Outputs per Module	8 (current sourcing)
Commons per Module	1
Output Type	PNP open collector
Operating Voltage	12 to 24 VDC
Output Voltage	10.8 to 26.4 VDC
Peak Voltage	40VDC
ON Voltage Drop	1.5 VDC
AC Frequency	N/A
Minimum Load Current	N/A
Max Load Current	0.3 A per point; 2.4 A per common
Max Leakage Current	1.0 mA @ 40VDC
Max Inrush Current	1A for 10ms
Base Power Required 5VDC	100mA
OFF to ON Response	1ms
ON to OFF Response	1ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.1 oz. (60g)
Fuse	5A fast blow, non-replaceable

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

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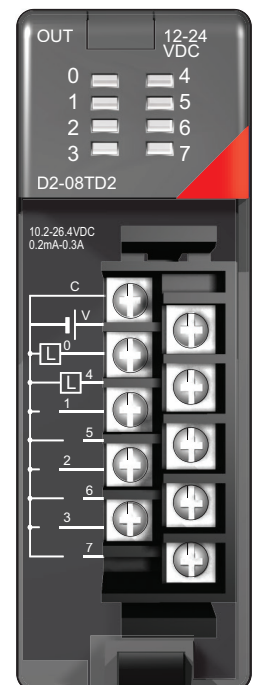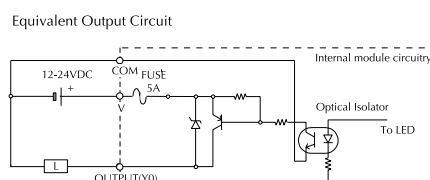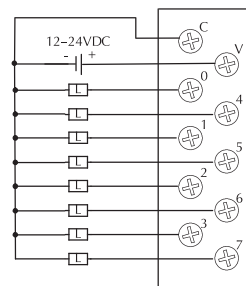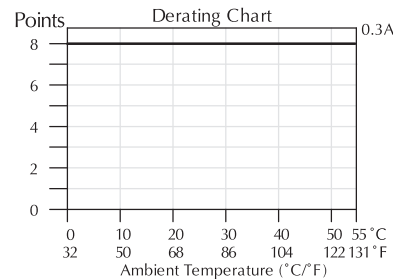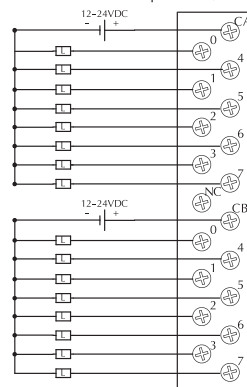
DC Output Modules

| D2-16TD1-2 DC Output $172.00	
Outputs per Module	16 (current sinking)
Commons per Module	1 (2 I/O terminal points)
Output Type	NPN open collector
External DC required	24VDC ±4V @ 80mA max
Operating Voltage	10.2-26.4 VDC
Peak Voltage	30VDC
ON Voltage Drop	0.5 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.2 mA
Max Load Current	0.1 A/point 1.6 A/common
Max Leakage Current	0.1 mA @ 30VDC
Max Inrush Current	150mA for 10ms
Base Power Required 5VDC	200mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	2.3 oz. (65g)
Fuses	None

See Wiring Solutions for part numbers of **ZIP**Link cables and connection modules compatible with this I/O module.
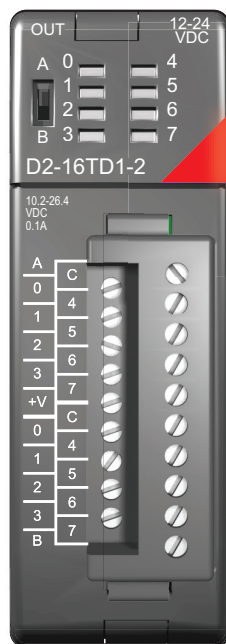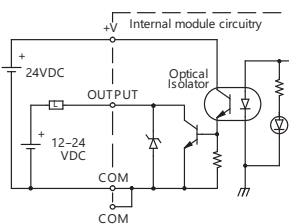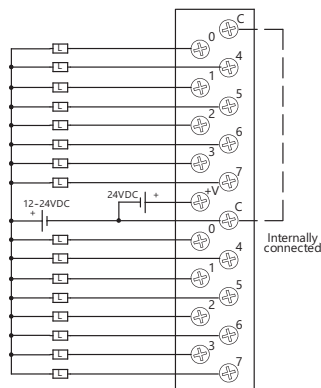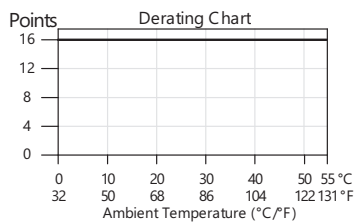
| D2-16TD2-2 DC Output $154.00	
Outputs per Module	16 (current sourcing)
Commons per Module	2
Output Type	NPN open collector
Operating Voltage	10.2-26.4 VDC
Peak Voltage	30VDC
ON Voltage Drop	1.0 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.2 mA
Max Load Current	0.1 A/point 1.6 A/module
Max Leakage Current	0.1 mA @ 30VDC
Max Inrush Current	150mA for 10ms
Base Power Required 5VDC	200mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80g)
Fuses	None

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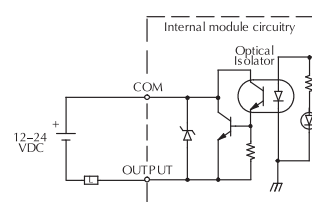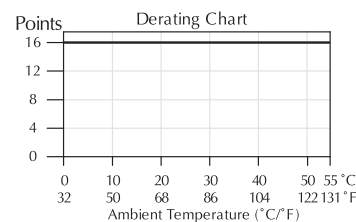
DC Output Modules

D2-32TD1 DC Output	$183.00
Outputs per Module	32 (current sinking)
Commons per Module	4 (8 I/O terminal points)
Output Type	NPN open collector
Operating Voltage	12-24 VDC
Peak Voltage	30VDC
ON Voltage Drop	0.5 VDC maximum
Minimum Load Current	0.2 mA
Max Load Current	0.1 A/point; 3.2 A per module
Max Leakage Current	0.1 mA @ 30VDC
Max Inrush Current	150mA for 10ms
Base Power Required 5VDC	350mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (not included)	40-pin connector[1]
Status Indicator	Module activity (no I/O status indicators)
Weight	2.1 oz. (60g)
Fuses	None
External DC Power Required	20-28 VDC max. 120mA (all points on)

1 Connector sold separately.
 See Terminal Blocks and Wiring for wiring options.
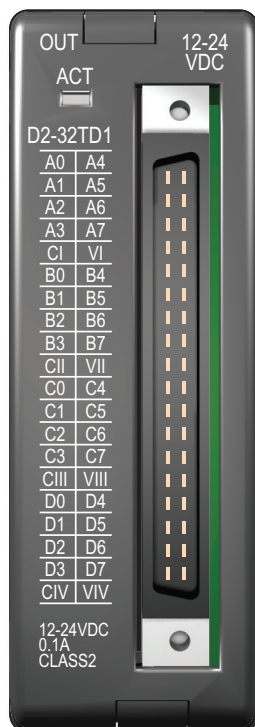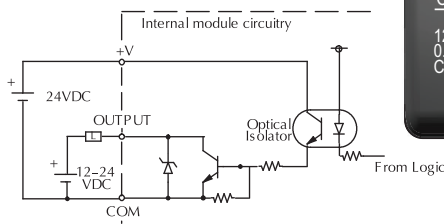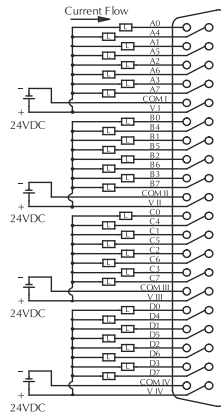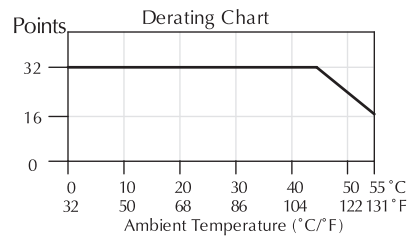
D2-32TD2 DC Output	$182.00
Outputs per Module	32 (current sourcing)
Commons per Module	4 (8 I/O terminal points)
Output Type	Transistor
Operating Voltage	12 to 24 VDC
Peak Voltage	30VDC
ON Voltage Drop	0.5 VDC @ 0.1 A
Minimum Load Current	0.2 mA
Max Load Current	0.1 A/point; 0.8 A/common
Max Leakage Current	0.1 mA @ 30VDC
Max Inrush Current	150mA @ 10ms
Base Power Required 5VDC	350mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (not included)	40-pin connector[1]
Status Indicator	Module activity (no I/O status indicators)
Weight	2.1 oz (60g)
Fuses	None

1 Connector sold separately.
 See Terminal Blocks and Wiring for wiring options.

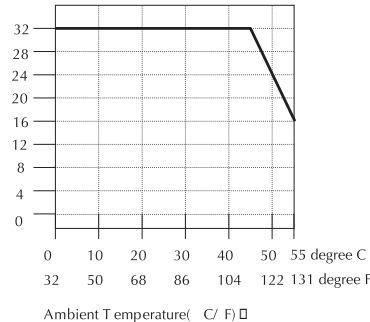See Wiring Solutions for part numbers of **ZIP**Link cables and connection modules compatible with this I/O module.
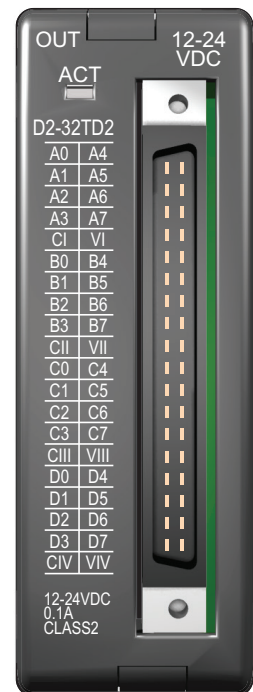
See Wiring Solutions for part numbers of **ZIP**Link cables and connection modules compatible with this I/O module.
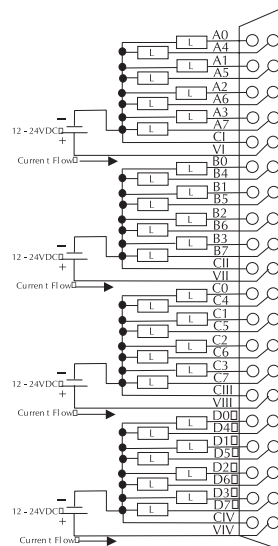
DC Output Modules

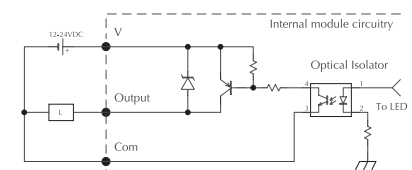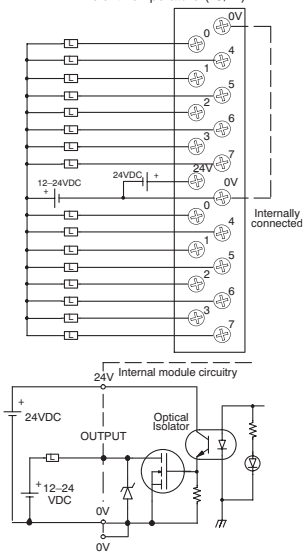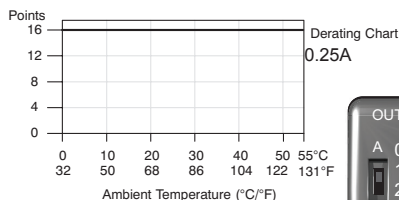*Not supported in D2-250 CPUs.*

F2-16TD1P DC Output with Fault Protection	$178.00
Inputs per module	16 (status indication)
Outputs per module	16 (current sinking)
Commons per module	1 (2 I/O terminal points)
Output type	NMOS FET (open drain)
Operating voltage	10.2–26.4 VDC, external
Peak voltage	40VDC
AC frequency	N/A
ON voltage drop	0.7 V (output current 0.5 A)
Overcurrent trip	0.6 A min., 1.2 A max.
Minimum load current	0.2 mA
Maximum load current	0.25 A/point; 4A/common
Max leakage current	0.2 mA (load detect enabled); 0.3 mA disabled
Max inrush current	Self-limited
Base power required 5V	70mA
OFF to ON response	0.5 ms
ON to OFF response	0.5 ms
Terminal type	Removable (D2-16IOCON)
Status indicators	Logic Side
Weight	2.0 oz. (25g)
Fuses	None
External DC required	24VDC ±10% @ 50mA
External DC overvoltage shutdown	27V, outputs are restored when voltage is within limits

Module detects the following faults:

1. Missing external 24VDC
2. Open load
3. Over temperature
4. Over load current

When the A/B switch is in the A position, the LEDs display the output status of the module's first 8 output points. Positon B displays the output status of the module's second group of 8 output points.
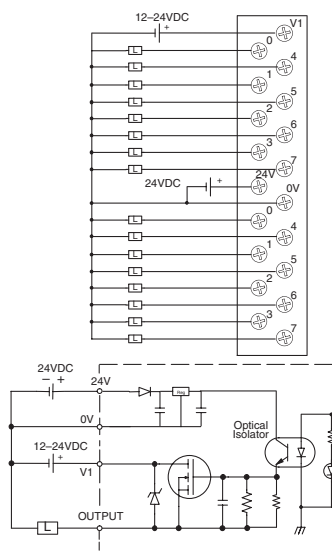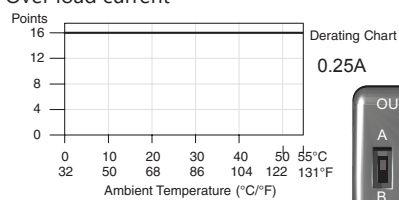
CPU	Firmware Required
D2-250-1	Version 4.80 or later
D2-262	Version 1.0 or later

Not supported in D2-250 CPUs.

F2-16TD2P DC Output with Fault Protection	$179.00
Inputs per module	16 (status indication)
Outputs per module	16 (current sourcing)
Commons per module	1
Output type	NMOS FET (open source)
Operating voltage	10.2 -26.4 VDC, external
Peak voltage	40VDC
AC frequency	N/A
ON voltage drop	0.7 V (output current 0.5 A)
Overcurrent trip	0.6 A min., 1.2 A max.
Minimum load current	0.2 mA
Maximum load current	0.25 A/point; 4A/common
Max leakage current	0.2 mA (load detect enabled); 0.3 mA disabled
Max inrush current	Self-limited
Base power required 5V	70mA
OFF to ON response	0.5 ms
ON to OFF response	0.5 ms
Terminal type	Removable (D2-16IOCON)
Status indicators	Logic Side
Weight	2.0 oz. (25g)
Fuses	None
External DC required	24VDC ±10% @ 50mA
External DC overvoltage shutdown	27V, outputs are restored when voltage is within limits

Module detects the following faults:

1. Missing external 24VDC
2. Open load
3. Over temperature
4. Over load current

When the A/B switch is in the A position, the LEDs display the output status of the module's first 8 output points. Positon B displays the output status of the module's second group of 8 output points.

CPU	Firmware Required
D2-250-1	Version 4.80 or later
D2-262	Version 1.0 or later

AC Output Modules

D2-08TA AC Output $195.00	
Outputs per Module	8
Commons per Module	1 (2 I/O terminal points)
Output Type	SSR (Triac)
Operating Voltage	15-264 VAC
Peak Voltage	264VAC
ON Voltage Drop	< 1.5 VAC (>0.1 A) < 3.0 VAC (<0.1 A)
AC Frequency	47 to 63 Hz
Minimum Load Current	10mA
Max Load Current	0.5 A/point; 4A/common
Max Leakage Current	4mA (264VAC, 60Hz) 1.2 mA (100VAC, 60Hz) 0.9 mA (100VAC, 50Hz)
Max Inrush Current	10A for 10ms
Base Power Required 5VDC	250mA
OFF to ON Response	1ms
ON to OFF Response	1ms + 1/2 cycle
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80g)
Fuses	1 per common, 6.3 A slow blow, non-replaceable

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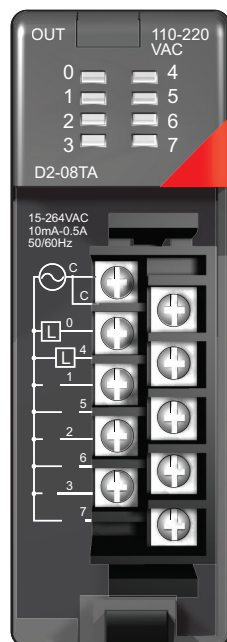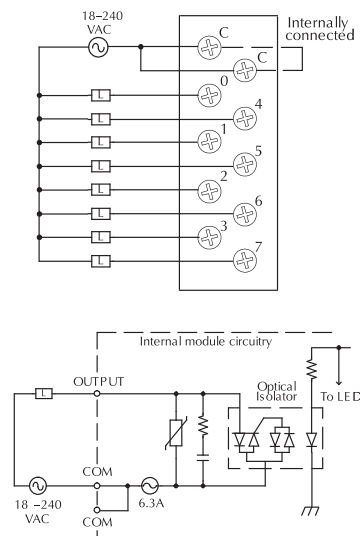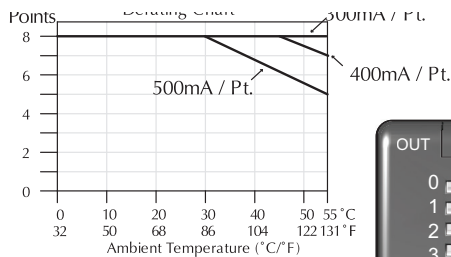

F2-08TA AC Output $208.00	
Outputs per Module	8
Commons per Module	2 (Isolated)
Output Type	SSR (Triac with zero crossover)
Operating Voltage	24-140 VAC
Peak Voltage	140VAC
ON Voltage Drop	1.6 V(rms) @ 1.5 A
AC Frequency	47 to 63 Hz
Minimum Load Current	50mA
Max Load Current	1.5 A / pt @ 30ºC 1.0 A / pt @ 60ºC 4.0 A / common; 8.0 A / module @ 60ºC
Max Leakage Current	0.7 mA(rms)
Peak One Cycle Surge Current	15A
Base Power Required 5VDC	250mA
OFF to ON Response	0.5 ms - 1/2 cycle
ON to OFF Response	0.5 ms - 1/2 cycle
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	3.5 oz. (99g)
Fuses	None

See Wiring Solutions for part numbers of **ZIP**Link cables and connection modules compatible with this I/O module.
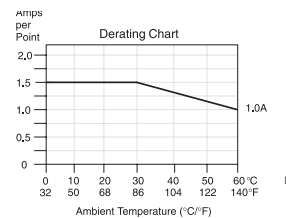
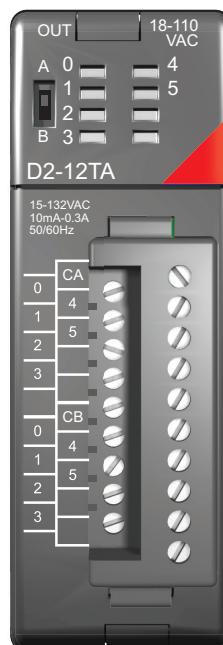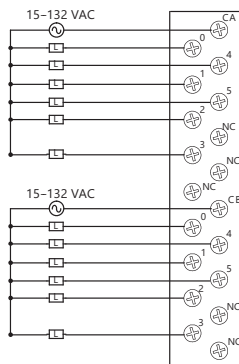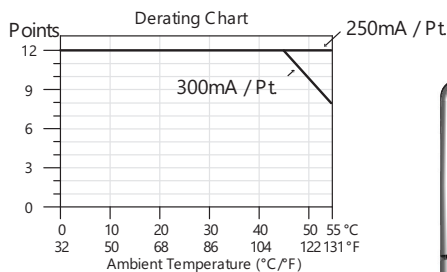Derating Note: All outputs can be run at the current per point shown.
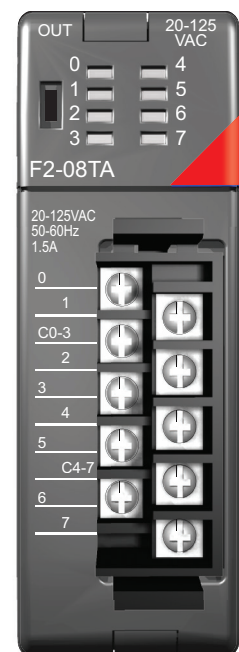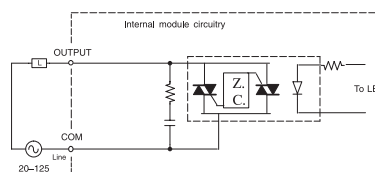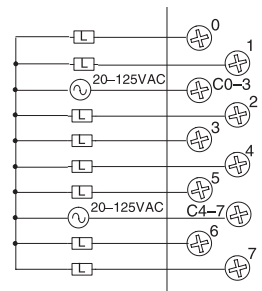
AC Output Modules

D2-12TA AC Output $223.00	
Outputs per Module	12
Outputs Points Consumed	16 (four unused, see chart below)
Commons per Module	2 (isolated)
Output Type	SSR (Triac)
Operating Voltage	15-132 VAC
Peak Voltage	132 VAC
ON Voltage Drop	< 1.5VAC (>50mA) < 4.0VAC (<50mA)
AC Frequency	47 to 63 Hz
Minimum Load Current	10mA
Max Load Current	0.3 A/point; 1.8 A/common
Max Leakage Current	2mA (132VAC, 60Hz)
Max Inrush Current	10A for 10ms
Base Power Required 5VDC	350mA
OFF to ON Response	1ms
ON to OFF Response	1ms + 1/2 cycle
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80g)
Fuses	(2) 1 per common 3.15 A slow blow, replaceable Order D2-FUSE-1 (5 per pack)

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

Note: When used with the ZIPLink wiring system, relay outputs are derated not to exceed 2 Amps per point max.

Derating Chart

250mA / Pt.

300mA / Pt.

Addresses Used			
Points	Used?	Points	Used?
Yn+0	Yes	Yn+10	Yes
Yn+1	Yes	Yn+11	Yes
Yn+2	Yes	Yn+12	Yes
Yn+3	Yes	Yn+13	Yes
Yn+4	Yes	Yn+14	Yes
Yn+5	Yes	Yn+15	Yes
Yn+6	No	Yn+16	No
Yn+7	No	Yn+17	No

n is the starting address

OUT   18-110 VAC

A 0   4
   1   5
   2
B 3

D2-12TA

15-132VAC
10mA-0.3A
50/60Hz

15–132 VAC

15–132 VAC

Internal module circuitry

OUTPUT   Optical Isolator   To LED

COM

15–132 VAC   3.15A

Relay Output Modules

D2-04TRS Relay Output $114.00

Outputs per Module	4
Outputs Points Consumed	8 (only 1st 4pts. are used)
Commons per Module	4 (isolated)
Output Type	Relay, form A (SPST)
Operating Voltage	5-30 VDC / 5-240 VAC
Peak Voltage	30 VDC, 264 VAC
ON Voltage Drop	0.72 VDC maximum
AC Frequency	47 to 63 Hz
Minimum Load Current	10mA
Max Load Current (resistive)	4A/point; 8A/module (resistive)
Max Leakage Current	0.1 mA @ 264 VAC
Max Inrush Current	5A for < 10ms
Base Power Required 5VDC	250mA
OFF to ON Response	10ms
ON to OFF Response	10ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80g)
Fuses	1 per point 6.3 A slow blow, replaceable Order D2-FUSE-3 (5 per pack)

Typical Relay Life (Operations)

	Voltage & Load Current			
Type of Load	**1A**	**2A**	**3A**	**4A**
24VDC Resistive	500K	200K	100K	50K
24VDC Solenoid	100K	40K	–	–
110VAC Resistive	500K	250K	150K	100K
110VAC Solenoid	200K	100K	50K	–
220VAC Resistive	350K	150K	100K	50K
220VAC Solenoid	100K	50K	–	–

At 24VDC, solenoid (inductive) loads over 2A cannot be used.

At 100VAC, solenoid (inductive) loads over 3A cannot be used.

At 220VAC, solenoid (inductive) loads over 2A cannot be used.

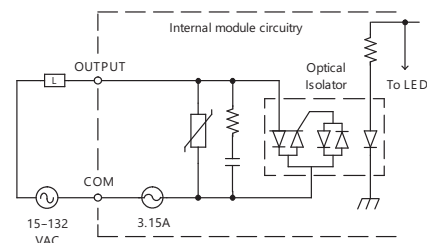See Wiring Solutions for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.
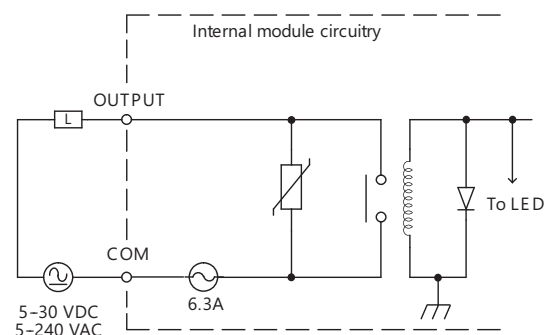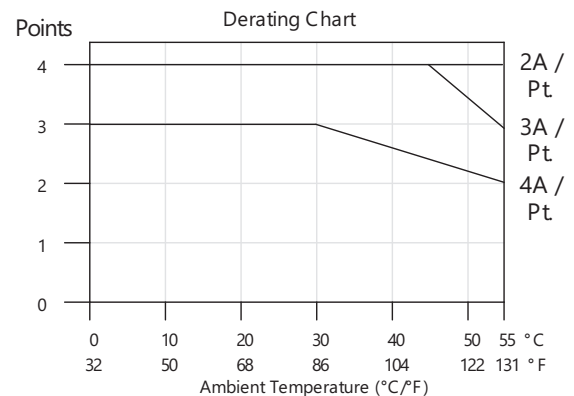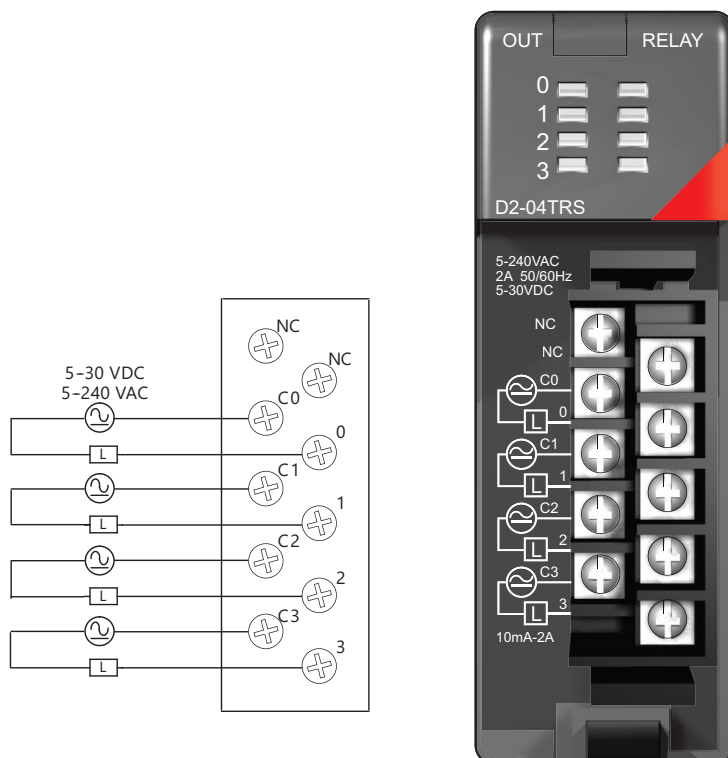
Relay Output Modules

D2-08TR Relay Output $111.00	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	1 (2 I/O terminals)
Output Type	Relay, form A (SPST)
Operating Voltage	5-30 VDC; 5-240 VAC
Peak Voltage	30VDC, 264VAC
ON Voltage Drop	N/A
AC Frequency	47 to 60 Hz
Minimum Load Current	5mA @ 5VDC
Max Load Current (resistive)	1A/point; 4A/common
Max Leakage Current	0.1 mA @ 265VAC
Max Inrush Current	Output: 3A for 10ms Common: 10A for 10ms
Base Power Required 5VDC	250mA
OFF to ON Response	12ms
ON to OFF Response	10ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	3.9 oz. (110g)
Fuses	One 6.3 A slow blow, replaceable Order D2-FUSE-3 (5 per pack)

Typical Relay Life (Operations)		
Voltage/Load	Current	Closures
24VDC Resistive	1A	500K
24VDC Solenoid	1A	100K
110VAC Resistive	1A	500K
110VAC Solenoid	1A	200K
220VAC Resistive	1A	350K
220VAC Solenoid	1A	100K

See Wiring Solutions for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.
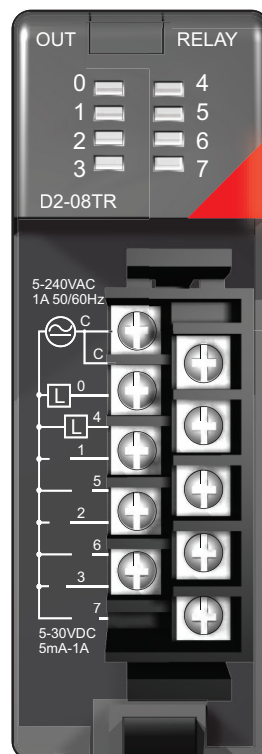
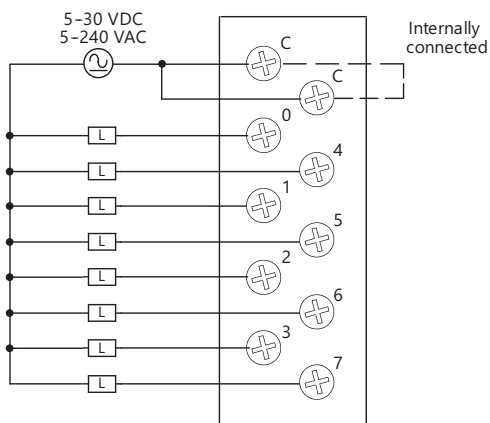*Note: When used with the ZIPLink wiring system, relay outputs are derated not to exceed 2 Amps per point max.*
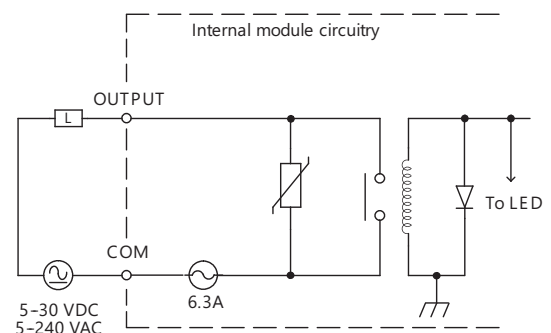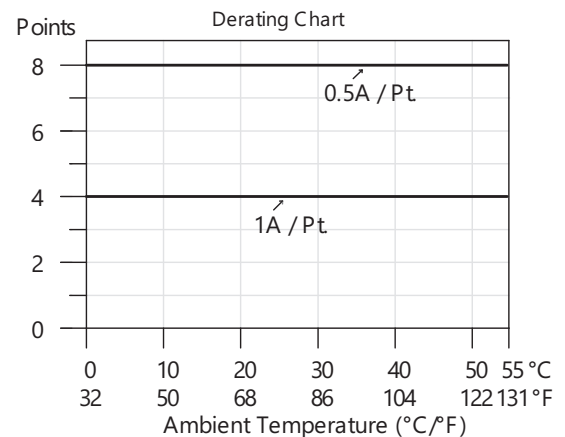
Relay Output Modules

F2-08TRS Relay Output $200.00	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	8 (isolated)
Output Type	3, Form C (SPDT) 5, Form A (SPST normally open)
Operating Voltage	7A @ 12-28 VDC, 12-250 VAC 0.5 A @ 120VDC
Peak Voltage	150VDC, 265VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63 Hz
Minimum Load Current	10mA @ 12VDC
Max Load Current (resistive)	7A/point [3] (subject to derating)
Max Leakage Current	N/A
Max Inrush Current	12A
Base Power Required 5VDC	670mA
OFF to ON Response	15ms (typical)
ON to OFF Response	5ms (typical)
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	5.5 oz. (156g)
Fuses	None

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

Typical Relay Life (Operations) at Room Temperature

	Voltage & Load Current		
Type of Load	50mA	5A	7A
24VDC Resistive	10M	600K	300K
24VDC Solenoid	–	150K	75K
110VAC Resistive	–	600K	300K
110VAC Solenoid	–	500K	200K
220VAC Resistive	–	300K	150K
220VAC Solenoid	–	250K	100K

1) Contact life may be extended beyond those values shown with the use of arc suppression techniques described in the DL205 User Manual. Since these modules have no leakage current, they do not have built-in snubber. For example, if you place a diode across a 24VDC inductive load, you can significantly increase the life of the relay.

2) At 120VDC 0.5 A resistive load, contact life cycle is 200K cycles.

3) Normally closed contacts have 1/2 the current handling capability of the normally open contacts.

Derating Chart

Typical Circuit (points 1,2,3,4,5)

Typical Circuit (Points 0, 6, & 7 only)

Relay Output Modules

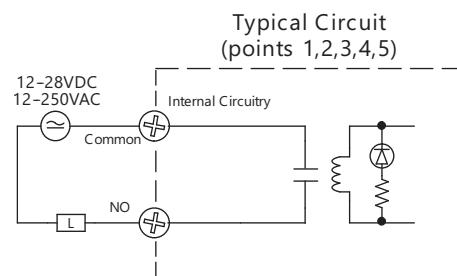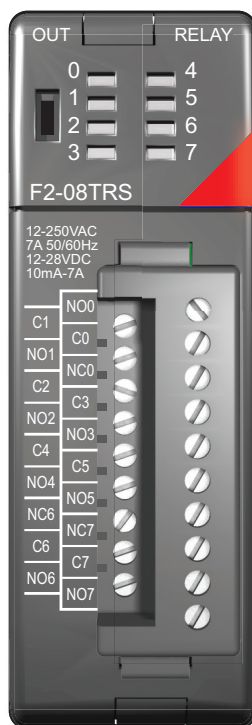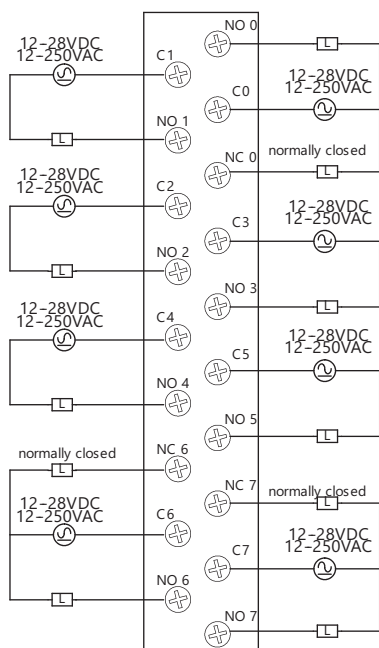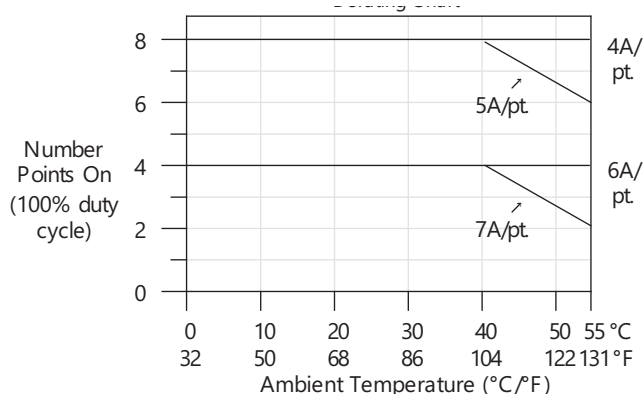| F2-08TR Relay Output $149.00	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	2 (isolated), 4-pts. per common
Output Type	8, Form A (SPST normally open)
Operating Voltage	7A @ 12-28 VDC, 12-250 VAC; 0.5 A @ 120VDC
Peak Voltage	150VDC, 265VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63 Hz
Minimum Load Current	10mA @ 12 VDC
Max Load Current (resistive)	10A/point [3] (subject to derating) Max of 10A/common
Max Leakage Current	N/A
Max Inrush Current	12A
Base Power Required 5VDC	670mA
OFF to ON Response	15ms (typical)
ON to OFF Response	5ms (typical)
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	5.5 oz. (156g)
Fuses	None

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

Typical Relay Life (Operations) at Room Temperature			
	Voltage & Load Current		
Type of Load	**50mA**	**5A**	**7A**
24VDC Resistive	10M	600K	300K
24VDC Solenoid	–	150K	75K
110VAC Resistive	–	600K	300K
110VAC Solenoid	–	500K	200K
220VAC Resistive	–	300K	150K
220VAC Solenoid	–	250K	100K

1) Contact life may be extended beyond those values shown with the use of arc suppression techniques described in the DL205 User Manual. Since these modules have no leakage current, they do not have built-in snubber. For example, if you place a diode across a 24VDC inductive load, you can significantly increase the life of the relay.

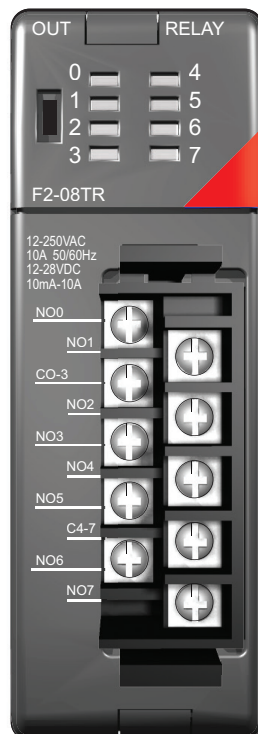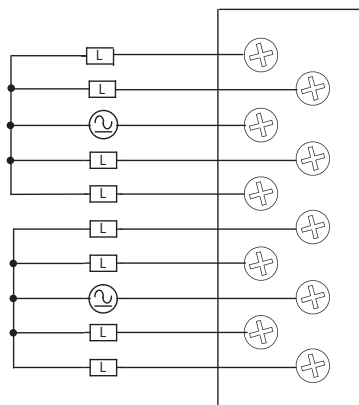2) At 120VDC 0.5 A resistive load, contact life cycle is 200K cycles.

3) Normally closed contacts have 1/2 the current handling capability of the normally open contacts.

Derating Chart

Typical Circuit

Relay Output Modules

D2-12TR Relay Output $184.00	
Outputs per Module	12
Outputs Points Consumed	16 (four unused, see chart below)
Commons per Module	2 (6-pts. per common)
Output Type	Relay, form A (SPST)
Operating Voltage	5-30 VDC; 5-240 VAC
Peak Voltage	30VDC; 264VAC
ON Voltage Drop	N/A
AC Frequency	47 to 60 Hz
Minimum Load Current	5mA @ 5VDC
Max Load Current (resistive)	1.5 A/point; Max of 3A/common
Max Leakage Current	0.1 mA @ 265 VAC
Max Inrush Current	Output: 3A for 10ms Common: 10A for 10ms
Base Power Required 5VDC	450mA
OFF to ON Response	10ms
ON to OFF Response	10ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	4.6 oz. (130g)
Fuses	(2) 4A slow blow, replaceable Order D2-FUSE-4 (5 per pack)

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

Typical Relay Life (Operations)
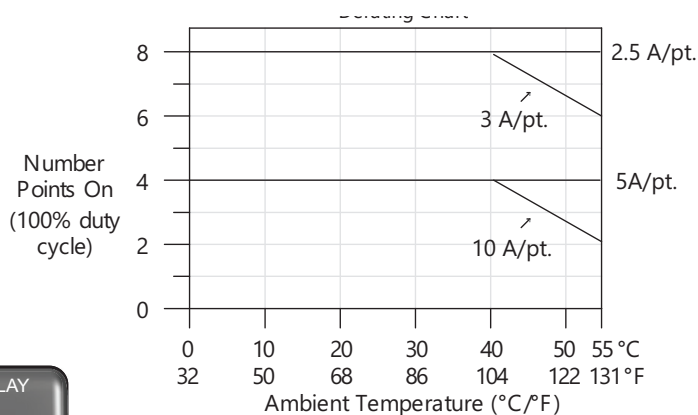
Voltage/Load	Current	Closures
24VDC Resistive	1A	500K
24VDC Solenoid	1A	100K
110VAC Resistive	1A	500K
110VAC Solenoid	1A	200K
220VAC Resistive	1A	350K
220VAC Solenoid	1A	100K

Addresses Used

Points	Used?	Points	Used?
Yn+0	Yes	Yn+10	Yes
Yn+1	Yes	Yn+11	Yes
Yn+2	Yes	Yn+12	Yes
Yn+3	Yes	Yn+13	Yes
Yn+4	Yes	Yn+14	Yes
Yn+5	Yes	Yn+15	Yes
Yn+6	No	Yn+16	No
Yn+7	No	Yn+17	No
n is the starting address			

DC Input/Relay Output Module

D2-08CDR 4-pt. DC In / 4pt. Relay Out $98.00

General Specifications	
Base Power Required 5VDC	200mA
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	3.5 oz. (100g)

Input Specifications	
Inputs per Module	4 (sink/source)
Input Points Consumed	8 (only first 4-pts. are used)
Commons per Module	1
Input Voltage Range	20-28 VDC
Peak Voltage	30VDC
ON Voltage Level	19VDC minimum
OFF Voltage Level	7VDC maximum
AC Frequency	N/A
Input Impedance	4.7 kΩ
Input Current	5mA @ 24VDC
Maximum Current	8mA @ 30VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	1.5 mA
OFF to ON Response	1 to 10 ms
ON to OFF Response	1 to 10 ms
Fuses (input circuits)	None

Output Specifications	
Outputs per Module	4
Outputs Points Consumed	8 (only first 4-pts. are used)
Commons per Module	1
Output Type	Relay, form A (SPST)
Operating Voltage	5-30 VDC; 5-240 VAC
Peak Voltage	30VDC; 264VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63 Hz
Minimum Load Current	5 mA @ 5VDC
Max Load Current (resistive)	1A/point ; 4A/module
Max Leakage Current	0.1 mA @ 264VAC
Max Inrush Current	3A for < 100ms 10 A for < 10ms (common)
OFF to ON Response	12ms
ON to OFF Response	10ms
Fuses (output circuits)	1 (6.3 A slow blow, replaceable); Order D2-FUSE-3 (5 per pack)

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

Derating Chart

Typical Relay Life (Operations)		
Voltage/Load	Current	Closures
24VDC Resistive	1A	500K
24VDC Solenoid	1A	100K
110VAC Resistive	1A	500K
110VAC Solenoid	1A	200K
220VAC Resistive	1A	350K
220VAC Solenoid	1A	100K
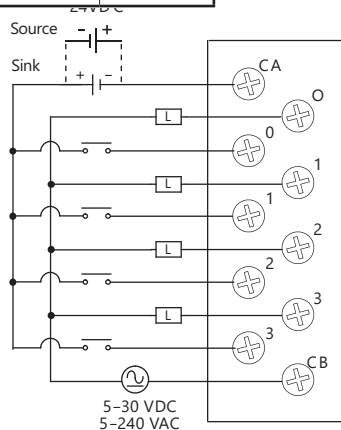
For "Sinking and Sourcing Concepts", see the Appendix section in this catalog.
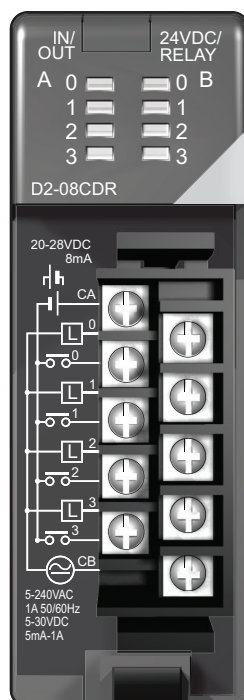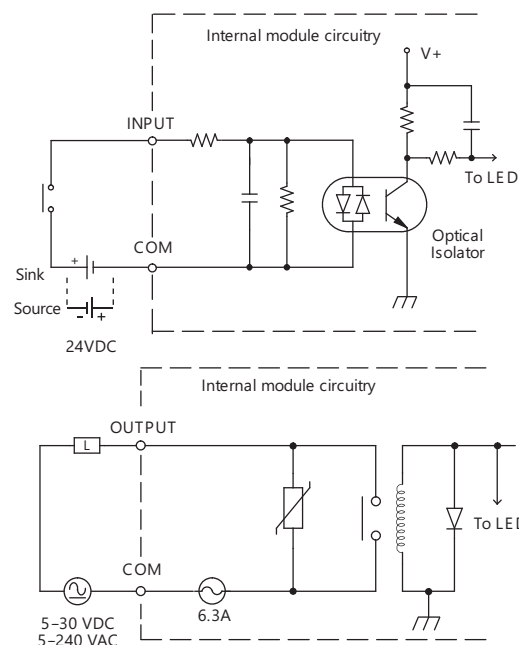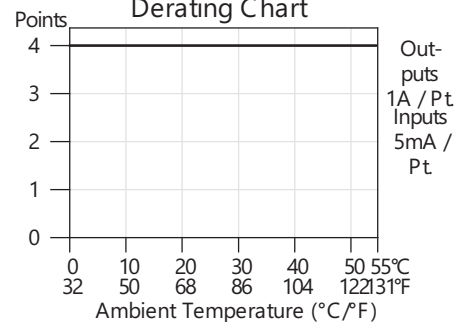
Analog Current Input Modules

F2-04AD-1 4-Channel 4-20mA Analog In
$396.00

This module can be powered by either a 12VDC or 24VDC power supply, and is a direct replacement for F2-04AD-1L modules.

Number of Channels	4, single ended (1 common)
Input Ranges	4 to 20 mA current
Resolution	12-bit (1 in 4096)
Active Low-pass Filtering	-3 dB at 120Hz, 2 poles (-12dB per octave)
Input Impedance	250Ω ±0.1%, 1/2 W current input
Absolute Maximum Ratings	-40mA to +40mA, current input
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	4 channels per scan maximum (D2-262 CPU)
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (offset error not included)	±12 counts max., @ 20mA current input
Offset Calibration Error	±7 counts max.,@ 4mA current input
Step Response	4.9 ms to 95% of F.S. change

|	
Maximum Inaccuracy	±.5% @ 77°F (25°C) ±.65% 32° to 140°F (0° to 60°C)
Accuracy vs. Temperature	±50 ppm/°C maximum full scale (including max. offset change)
Recommended Fuse	0.032 A, Series 217 fast-acting, current inputs
Digital Input Points Required	16 (X) input points (12 binary data bits, 2 channel ID bits, 2 diagnostic bits)
Base Power Required 5 VDC	100mA
External Power Supply	5mA maximum, +10 to +30 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
Terminal Type (included)	Removable; D2-8IOCON

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

Note 1: Shields should be grounded at the signal source

More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032 A, fast-acting fuse is recommended for 4-20 mA 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 4-20 mA transmitter types are:
2 or 3 wire: Isolation between input signal and power supply.
4 wire: Isolation between input signal, power supply, and 4-20 mA output

Analog Current Input Modules

F2-08AD-1 8-Channel 4-20mA Analog In $486.00	
Number of Channels	8, single ended (1 common)
Input Ranges	4 to 20 mA current
Resolution	12 bit (1 in 4096)
Low-pass Filtering	-3dB at 200Hz, (-6dB per octave)
Input Impedance	250Ω ±0.1%, 1/2 W current input
Absolute Maximum Ratings	-45mA to +45mA
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	8 channels per scan maximum (D2-250-1 and D2-262 CPUs)
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (offset error not included)	±5 counts max., @ 20mA current input
Offset Calibration Error	±2 counts max., @ 4mA current input
Step Response	1ms to 95% of F.S. change

Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.25% 32º to 140ºF (0º to 60ºC)
Accuracy vs.Temperature	±50 ppm/ºC maximum full scale (including max. offset change of two counts)
Recommended Fuse	0.032A, Series 217 fast-acting, current inputs
Digital Input Points Required	16 (X) input points (12 binary data bits, 3 channel ID bits, 1 broken transmitter bit)
Base Power Required 5VDC	100mA
External Power Supply	5mA maximum, +10 to +30 VDC
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Note 1: Shields should be grounded at the signal source.

More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032 A, fast-acting fuse is recommended for 4-20 mA current loops. If the power supply common of an external power supply is not connected to 0 VDC on the module, then the output of the external transmitter must be isolated. To avoid "ground loop" errors, recommended 4-20 mA transmitter types are:

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

Analog Voltage Input Modules

F2-04AD-2 4-Channel Voltage Analog In
$432.00

This module can be powered by either a 12VDC or 24VDC power supply, and is a direct replacement for F2-04AD-2L modules.

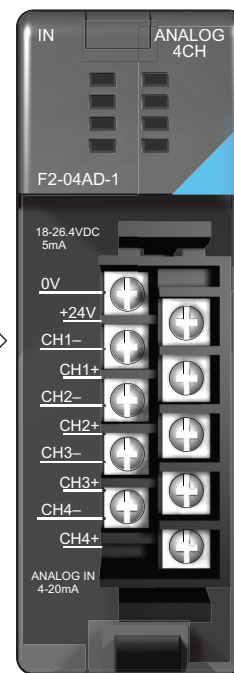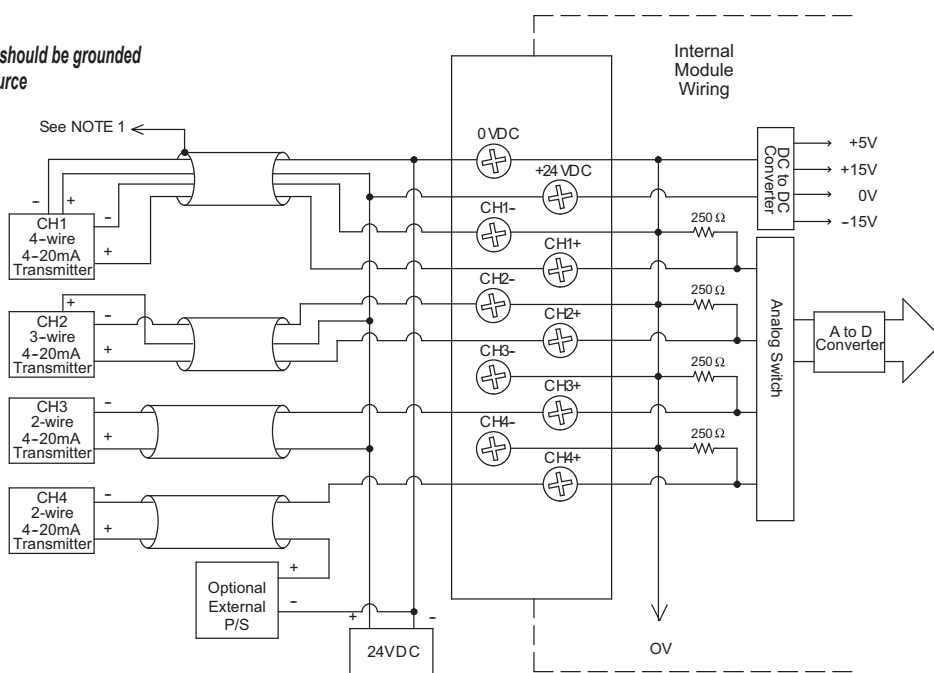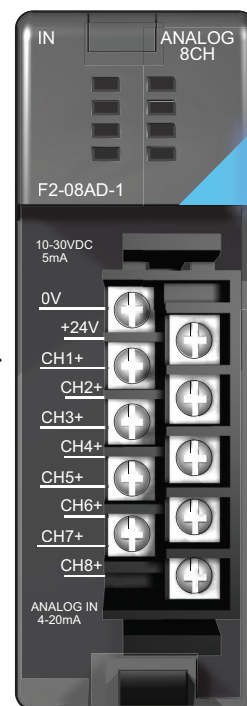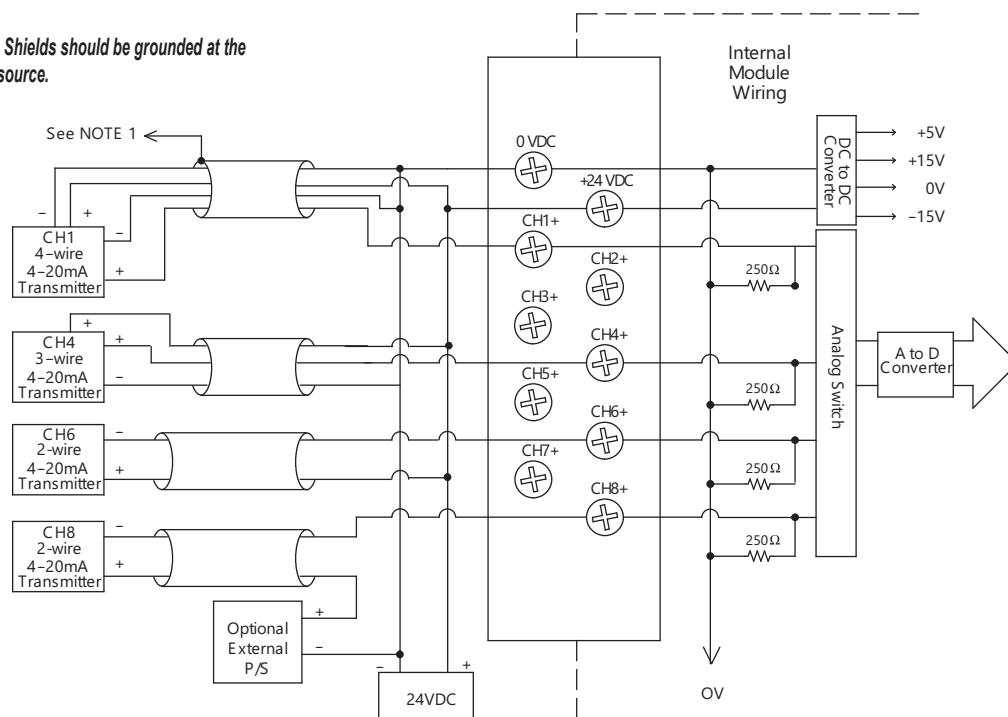|	
Number of Channels	4, single ended (1 common)
Input Ranges	0 to 5 V, 0 to 10 V, ±5V, ±10V
Resolution	12 bit (1 in 4096)
Active Low-pass Filtering	-3dB at 80Hz, 2 poles (-12dB per octave)
Input Impedance	>20MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	4 channels per scan maximum (D2-262 CPU)
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum ±2 counts maximum (bi-polar)
Input Stability	±1 count
Full Scale Calibration Error (offset error not included)	±3 counts maximum
Offset Calibration Error	±1 count maximum (0V input)
Step Response	8.2 ms to 95% of F.S change

Maximum Inaccuracy	± 0.1% @ 77ºF (25ºC) ± 0.3% 32º to 140ºF (0º to 60ºC)
Accuracy vs Temperature	± 50 ppm/ºC full scale calibration change (including maximum offset change)
Digital Input Points Required	16(x) input points (12 binary data bits, 2 channel ID bits)
Base Power Required 5VDC	110mA
External Power Supply	5mA maximum, +10 to +30 VDC
Operating Temperature	32º to 140ºF (0 to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Note 1: Shields should be grounded at the signal source.
Note 2: Unused inputs should be jumpered together (i.e. CH4- to CH4+).
Note 3: More than one external power supply can be used provided the commons are connected together.
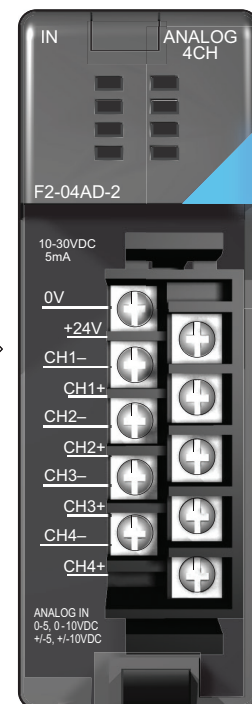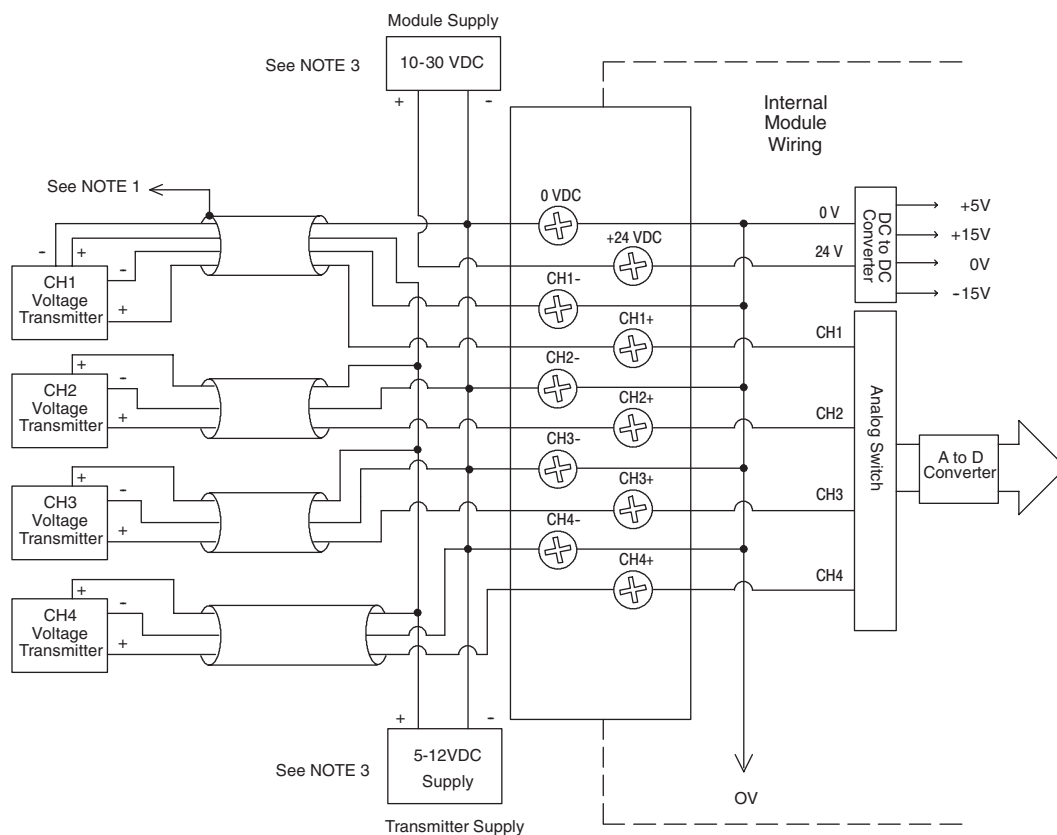
Analog Voltage Input Modules

F2-08AD-2 8-Channel Voltage Analog In
$516.00

Number of Channels	8, single ended (1 common)
Input Ranges	0 to 5 V, 0 to 10V, ±5V, ±10VDC
Resolution	12 bit (1 in 4095) uni-polar 13 bit (-4095 to 4095) bi-polar
Active Low-pass Filtering	-3dB at 200Hz, (-6dB per octave)
Input Impedance	>20MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	8 channels per scan maximum (D2-262 CPU)
Linearity Error (End to End)	±1 count (0.025% of full scale) maximum
Input Stability	±1 count
Full Scale Calibration Error (offset error not included)	±3 counts maximum
Offset Calibration Error	±1 count maximum (0V input)
Step Response	1ms to 95% of F.S. change

Includes circuitry to automatically detect broken or open transmitters.

Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.3% 32º to 140ºF (0º to 60ºC)
Accuracy vs Temperature	±50 ppm/ºC maximum full scale (including max. offset change of 2 counts)
Digital Input Points Required	16 (X) input points, (12 binary data bits, 3 channel ID bits, 1 sign bit, 1 diagnostic bit)
Base Power Required 5VDC	100mA
External Power Supply	5mA maximum, +10 to +30 VDC
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Typical user wiring

Note 1: Shields should be grounded at the signal source.
Note 2: Connect all external power supply commons.
Note 3: Connect unused channels (CH5+, CH6+, CH7+, CH8+ in this example) to 0VDC.

Temperature Input Modules

F2-04RTD 4-Channel RTD In	$539.00
Number of Channels	4
Input Ranges	Type Pt100: -200.0 to 850.0ºC, -328 to 1562ºF Type Pt1000: -200.0 to 595.0ºC, -328 to 1103ºF Type jPt100: -38.0 to 450.0ºC, -36 to 842ºF Type Cu-10Ω/Cu-25Ω: -200.0 to 260.0ºC, -328 to 500ºF
Resolution	16 bit (1 in 65535)
Display Resolution	±0.1ºC, ±0.1ºF (±3276.7)
RTD Excitation Current	210µA
Input Type	Differential
Notch Filter	>50dB notches at 50/60 Hz -3dB = 13.1 Hz
Maximum Setting Time	100ms (full-scale step input)
Common Mode Range	0–5 VDC
Absolute Maximum Ratings	Fault protected inputs to ±50VDC
Sampling Rate	160ms per channel

Converter Type	Charge Balancing	
Linearity Error	±.05ºC maximum, ±.01ºC typical	
Maximum Inaccuracy	Type Pt100, Pt1000, jPt100: ±1ºC	
	Type Cu-10Ω/Cu-25Ω: ±5ºC	
PLC Update Rate	4 channel/scan max., D2-262 CPU	
Digital Input Points Required	32 input points (16 binary data bits, 2 channel ID bits, 4 fault bits)	
Base Power Required 5VDC	90A	
Operating Temperature	32° to 140°F (0° to 60°C)	
Storage Temperature	-4° to 158°F (-20° to 70°C)	
Temperature Drift	None (self-calibrating)	
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	
Terminal Type (included)	Removable; D2-8IOCON	

Typical user wiring

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 an RTD sensor has four wires, the plus sense wire should be left unconnected as shown.
3. This module is not compatible with the ZIPLink wiring systems.
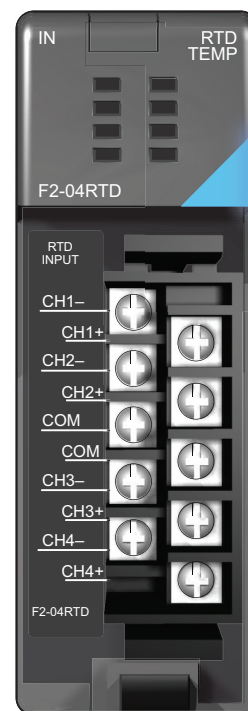
Temperature Input Modules

F2-04THM 4-Channel Thermocouple In
$582.00

General Specifications

Number of Channels	4, differential
Common Mode Range	±5VDC
Common Mode Rejection	90dB min. @ DC, 150dB min. @ 50/60 Hz.
Input Impedance	1 MΩ
Absolute Maximum Ratings	Fault-protected inputs to ±50 VDC
Accuracy vs. Temperature	±5 ppm/ºC maximum full scale calibration (including maximum offset change)
PLC Update Rate	4 channels per scan max. D2-262 CPU
Digital Input Points Required	32 (X) input points (16 binary data bits, 2 channel ID bits, 4 diagnostic bits)
External Power Supply	60mA maximum, 18 to 26.4 VDC
Base Power Required 5VDC	110mA
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Non-removable

Thermocouple Specifications

|		
Input Ranges	Type J -190 to 760ºC	-310 to 1400ºF
	Type E -210 to 1000ºC	-346 to 1832ºF
	Type K -150 to 1372ºC	-238 to 2502ºF
	Type R 65 to 1768ºC	149 to 3214ºF
	Type S 65 to 1768ºC	149 to 3214ºF
	Type T -230 to 400ºC	-382 to 752ºF
	Type B 529 to 1820ºC	984 to 3308ºF
	Type N -70 to 1300ºC	-94 to 2372ºF
	Type C 65 to 2320ºC	149 to 4208ºF
Display Resolution	±0.1ºC or ±0.1ºF	
Cold Junction Compensation	Automatic	
Conversion Time	100ms per channel	
Warm-Up Time	30 minutes typically ± 1ºC repeatability	
Linearity Error (End to End)	±.05ºC maximum, ±.01ºC typical	
Maximum Inaccuracy	±3ºC (excluding thermocouple error)	

Voltage Input Specifications

Voltage Ranges	0-5V, ±5V, 0-156.25 mV, ±156.25 mVDC
Resolution	16-bit (1 in 65535)
Full Scale Calibration Error (Offset Error Included)	±13 counts typical ±33 maximum
Offset Calibration Error	±1 count maximum, @ 0V input
Linearity Error (End to End)	±1 count maximum
Maximum Inaccuracy	±.02% @ 25ºC (77ºF)

CPU Firmware Required

CPU	Firmware Required
D2-250	V1.06
D2-250-1	All firmware versions work
D2-262	Version 1.0 or later

Thermocouple input wiring diagram

Voltage input wiring diagram
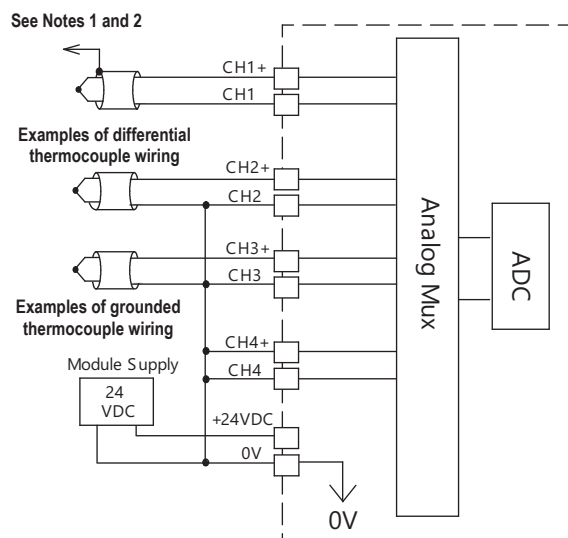
Notes:
1: Terminate shields at the respective signal source.
2: Connect unused channels to a common terminal (0V, CH4+, CH4).
3: When using 0-156 mV and 5V ranges, connect (-) or (0) volts terminal to 0V to ensure common mode range acceptance.
4. This module is not compatible with the ZIPLink wiring system.
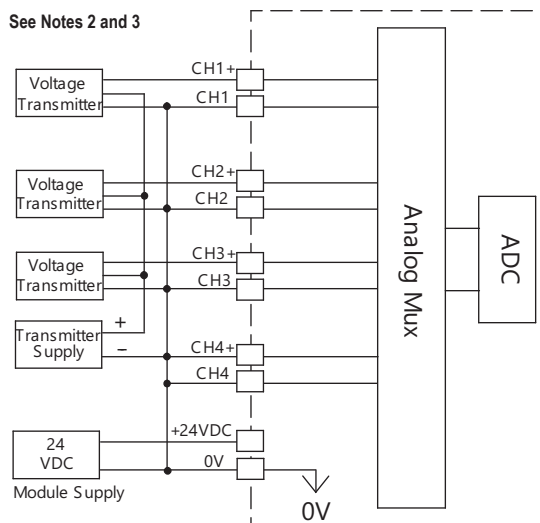
Analog Current Output Modules

F2-02DA-1 2-Channel 4-20mA Analog Output
$282.00

This module requires a 24VDC user power supply for operation.

Number of Channels	2
Output Ranges	4 to 20 mA
Resolution	12-bit (1 in 4096)
Output Type	Single ended, one common
Digital Output Points Required	16 (Y) output points (12 binary data bits, 2 channel ID bits)
Maximum Loop Supply	30VDC
Peak Output Voltage	40VDC (clamped by transient voltage suppressor)
Load Impedance	Zero Ω minimum
Maximum Load/Power Supply	620Ω/18V, 910Ω/24V, 1200Ω/ 30V
PLC Update Rate	2 channels per scan maximum (D2-262 CPU)
Linearity Error (end to end)	±1 count (±0.025% of full scale) maximum
Conversion Settling Time	100μs maximum (full scale change)
Full Scale Calibration Error (offset error included)	± 5 counts max., 20mA @77ºF (25ºC)
Offset Calibration Error	± 3 counts max., 4mA @ 77ºF (25Cº)

Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	0.1% @ 77ºF (25ºC) 0.3% @ 32º to 140ºF (0º to 60ºC)
Base Power Required 5VDC	40mA
External Power Supply	24VDC, 60mA. (add 20mA for each current loop used)
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4 to 158ºF(-20 to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

NOTE 1: Shields should be connected to the 0V of the module or the OV of the R/S.
NOTE 2: Unused current outputs should remain open (no connections) for minimum power consumption.

Typical user wiring

Maximum user load is dependent upon loop power supply
Loop power supply	Load range
30VDC	0 to 1200 Ω
24VDC	0 to 910 Ω
18VDC	0 to 620 Ω

Analog Current Output Modules

F2-02DAS-1 2-Channel Isolated 4-20mA Analog Output $432.00

Number of Channels	2, isolated
Output Ranges	4 to 20 mA
Resolution	16 bit (1 in 65536)
Output Type	Current sourcing
Digital Output Points Required	32 (Y) output points (16 binary data bits, 2 channel ID bits, 1 output enable bit)
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Base Power Required 5VDC	100mA
Loop Supply	18-32 VDC
External Power Supply	18-32 VDC @ 50mA per channel
Output Loop Compliance	Vin - 2.5 V
Max Load Impedance	525Ω
Maximum Load/ Power Supply	375Ω/12V, 975Ω/24V, 1375Ω/32V
PLC Update Rate	2 channels per scan maximum (D2-262 CPU)
Conversion Settling Time	3ms to 0.1% of full scale

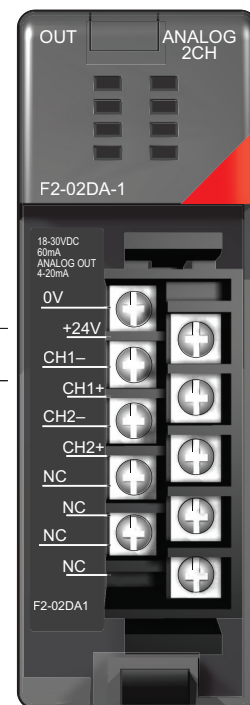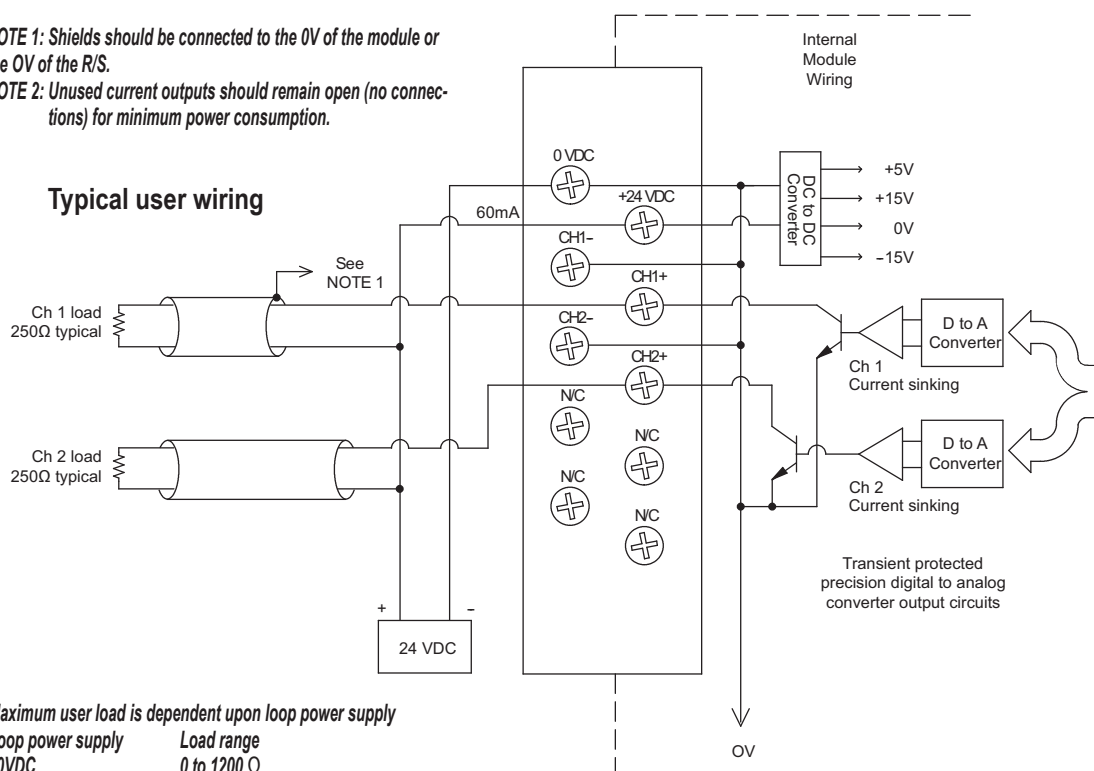|	
Linearity Error (end to end)	±10 count (±0.015% of full scale) maximum
Gain Calibration Error	±32 counts (±0.05%)
Offset Calibration Error	±13 counts (±0.02%)
Output Drift	50 ppm/°C
Maximum Inaccuracy	0.07% @ 25ºC (77ºF) 0.18% 0 to 60ºC (32º to 140ºF)
Operating Temperature	0º to 60ºC (32º to 140ºF)
Storage Temperature	-20º to 70ºC (-4º to 158ºF)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Typical user wiring

NOTE 1: Shields should be connected to the 0V terminal of the module.
NOTE 2: Load must be within compliance voltage.
NOTE 3: For non-isolated outputs, connect all 0V's together (0V1... 0V2) and connect all +V's together (+V1...+V2).

Analog Current Output Modules

F2-08DA-1 8-Channel 4-20mA Analog Output $535.00

Number of Channels	8, single-ended
Output Ranges	4 to 20 mA
Resolution	12-bit (1 in 4096)
Output Type	Current sinking or current sourcing
Digital Output Points Required	16 (Y) output points (12 binary data bits, 3 channel ID bits, 1 output enable bit)
Base Power Required 5VDC	30mA
Maximum Loop Voltage	30VDC
External Power Supply	18 to 30 VDC, 50mA., class 2 (add 20mA for each current loop used)
Source Load	0-400 Ω @ 18-30 VDC
Sink Load	0-600 Ω/18V, 0-900 Ω/24V, 0-1200 Ω/30V
Total Load (sink + source)	600Ω/18V, 900Ω/24 V, 1200Ω/30V
PLC Update Rate	8 channels per scan maximum (D2-262 CPU)
Conversion Settling Time	400µs maximum (full scale change)

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

Linearity Error (end to end)	±2 count (±0.050% of full scale) maximum
Full Scale Calibration Error	± 12 counts max. sinking @ any load ± 12 counts max. sourcing @ 125Ω load ± 18 counts max. sourcing @ 250Ω load ± 26 counts max. sourcing @ 400Ω load
Offset Calibration Error	± 9 counts max. sinking @ any load ± 9 counts max. sourcing @ 125Ω load ± 11 counts max. sourcing @ 250Ω load ± 13 counts max. sourcing @ 400Ω load
Maximum Full Scale Inaccuracy @ 60ºC	0.5% sinking (any load) sinking & sourcing @ 125Ω load 0.64% sourcing @ 250Ω load 0.83% sourcing @ 400Ω load
Maximum Full Scale Inaccuracy @ 25ºC (Incudes all errors and temp drift)	0.3% sinking (any load) sinking & sourcing @ 125Ω load 0.44% sourcing @ 250Ω load 0.63% sourcing @ 400Ω load
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4 to 158ºF(-20 to 70ºC)
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
Terminal Type (included)	Removable; D2-16IOCON

Typical user wiring
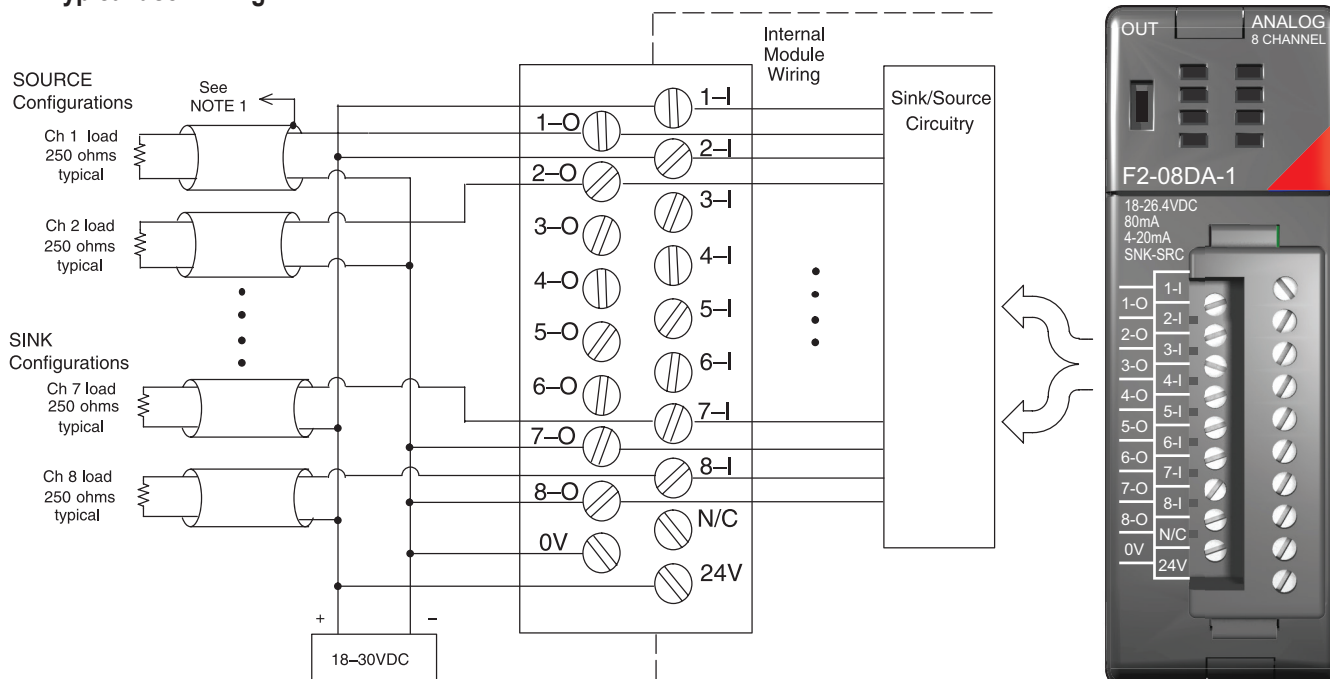
NOTE 1: Shields should be connected to the 0V of the module.

Analog Voltage Output Modules

F2-02DA-2 2-Channel Voltage Analog Output
$295.00

This module requires a 24VDC user power supply for operation. All other specifications are the same.

Number of Channels	2
Output Ranges	0 to 5 V, 0 to 10 V, ±5V, ±10V
Resolution	12-bit (1 in 4096)
Output Type	Single ended, 1 common
Digital Output Points Required	16 (Y) output points (12 binary data bits, 2 channel ID bits)
Peak Output Voltage	15VDC (clamped by transient voltage suppressor)
Load Impedance	2000Ω minimum
Load Capacitance	0.01 µF maximum
PLC Update Rate	2 channels per scan, maximum (D2-262 CPU)
Linearity Error (end to end)	±1 count (0.025% of full scale) maximum
Conversion Settling Time	5µs maximum (full scale change)
Full Scale Calibration Error (offset error included)	±12 counts max. unipolar @ 77ºF (25ºC) ±16 counts max. bipolar @ 77ºF (25ºC)
Offset Calibration Error	±3 counts max., unipolar @ 77ºF (25ºC) ±8 counts max., bipolar @ 77ºF (25ºC)

Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	+0.3% unipolar ranges @ 77ºF (25ºC) ±0.45% unipolar ranges >77ºF (25ºC) ±0.4% bipolar ranges @ 77ºF (25ºC) ±0.55% bipolar ranges >77ºF (25ºC)
Base Power Required 5VDC	40mA
External Power Supply	24VDC, 60mA (outputs fully loaded)
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Typical user wiring

Internal module wiring

24 VDC

0 VDC
+24 VDC
60mA
CH1–
CH1+
CH2–
CH2+
N/C
N/C
N/C

DC to DC Converter
+5V
+15V
0V
–15V

Ch 1 Voltage sink/source
D to A Converter

Ch 2 Voltage sink/source
D to A Converter

Transient protected precision digital to analog converter output circuits

Ch 1 load 2K Ω minimum

Ch 2 load 2K Ω minimum

See NOTE 1

0V

NOTE 1: Shields should be connected to the 0V of the module or the 0V of the R/S.
NOTE 2: Unused voltage outputs should remain open (no connections) for minimum power consumption.

OUT   ANALOG 2CH

F2-02DA-2

18-30VDC 60mA ANALOG OUT 0-5VDC -5-+5VDC
0V
+24V
CH1–
CH1+
CH2–
CH2+
NC
NC
NC
NC
0-10VDC -10-+10VDC
F2-02DA-2

Analog Voltage Output Modules

F2-02DAS-2 2-Channel 0-5V, 0-10V Isolated Analog Output $471.00

Number of Channels	2, isolated
Output Ranges	0–5 V, 0–10 V
Resolution	16-bit (1 in 65536)
Output Type	Sourced through external loop supply
Digital Output Points Required	32 (Y) output points (16 binary data bits, 2 channel ID bits)
Isolation Voltage	±750V continuous, channel to channel, channel to logic
Base Power Required 5VDC	60mA
External Power Supply	21.6–26.4 VDC @ 60mA per channel
Load Impedance	2kΩ min.
PLC Update Rate	2 channels per scan, maximum (D2-262 CPU)
Conversion Settling Time	3ms to 0.1% of full scale

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

Linearity Error (end to end)	±10 count (±0.015% of full scale) maximum
Gain Calibration Error	±32 counts (±0.05%)
Offset Calibration Error	±13 counts (±0.02%)
Output Drift	50 ppm/ºC
Maximum Inaccuracy	0.07% @ 25ºC (77ºF) 0.18% 0 to 60ºC (32º to 140ºF)
Operating Temperature	0º to 60ºC (32º to 140ºF)
Storage Temperature	-20º to 70ºC (-4º to 158ºF)
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
Terminal Type (included)	Removable; D2-8IOCON

Typical user wiring

NOTE 1: Shields should be connected to the 0V of the module or the 0V of the P/S.

Analog Voltage Output Modules

F2-08DA-2 8-Channel Voltage Analog Output
$530.00

Number of Channels	8, single-ended, 1 common
Output Ranges	0 to 5V, 0 to 10V
Resolution	12-bit (1 in 4096)
Output Type	Voltage sourcing
Digital Output Points Required	16 (Y) output points (12 binary data bits, 3 channel ID bits, 1 output enable bit)
Base Power Required 5VDC	60mA
External Power Supply	21.6-26.4 VDC, 140mA (outputs fully loaded)
Peak Output Voltage	15VDC (clamped by transient voltage suppressor)
Load Impedance	1-10kΩ
Load Capacitance	0.01 µF maximum
PLC Update Rate	8 channels per scan maximum (D2-262 CPU)
Conversion Settling Time	400µs maximum (full scale change) 4.5 ms to 9ms for digital out to analog out

Linearity Error (end to end)	±1 count (±0.025% of full scale) maximum
Full Scale Calibration Error	±12 counts max. unipolar @ 25ºC (77ºF)
Offset Calibration Error	±3 counts max., unipolar @ 25ºC (77ºF)
Accuracy vs. Temperature	±57 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	±0.3% @ 25ºC (77ºF) ±0.45% @ 0-60ºC (32-140ºF)
Operating Temperature	0º to 60ºC (32º to 140ºF)
Storage Temperature	-20º to 70ºC (-4º to 158ºF)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Typical user wiring

NOTE 1: Shields should be connected to the 0V of the module.

Analog In/Out Combination Module

F2-4AD2DA 4-Channel Analog Input 2-Channel Analog Output $556.00

Number of Input Channels	4, single-ended (1 common)
Number of Output Channels	2, single-ended (1 common)
Ranges	4 to 20 mA current (current sinking)
Resolution	12 bit (1 in 4096)
Peak Withstanding Voltage	75VDC, current outputs
Maximum Continuous Overload	-40 to +40 mA, each current output
Input Impedance	250Ω, ±0.1%, 1/2 W, 25 ppm/ºC current input resistance
External Load Resistance	0Ω minimum, current outputs
Maximum Loop Supply	30VDC
Recommended Fuse	0.032 A, series 217 fast-acting, current inputs
Maximum Load/Power Supply	910Ω/24V, current outputs 620Ω/18V, 1200Ω/30V
Active Low-pass Filter	-3dB @ 20Hz, 2 poles (-12 dB per octave)
Linearity Error (best fit)	±1 count (±0.025% of full scale) maximum
Output Settling Time	100µs maximum (full scale change)

Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change)
Maximum Inaccuracy	±0.1% @ 77ºF (25ºC) ±0.3% @ 32 to 140ºF (0 to 60ºC)
Digital Input and Output Points Required	16 (X) input points (12 binary data bits, 2 channel ID bits, 2 diagnostic bits) 16 (Y) output points (12 binary data bits, 2 channel enable bits)
PLC Update Rate	4 channels per scan maximum: (D2-250-1 and D2-262 CPUs) 2 output channels per scan maximum: (D2-262 CPU)
Base Power Required 5VDC	90mA
External Power Supply Requirement	18-26.4 VDC @ 80mA 20mA per loop
Operating Temperature	32º to 140ºF (0º to 60ºC)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
Terminal Type (included)	Removable; D2-8IOCON

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

Note 1: Shields should be connected at their respective signal source.
Note 2: Unused channel should remain open for minimum power consumption.
Note 3: More than one external power supply can be used provided the power supply commons are connected.
Note 4: A Series 217, 0.032 A fast-acting fuse is recommended for 4-20 mA current input loops.
Note 5: If the power supply common of an external power supply is not connected to 0 VDC on the module, then the output of the external transmitter must be isolated. To avoid "ground loop" errors, recommended 4-20 mA transmitter types are:
2 or 3 wire: isolation between Input signal and power supply
4 wire: Isolation between input signal, power supply, and 4-20 mA output.

Note 6: If an analog channel is connected backwards, then erroneous data values will be returned for that channel.
Note 7: To avoid small errors due to terminal block losses, connect 0 VDC, IN-, and OUT- on the terminal block as shown. The module's internal connection alone of these nodes is not sufficient to permit module performance up to the accuracy specifications.
Note 8: Choose an output transducer resistance according to the maximum load/power listed in the Output Specifications.

Typical user wiring
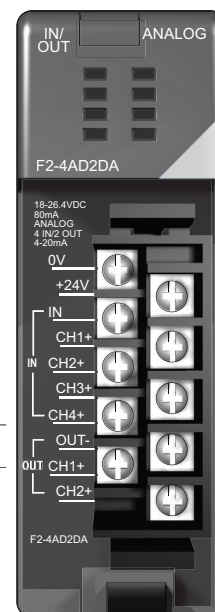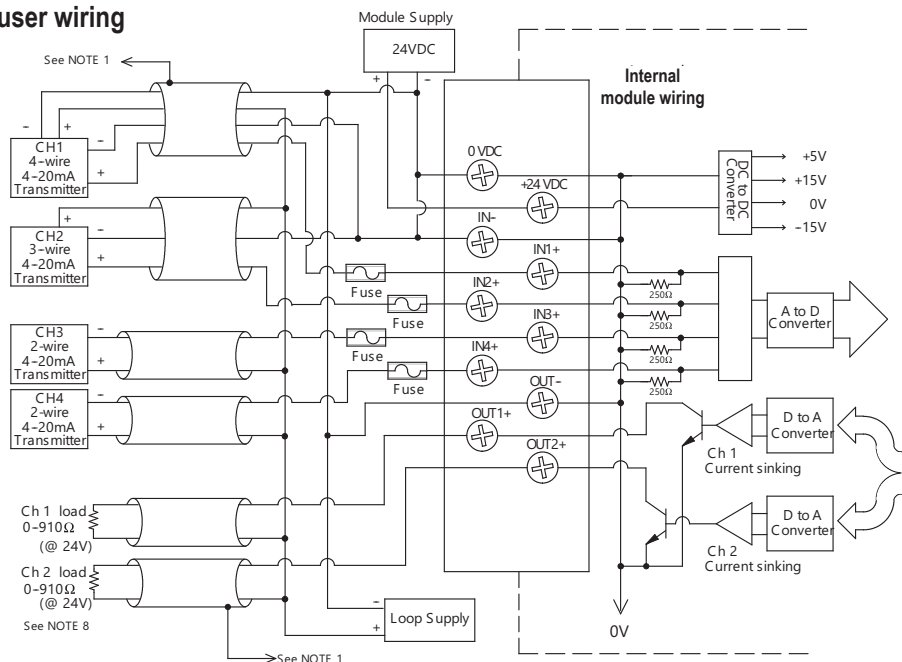
Analog In/Out Combination Module

Requires D2-250-1 or D2-262 CPU.

F2-8AD4DA-1 8-Channel Analog Current Input 4-Channel Analog Current Output $697.00	
Input Channels per Module	8, single ended (one common)
Input Range	0 to 20 mA
Resolution	12, 14, 16-bit selectable
External DC Power Required	100mA @ 18-26.4 VDC
Max. Continuous Overload	±45mA
Input Impedance	100Ω 0.1% 1/4 W
Filter Characteristics	Active low pass, -3dB @ 80Hz
Conversion Time	12-bit = 1.5 ms per channel 14-bit = 6ms per channel 16-bit = 25ms per channel
Conversion Method	Over sampling successive approximation
Accuracy vs. Temperature	±25 ppm / °C Max.
Maximum Inaccuracy	0.1% of range
Linearity Error (End to End)	12-bit = ±2 count max. (±0.06% of range) 14-bit = ±10 count max. (±0.06% of range) 16-bit = ±20 count max. (±0.06% of range) Monotonic with no missing codes
Full Scale Calibration Error (not including offset error)	±0.07% of range max.
Offset Calibration Error	±0.03% of range max.
Rec. Fuse (external)	0.032 A, Littelfuse Series 217 fast-acting
Base Power Required 5VDC	35mA

Output Channels per Module	4
Output Range	4 to 20 mA
Resolution	16-bit, 0.244 mA/bit
Output Type	Current sourcing at 20mA, max.
Load Impedance	0-750 Ω
Max. Inaccuracy	0.25% of range
Max. Full Scale Calibration Error (not incl. offset error)	±0.075% of range max.
Max. Offset Calibration Error	±0.1% of range max.
Accuracy vs. Temperature	±25 ppm/ °C max. full scale calibration change (± 0.0025% of range / °C)
Max. Crosstalk at DC, 50/60Hz	-70dB, 1 LSB
Linearity Error (End to End)	±1 count max. (±0.025% of full scale) Monotonic with no missing codes
Output Stability and Repeatability	±1 LSB after 10 minute warm-up typical
Output Ripple	0.005% of full scale
Output Settling Time	0.5 ms max., 5µs, min. (full scale change)
Max. Continuous Overload	Outputs open circuit protected
Type of Output Protection	Electronically current limited to 20mA or less
Output Signal at Power-up and Power-down	4mA
Terminal Type (included)	Removable; D2-16IOCON

Note 1: A Littelfuse Series 217, 0.032A fast-acting fuse is recommended for all 4-20mA current loop inputs.

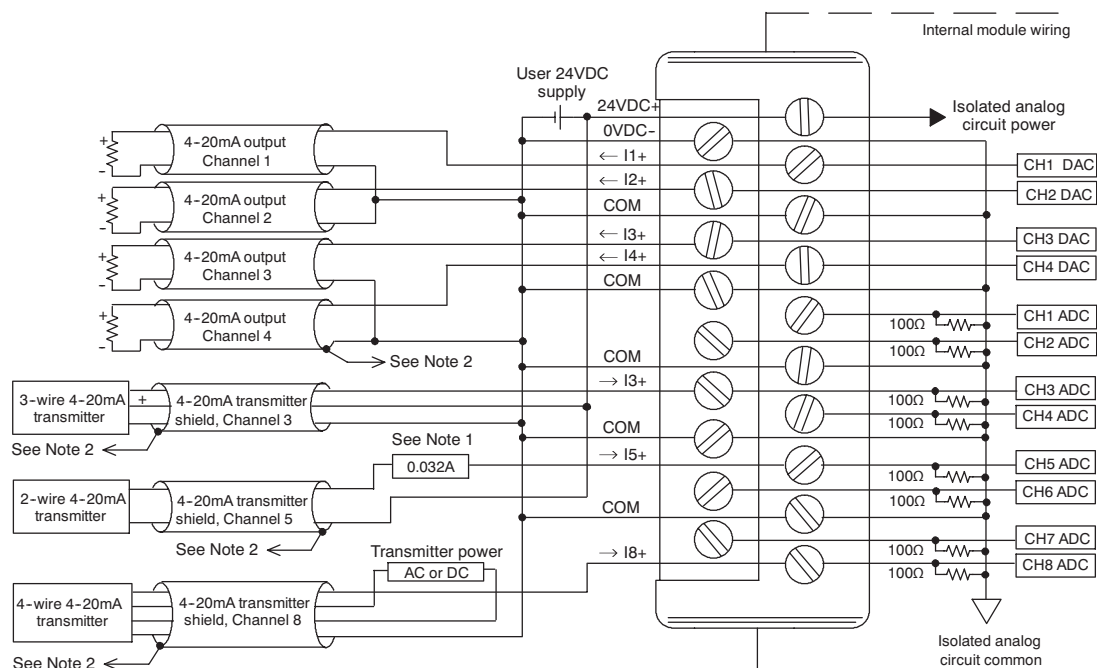Note 2: Connect shields to the 0V of the module; do not connect both ends of shield.
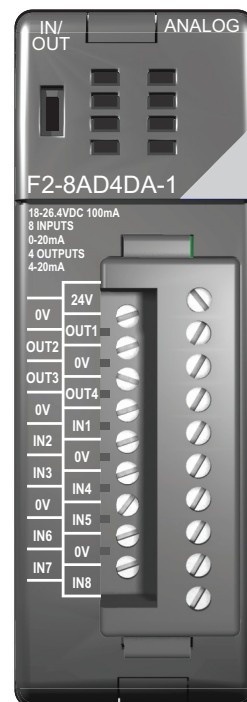
Analog In/Out Combination Module

Requires D2-250-1 or D2-262 CPU.

F2-8AD4DA-2 8-Channel Analog Voltage Input 4-Channel Analog Voltage Output $689.00	
Input Channels per Module	8, single ended (one common)
Input Range	0 to 10 V
Resolution	12, 14, 16-bit selectable
External DC Power Required	80mA @ 18-26.4 VDC
Max. Continuous Overload	±100V
Input Impedance	>10MΩ
Filter Characteristics	Active low pass, -3dB @ 80Hz
Conversion Time	12-bit = 1.5 ms per channel 14-bit = 6 ms per channel 16-bit = 25 ms per channel
Conversion Method	Over sampling successive approximation
Accuracy vs. Temperature	±50 ppm/°C Max.
Maximim Inaccuracy	0.1% of range
Linearity Error (End to End)	12-bit = ±1 count max. (±0.025% of range) 14-bit = ±4 count max. (±0.025% of range) 16-bit = ±16 count max. (±0.025% of range) Monotonic with no missing codes
Full Scale Calibration Error (not including offset error)	±0.075% of range max.
Offset Calibration Error	±0.025% of range max.
Base Power Required 5VDC	35mA

Output Channels per Module	4
Output Range	0–5 V, 0–10 V
Resolution	16-bit
Output Type	Voltage sourcing/sinking at 10mA max.
Load Impedance	>1000Ω
Max. Inaccuracy	0.15% of range
Max. Full Scale Calibration Error (not incl. offset error)	±0.075% of range max.
Max. Offset Calibration Error	±0.025% of range max.
Accuracy vs. Temperature	±50 ppm/°C max. full scale calibration change (± 0.005% of range /°C)
Max. Crosstalk @ DC, 50/60Hz	-70dB, 1 LSB
Linearity Error (End to End)	±1 count max. (±0.025% of full scale) Monotonic with no missing codes
Output Stability and Repeatability	±1 LSB after 10 minute warm-up typical
Output Ripple	0.005% of full scale
Output Settling Time	0.5 ms max., 5µs min. (full scale change)
Max. Continuous Overload	Outputs current limited to 15mA typical
Type of Output Protection	1VDC peak output voltage (clamped by transient voltage suppressor)
Output Signal at Power-up and Power-down	0V
Terminal Type (included)	Removable; D2-16IOCON
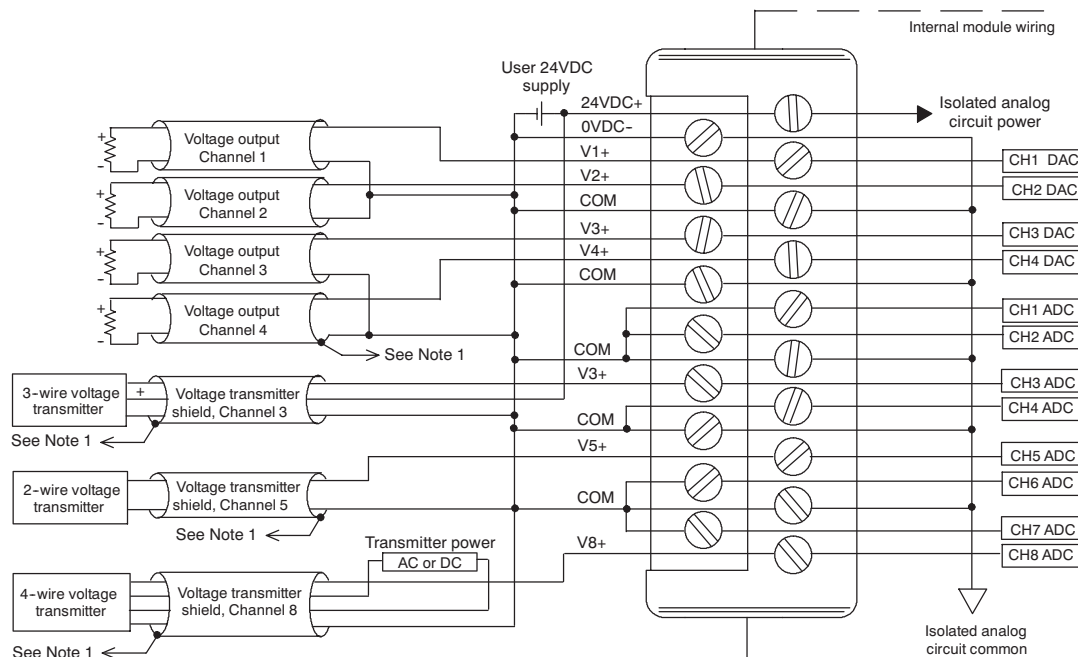
Note 1: Connect shields to the 0V of the module; do not connect both ends of shield.
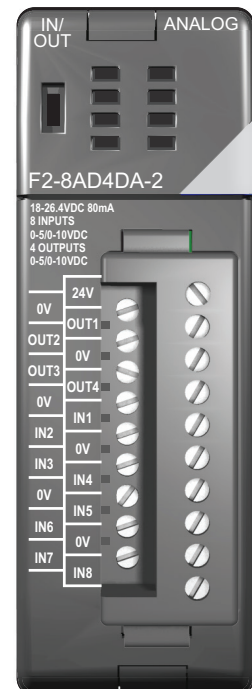
DL205 Instruction Set

Boolean Instructions

Store (STR)
Begins a new rung or an additional branch in a rung with a normally open contact.

Store Not (STRN)
Begins a new rung or an additional branch in a rung with a normally closed contact.

Store Bit-of-Word (STRB)
D2-250-1 and D2-262 only. Begins a new rung or an additional branch in a rung with a normally open contact.

Store Not Bit-of-Word (STRNB)
D2-250-1 and D2-262 only. Begins a new wrung 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 (ORN)
Logically ORs a normally closed contact in parallel with another contact in a rung.

Or Bit-of-Word (ORB)
D2-250-1 and D2-262 only. ORs a normally open contact in parallel with another contact in a rung.

Or Not Bit-of-Word (ORNB)
D2-250-1 and D2-262 only. 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 (ANDN)
Logically ANDs a normally closed contact in series with another contact in a rung.

And Bit-of-Word (ANDB)
D2-250-1 and D2-262 only. ANDs a normally open contact in series with another contact in a rung.

And Not Bit-of-Word (ANDNB)
D2-250-1 and D2-262 only. 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.

Out Bit-of-Word (OUTB)
D2-250-1 and D2-262 only. Reflects status of the rung (on/off) and outputs the discrete (on/off) state to the specified bit in the referenced memory location.

Not (NOT)
D2-250-1 and D2-262 only. Inverts the status of the rung at the point of the instruction.

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 (STRPD)
D2-250-1 and D2-262 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)
D2-250-1 and D2-262 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 (ORPD)
D2-250-1 and D2-262 only. Logically ORs a leading edge triggered one-shot contact in parallel with another contact in a rung.

Or Negative Differential (ORND)
D2-250-1 and D2-262 only. Logically ORs a trailing edge triggered one-shot contact in parallel with another contact in a rung.

And Positive Differential (ANDPD)
D2-250-1 and D2-262 only. Logically ANDs a leading edge triggered one-shot contact in series with another contact in a rung.

And Negative Differential (ANDND)
D2-250-1 and D2-262 only. Logically ANDs a trailing edge triggered one-shot contact in series with another contact in a rung.

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 instruction.

Reset (RST)
An output that resets a point or a range of points.

Set Bit-of-Word (SETB)
D2-250-1 and D2-262 only. Sets or turns on a bit in a V-memory location.

Reset Bit-of-Word (RSTB)
D2-250-1 and D2-262 only. Resets or turns off a bit in a V-memory location.

Pause outputs (PAUSE)
Disables the update for a range of specified output points.

Comparative Boolean Instructions

Store if Equal (STRE)
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 (STRNE)
Begins a new rung or additional branch in a rung with a normally closed comparative contact. The contact will be on when A is not equal to B.

Or if Equal (ORE)
Connects a normally open comparative contact in parallel with another contact. The contact will be on when A = B.

Or if Not Equal (ORNE)
Connects a normally closed comparative contact in parallel with another contact. The contact will be on when A is not equal to B.

And if Equal (ANDE)
Connects a normally open comparative contact in series with another contact. The contact will be on when A = B.

And if Not Equal (ANDNE)
Connects a normally closed comparative contact in series with another contact. The contact will be on when A is not equal to B.

Store (STR)
Begins a new rung or additional branch in a rung with a normally open comparative contact. The will be on when A ≥ B.

Store Not (STRN)
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 ≥ B.

Or Not (ORN)
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 ≥ B.

And Not < (ANDN)
Connects a normally closed comparative contact in parallel with another contact. The contact will be on when A < B.

Immediate Instruction

Store Immediate (STRI)
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 (STRNI)
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 (ORI)
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 (ORNI)
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 (ANDI)
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 (ANDNI)
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 (OUTI)
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 (OROUTI)
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.

Out Immediate Formatted (OUTIF)
D2-262 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.

Set Immediate (SETI)
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 (RSTI)
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)
D2-262 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)
D2-262 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.

Timer, Counter, and Shift Register Instructions

Timer (TMR)
Single input incremental timer with 0.1 second resolution (0-999.9 sec).

Fast Timer (TMRF)
Single input incremental timer with 0.01 second resolution (0-99.99 sec).

Accumulating Timer (TMRA)
Two input incremental timer with 0.1 second resolution (0-9,999,999.9 sec). Time and enable/reset inputs control the timer.

Accumulating Fast Timer (TMRAF)
Two input incremental timer with 0.1 second resolution (0-999,999.99 s). Time and enable/reset inputs control the timer.

Counter (CNT)
Two input incremental counter (0-9999). Count and reset inputs control the counter.

Stage Counter (SGCNT)
Single input incremental counter (0-9999) RST instruction must be used to reset count.

Up Down Counter (UDC)
Three input counter (0-99,999,999). 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/Stack Load and Output Data

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 Formatted (LDF)
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)
Specifies a source address (V-memory) which will be offset by the value in the first stack location.

Load Accumulator Indexed from Data Constants (LDSX)
D2-250-1 and D2-262 only. Specifies a Data Label Area (DLBL) where numerical or ASCII constants are stored.

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)
Outputs a specified number of bits (1-32) from the accumulator to the specified discrete memory locations.

Out Least (OUTL)
D2-262 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)
D2-262 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)
D2-250-1 and D2-262 only. 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.

Logical Instructions (Accumulator)

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 an 8-digit constant or a value in two consecutive V-memory locations.

And Formatted (ANDF)
D2-250-1 and D2-262 only. Logically ANDs the value in the accumulator and a specified range of discrete memory bits (1-32).

And with stack (ANDS)
D2-262 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 an 8-digit constant or a value in two consecutive V-memory locations.

Or Formatted (ORF)
D2-250-1 and D2-262 only. Logically ORs the value in the accumulator with a range of discrete bits (1-32).

Or with Stack (ORS)
D2-262 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 an 8-digit constant or a value in two consecutive V-memory locations.

Exclusive Or Formatted (XORF)
D2-250-1 and D2-262 only. Performs an exclusive or of the value in the accumulator and a range of discrete bits (1-32).

Exclusive Or with Stack (XORS)
D2-262 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)
D2-250-1 and D2-262 only. Compares the value in the accumulator with a specified number of discrete locations (1-32).

Compare with Stack (CMPS)
D2-262 only. Compares the value in the accumulator with the first accumulator stack location.

Compare Real Number (CMPR)
D2-250-1 and D2-262 only. Compares the real number in the accumulator with two consecutive V-memory locations or a real number constant.

DL205 Instruction Set

Math Instructions (Accumulator)

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 (ADDD)
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)
D2-250-1 and D2-262 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, which is either a V-memory location or a 4-digit constant 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 an 8-bit constant, from a value in the accumulator. The result resides in the accumulator.

Subtract Real Number (SUBR)
D2-250-1 and D2-262 only. Subtracts 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)
D2-250-1 and D2-262 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)
D2-250-1 and D2-262 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 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)
D2-250-1 and D2-262 only. Divides a BCD value in the accumulator by a BCD value which is either two consecutive V-memory locations or a 8-digit constant. The result resides in the accumulator.

Divides Real Number (DIVR)
D2-250-1 and D2-262 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.

Increment (INC)
D2-250-1 and D2-262 only. Increments a BCD value in a specified V-memory location by 1 each time the instruction is executed.

Decrement (DEC)
D2-250-1 and D2-262 only. Decrements a BCD value in a specified V-memory location by 1 each time the instruction is executed.

Add Binary (ADDB)
D2-250-1 and D2-262 only. 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.

Subtract Binary (SUBB)
D2-250-1 and D2-262 only. 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.

Multiply Binary (MULB)
D2-250-1 and D2-262 only. Multiples a 16-bit binary value, which is either a V-memory location or a 16-bit constant, by the lower 16 bits in the accumulator. The result resides in the accumulator.

Divide Binary (DIVB)
D2-250-1 and D2-262 only. 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.

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 Formatted (ADDF)
D2-262 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)
D2-262 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)
D2-262 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.

Divide Formatted (DIVF)
D2-262 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 (ADDS)
D2-262 only. 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 (SUBS)
D2-262 only. 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 (MULS)
D2-262 only. 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 (DIVS)
D2-262 only. Divides the 8-digit BCD value in the accumulator by the 4-digit value in the first level of 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 (ADDBS)
D2-262 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 (SUBBS)
D2-262 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 (MULBS)
D2-262 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 (DIVBS)
D2-262 only. Divides a value in the accumulator by the binary value in the top location of the stack. The accumulator contains the result.

Transcendental Instructions (D2-262 Only)

Square Root Real (SQRTR)
Takes the square root of the real number stored in the accumulator. The result resides in the accumulator.

Sine Real (SINR)
Takes the sine of the real number stored in the accumulator. The result resides in the accumulator.

Cosine Real (COSR)
Takes the cosine of the real number stored in the accumulator. The result resides in the accumulator.

Tangent Real (TANR)
Takes the tangent of the real number stored in the accumulator. The result resides in the accumulator.

ARC Sine Real (ASINR)
Takes the inverse sine of the real number stored in the accumulator. The result resides in the accumulator.

ARC Cosine Real (ACOSR)
Takes the inverse cosine of the real number stored in the accumulator. The result resides in the accumulator.

ARC Tangent Real (ATANR)
Takes the inverse tangent of the real number stored in the accumulator. The result resides in the accumulator.

Bit Instructions (Accumulator)

Sum (SUM)
D2-250-1 and D2-262 only. Counts the number of bits 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)
D2-250-1 and D2-262 only. Rotates the bits in the accumulator a specified number of places to the left.

Rotate Right (ROTR)
D2-250-1 and D2-262 only. Rotates the bits in the accumulator a specified number of places to the right.

Encode (ENCO)
Encodes the bit position set to 1 in the accumulator, and returns the appropriate binary representation in the accumulator.

Decodes (DECO)
Decodes a 5 bit binary value (0-31) in the accumulator by setting the appropriate bit position to a 1. If the accumulator contains the value F (HEX), bit 15 will be set in the accumulator. If the value to be decoded is greater than 31, the number is divided by 32 until the value is less than 32 and then the value is decoded.

Number Conversion Instructions (Accumulator)

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 10's complement (BCD) of the 8-digit accumulator.

ASCII to HEX (ATH)
D2-250-1 and D2-262 only. Converts a table of ASCII values to a table of hexadecimal values.

HEX to ASCII (HTA)
D2-250-1 and D2-262 only. Converts a table of hexadecimal values to a table of ASCII values.

Segment (SEG)
D2-250-1 and D2-262 only. Converts four digit HEX value in accumulator to seven segment display format.

Gray Code to BCD (GRAY)
D2-250-1 and D2-262 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)
D2-250-1 and D2-262 only. Shuffles a maximum of 8 digits, rearranging them in a specified order. The result resides in the accumulator.

Radian Real Conversion (RADR)
D2-262 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)
D2-262 only. Converts the real radian value in the accumulator to the equivalent real member of degrees. The result resides in the accumulator.

Binary to Real Number (BTOR)
D2-250-1 and D2-262 only. Converts the binary value in the accumulator into a real number. The result resides in the accumulator.

Real to Binary (RTOB)
D2-250-1 and D2-262 only. Converts the real number in the accumulator into a binary value. The result resides in the accumulator.

Table Instructions

Move (MOV)
Moves the values from one V-memory table to another V-memory table.

Move Memory Cartridge/Load Label (MOVMC/LDLBL)
Copies data between V memory and program ladder memory.

Set Bit (SETBIT)
D2-262 only. Sets a single bit (to a 0) in a V-memory location.

Reset Bit (RSTBIT)
D2-262 only. Resets a single bit (to a 0) in a V-memory location.

Extended Table Instructions (D2-262 Only)

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)
Finds a value in a V-memory table and returns the table position containing the value to the accumulator.

Find Greater Than (FDGT)
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)
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.

Table to Destination (TTD)
Moves the value form the top of a V-memory table to a specified V-memory location. The table pointer increments each scan.

Remove from Bottom (RFB)
Moves the value from the bottom of a V-memory table to a specified V-memory location. The table pointer increments each scan.

Source To Table (STT)
Moves a value from a specified V-memory location to a V-memory table. The table pointer increments each scan.

Remove from Top (RFT)
Pops a value from the top of a V-memory table and stores it in a specified V-memory location. All other values in the V-memory table are shifted up each time a value is popped from the table.

Add To Top of Table (ATT)
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)
Shifts s specified number of bits to the left in a V-memory table.

Table Shift Right (TSHFR)
Shifts a specified number of bits to the right in a V-memory table.

And Move (ANDMOV)
Copies data from a table to the specified location, ANDing each word with the accumulator data as it is written.

Or Move (ORMOV)
Copies data from a table to the specified memory location, ORing each word with the accumulator data as it is written.

Exclusive Or Move (XORMOV)
Copies data from a table to the specified memory location, XORing each word with the accumulator data as it is written.

Swap (SWAP)
Exchanges the data in two tables of equal length.

Clock/Calendar Instructions

Date (DATE)
D2-250-1 and D2-262 only. Use to set the date in the CPU.

Time (TIME)
D2-250-1 and D2-262 only. Use to set the time in the CPU.

CPU Control Instructions

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).

Reset Watchdog Timer (RSTWT)
D2-250-1 and D2-262 only. Resets the CPU watchdog timer.

DL205 Instruction Set

Program Control Instructions

Goto Label (GOTO) (LBL)
D2-250-1 and D2-262 only. Skips all instructions between the Goto and corresponding LBL instructions.

For/Next (FOR/NEXT)
D2-250-1 and D2-262 only. Executes the logic between the FOR and NEXT instructions a specified number of times.

Goto Subroutine (GTS/SBR/RT/RTC)
GTS, SBR, RT: D2-250-1 and D2-262 only.
RTC: D2-250-1 and D2-262 only.
When a GTS instruction is executed the program jumps to the SBR (Subroutine). The subroutine is terminated with a RT instruction (unconditional return). When a return is executed, the program continues from the instruction after the calling GTS instruction. The RTC (Subroutine return conditional) instruction is used with an input contact to implement a conditional return from the subroutine.

Client Line Set/Client 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 Instructions

Interrupt Routine/Interrupt Return/Interrupt Return Conditional (INT/IRT/IRTC)
INT, IRT: D2-250-1 and D2-262 only.
IRTC: D2-250-1 and D2-262 only.
When a hardware or software interrupt occurs, the interrupt routine will be executed. The INT instruction is the beginning of the interrupt routine. The interrupt routine is terminated with an IRT of the interrupt routine. The in interrupt routine is terminated with an IRT instruction (unconditional interrupt return). When a 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)
D2-250-1 and D2-262 only. Enables hardware and software interrupts to be acknowledged.

Disable Interrupt (DISI)
D2-250-1 and D2-262 only. Disables hardware and software interrupts from being acknowledged.

Intelligent I/O Instructions

Read from Intelligent Module (RD)
Reads a block of data from an intelligent I/O module into CPU's V-memory.

Write to Intelligent Module (WT)
Writes a block of data to an intelligent I/O module from a block of CPU's V-memory.

Message Instructions

Fault/Data Label (FAULT/DLBL)
FAULT: D2-250-1 and D2-262 only.
DLBL: All D2 CPUs.
Displays a V-memory value or a data label constant to the hand-held programmer or personal computer using *Direct*SOFT.

Numerical Constant/ASCII constant (NCON/ACON)
Stores constants in numerical or ASCII form for use with other instructions.

Print Message (PRINT)
D2-250-1 and D2-262 only.
Prints the embedded text or text/data variable message to the specified communications port. Maximum message length is 255 words.

Network Instructions

Read from network (RX)
D2-250-1 and D2-262 only. Reads a block of data from another CPU on the network.

Write to network (WX)
D2-250-1 and D2-262 only. Writes a block of data from the Client device to a Server device on the network.

Modbus Instructions (D2-262)

Modbus Read (MRS)
Used CPU port 2 to read a block of data from Modbus RTU devices on the network.

Modbus Write (MWX)
Writes a block of data from CPU port 2 to Modbus RTU devices on the network.

ASCII Instructions (D2-262)

ASCII IN (AIN)
Configures port 2 to read raw ASCII input strings.

ASCII Find (AFIND)
Searches ASCII strings in V-memory to find a specific portion of the string.

ASCII IN (AEX)
Extracts a specific portion from an ASCII string.

Compare V-memory (CMPV)
Compares two blocks of V-memory.

Swap Bytes (SWAPB)
Swaps V-memory bytes.

Print to V-memory (VPRINT)
Used to send pre-coded ASCII strings to a pre-defined V-memory address when enabled.

Print from V-memory (PRINTV)
Used to write raw ASCII string out of port 2 when enabled.

Drum Instructions (D2-250-1 and D2-262)

Tuned Drum with Discrete Outputs (DRUM)
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)
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 and Event Drum with Discrete Outputs and Output Mask (MDRMD)
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 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 present step as destination when reset occurs.

Time and Event Drum with Word Output and Output Mask (MDRMW)
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.

RLL^PLUS Programming Instructions

(D2-262)

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 power flow to the coil.

Converge Stages (CV)
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)
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)
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.

Here are some of the IBox Instructions available

The IBox instructions are available when using a
D2-250-1 CPU with firmware version 4.60 or later,
D2-262 CPU with firmware version 1.0 and a supporting version
of DirectSOFT.

IBox Instructions - Analog Helper

Analog Input/Output Combo Module Pointer Setup (ANLGCMB)
Generates the logic to configure the pointer method for an analog input/output combination module.

Analog Input Module Pointer Setup (ANLGIN)
Generates the logic to configure the pointer method for an analog input module.

Analog Output Module Pointer Setup (ANLGOUT)
Generates the logic to configure the pointer method for an analog output module.

Analog Scale 12-Bit BCD to BCD (ANSCL)
Scales a 12 bit BCD analog value (0-4095 BCD) into BCD engineering units. Only works with unipolar unsigned raw values.

Analog Scale 12-Bit Binary to Binary (ANSCLB)
Scales a 12 bit binary analog value (0-4095 decimal) into Binary engineering units. Only works with unipolar unsigned raw values.

Filter Over Time - BCD (FILTER)
Performs a first-order filter on the Raw Data on a defined time interval (BCD).

Filter Over Time - Binary (FILTERB)
Perform a first-order filter on the Raw Data on a defined time interval (binary).

Hi/Low Alarm - BCD (HILOAL)
Monitors a BCD value V memory location and sets four possible alarm states, High-High, High, Low, and Low-Low.

Hi/Low Alarm - Binary (HILOALB)
Monitors a binary (decimal) value V memory location and sets four possible alarm states, High-High, High, Low, and Low-Low.

IBox Instructions - Discrete Helper

Off Delay Timer - (OFFDTMR)
Delays the "turning off" of the Output parameter by the specified Off Delay Time (in hundredths of a second).

On Delay Timer - (ONDTMR)
Delays the "turning on" of the Output parameter by the specified amount of time (in hundredths of a second).

One Shot - (ONESHOT)
Turns on the given bit output parameter for one scan on an OFF to ON transition.

Push On / Push Off Circuit (PONOFF)
Toggles an output state whenever its input power flow transitions from off to on. Also known as a "flip-flop" circuit.

IBox Instructions - Memory

Move Single Word (MOVEW)
Moves (copies) a word to a memory location directly or indirectly via a pointer, either as a HEX constant, from a memory location, or indirectly through a pointer.

Move Double Word (MOVED)
Moves (copies) a double word to two consecutive memory locations directly or indirectly via a pointer, either as a double HEX constant, from a double memory location, or indirectly through a pointer to a double memory location.

IBox Instructions - Math

BCD to Real with Implied Decimal Point (BCDTOR)
Converts the given 4 digit WORD BCD value to a Real number, with the implied number of decimal points (K0-K4).

Double BCD to Real with Implied Decimal Point (BCDTORD)
Converts the given 8 digit DWORD BCD value to a Real number, given an implied number of decimal points (K0-K8).

Math - BCD (MATHBCD)
Allows entry of complex mathematical expressions like in Visual Basic, Excel, or C++ to do complex calculations, nesting parentheses up to 4 levels deep. Any V-memory reference MUST be to a single word BCD formatted value.

Math - Binary (MATHBIN)
Allows entry of complex mathematical expressions like in Visual Basic, Excel, or C++ to do complex calculations, nesting parentheses up to 4 levels deep. Every V-memory reference MUST be to a single word binary formatted value.

Math - Real (MATHR)
Allows entry of complex mathematical expressions like in Visual Basic, Excel, or C++ to do complex calculations, nesting parentheses up to 4 levels deep. Every V-memory reference MUST be able to fit into a double word Real formatted value.

Real to BCD with Implied Decimal Point and Rounding (RTOBCD)
Converts the absolute value of the given Real number to a 4 digit BCD number, compensating for an implied number of decimal points (K0-K4) and performs rounding.

Real to Double BCD with Implied Decimal Point and Rounding (RTOBCDD)
Converts the absolute value of the given Real number to an 8 digit DWORDBCD number, compensating for an implied number of decimal points (K0-K8) and performs rounding.

Square BCD (SQUARE)
Squares the given 4-digit WORD BCD number and writes it as an 8-digit DWORD BCD result.

Square Binary (SQUAREB)
Squares the given 16-bit WORD binary number and writes it as a 32-bit DWORD binary result.

Square Real (SQUARER)
Squares the given REAL DWORD number and writes it to a REAL DWORD result.

Sum BCD Numbers (SUMBCD)
Sums a list of consecutive 4-digit WORD BCD numbers into an 8-digit DWORD BCD result.

Sum Binary Numbers (SUMBIN)
Sums a list of consecutive 16-bit WORD binary numbers into a 32-bit DWORD binary result.

Sum Real Numbers (SUMR)
Sums a list of consecutive Real DWORD numbers into a Real DWORD result.

IBox Instructions - Communications

ECOM100 Configuration (ECOM100)
Defines the common information for a specific ECOM100 module which is used by the other ECOM100 IBoxes and resides at the top of the ladder/stage program. If using more than one ECOM100 in a PLC system, a different ECOM100 Configuration IBox must be used for each ECOM100 module that utilizes ECOM IBox instructions.

ECOM100 Disable DHCP (ECDHCPD)
Commands the ECOM100 to use its internal TCP/IP settings.

ECOM100 Enable DHCP (ECDHCPE)
Commands the ECOM100 to obtain its TCP/IP settings from a DHCP server.

ECOM100 Query DHCP Setting (ECDHCPQ)
Determines if DHCP is enabled in the ECOM100.

ECOM100 Send E-mail (ECEMAIL)
Allows the ECOM100 to behave as an EMail client to send an SMTP request to the SMTP Server for sending the EMail messages to EMail addresses in the To: field and also to those listed in the Cc: list hard coded in the ECOM100. Messages are limited to 100 characters for the entire instruction.

ECOM100 Restore Default E-mail Setup (ECEMRDS)
Restores the original EMail Setup data stored in the ECOM100 back to the working copy based on the specified ECOM100#.

ECOM100 E-mail Setup (ECEMSUP)
Modifies the working copy of the EMail setup currently in the ECOM100 based on the specified ECOM100#. You may pick and choose any or all fields to be modified using this instruction.

ECOM100 IP Setup (ECIPSUP)
Configures the three TCP/IP parameters in the ECOM100: IP Address, Subnet Mask and Gateway Address.

ECOM100 Read Description (ECRDDES)
Reads the ECOM100's Description field up to the number of specified characters.

ECOM100 Read Gateway Address (ECRDGWA)
Reads the ECOM100's Gateway address and stores it in 4 consecutive V memory locations in decimal format.

ECOM100 Read IP Address (ECRDIP)
Reads the ECOM100's IP address and stores it 4 consecutive V memory locations in decimal format.

ECOM100 Read Module ID (ECRDMID)
Reads the ECOM100's binary (decimal) WORD sized Module ID and stores it in V memory.

ECOM100 Read Module Name (ECRDNAM)
Reads the ECOM100's Module Name up to the number of specified characters and stores it in V memory.

ECOM100 Read Subnet Mask (ECRDSNM)
Reads the ECOM100's Subnet Mask address and stores it 4 consecutive V memory locations in decimal format.

ECOM100 Write Description (ECWRDES)
Writes the specified Description to the ECOM100 module.

ECOM100 Write Gateway Address (ECWRGWA)
Writes the specified Gateway IP Address to the ECOM100 module.

ECOM100 Write IP Address (ECWRIP)
Writes the specified IP Address to the ECOM100 module.

ECOM100 Write Module ID (ECWRMID)
Writes the specified Module ID to the ECOM100 module.

ECOM100 Write Name (ECWRNAM)
Writes the specified Name to the ECOM100 module.

ECOM100 Write Subnet Mask (ECWRSNM)
Writes the specified Subnet Mask to the ECOM100 module.

ECOM100 RX Network Read (ECRX)
Performs the RX instruction with built-in interlocking with all other ECOM100 RX (ECRX) and ECOM100 WX (ECWX) IBoxes in your program to simplify communications networking.

ECOM100 WX Network Write (ECWX)
Performs the WX instruction with built-in interlocking with all other ECOM100 RX (ECRX) and ECOM100 WX (ECWX) IBoxes in your program to simplify communications networking.

NETCFG Network Configuration (NETCFG)
Defines all the common information necessary for performing RX/WX Networking using the NETRX and NETWX IBox instructions via a local CPU serial port, DCM or ECOM module.

Network RX Read (NETRX)
Performs the RX instruction with built-in interlocking with all other Network RX (NETRX) and Network WX (NETWX) IBoxes in your program to simplify communications networking.

Network WX Read (NETWX)
Performs the WX instruction with built-in interlocking with all other Network RX (NETRX) and Network WX (NETWX) IBoxes in your program to simplify communications networking.

IBox Instructions - Counter I/O

CTRIO Configuration (CTRIO)
Defines the common information for a specific CTRIO module which is used by the other CTRIO IBox instructions and resides at the top of the ladder/stage program. If using more than one CTRIO module in a PLC system, a different CTRIO Configuration IBox must be used for each CTRIO module that utilizes any CTRIO IBox instructions.

CTRIO Add Entry to End of Preset Table (CTRADPT)
Appends an entry to the end of a memory based Preset Table on a specific CTRIO Output resource. Will take more than 1 PLC scan to execute.

CTRIO Clear Preset Table (CTRCLRT)
Clears the RAM based Preset Table on a leading edge transition to this IBox. Will take more than 1 PLC scan to execute.

CTRIO Edit Preset Table Entry (CTREDPT)
Edits a single entry in a Preset Table on a specific CTRIO Output resource. Will take more than 1 PLC scan to execute.

CTRIO Edit Preset Table Entry and Reload (CTREDRL)
Performs dual operation to a CTRIO Output resource in one CTRIO command. Will take more than 1 PLC scan to execute.

CTRIO Initialize Preset Table (CTRINPT)
Creates a single entry Preset Table in memory but not as a file, on a specific CTRIO Output resource. Will take more than 1 PLC scan to execute.

CTRIO Initialize Preset Table on Reset (CTRINTR)
Configures the initial Preset Table to be automatically loaded whenever the Reset event occurs on a specific Output resource. Will take more than 1 PLC scan to execute.

CTRIO Load Profile (CTRLDPR)
Loads a CTRIO Profile File to a CTRIO Output resource on a leading edge transition to this IBox. Will take more than 1 PLC scan to execute.

CTRIO Read Error (CTRRDER)
Gets the decimal error code value from the CTRIO module and places it into the specified Error Code register. Since the Error Code in the CTRIO is only maintained until another CTRIO command is given, this instruction must be used immediately after the CTRIO IBox that reports an error via its Error bit parameter.

CTRIO Run to Limit Mode (CTRRTLM)
Loads the Run to Limit command and given parameters on a specific Output resource. The CTRIO's Input(s) must be configured as Limit(s) for this function to operate. Will take more than 1 PLC scan to execute.

CTRIO Run to Position Mode (CTRRTPM)
Loads the Run to Position command and given parameters on a specific Output resource. Will take more than 1 PLC scan to execute.

CTRIO Velocity Mode (CTRVELO)
Loads the Velocity command and given parameters on a specific Output resource. Will take more than 1 PLC scan to execute.

CTRIO Write File to ROM (CTRWFTR)
Writes the runtime changes made to a loaded CTRIO Preset Table back to Flash ROM. Will take more than 1 PLC scan to execute.