CLICK PLCs
Section 2

DL05/06 PLC
Section 3

DL105 PLC
Section 4

DL205 PLC
Section 5
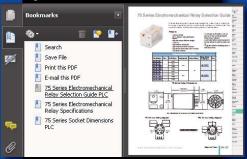
DL305 PLC
Section 6

DL405 PLC
Section 7

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- 75 Series Socket Dimensions PLC

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- **Click on part #s to link directly to our online store for current pricing, specs, stocking information and more**

DL205 - Most Cost-effective Micro Modular PLC Available

Two counting/pulse output modules

D2-CTRINT supports two 5 kHz counters or one quadrature input or one 5 kHz output. One module only per system.

H2-CTRIO supports four 100 kHz counters or two quadrature inputs with two 25 kHz pulse train outputs. Multiple modules allowable.

What is it?

The DL205 series PLC is a micro modular PLC that allows you to drastically lower your control system cost. This PLC has the necessary specifications to replace PLCs costing two to three times as much. Check out our prices and see for yourself!

What's it got?

The DL205 offers CPUs that provide a wide range of power and features while minimizing cost. For instance, our most advanced CPU, the D2-260, offers 30.4K of total memory (15.8K of program memory) and can support up to 16,384 I/O points. The D2-260 has two built-in communication ports that, depending on the specifications of each, can support devices such as HMIs, serial networks, remote I/O and ASCII devices. Its 280+ RLL (Relay Ladder Logic) and new *IBox* instructions give it the ability to be part of a large and powerful control system with a price that meets a tiny budget! Four base sizes with built-in power supply support 12/24 VDC, 110/220 VAC and 125 VDC (6 and 9 slot only) power sources.

Over 35 powerful I/O and communication modules are available from deiscrete and analog to high-speed counter and Ethernet modules.

Related products include:

- Industrial DIN-rail mountable telephone modem and an industrial DIN-rail mountable Ethernet hub/switch
- ZIPLink connector modules - relay, fuse and LED options (See Terminal Blocks & Wiring section.)
- Connectivity to *Sure*Servo and *Sure*Step motion products

Relay ladder logic CPUs

Windows®CE based CPUs

DL205 CPUs

Four RLL (Relay Ladder Logic based) CPUs

D2-230 - 2.4K memory, maximum 256 I/O
D2-240 - 3.8K memory, maximum 896 I/O
D2-250-1 - 14.8K memory, maximum 2048 I/O
D2-260 - 30.4K memory, maximum 8192 I/O

Windows CE-based CPU for Think & Do

H2-WPLC3-EN - 100 MHz CPU with 8 MB ROM/ 8 MB RAM

Discrete input/ output modules

DC Input Modules

D2-08ND3	8-pt. 12-24V sink/source	
D2-16ND3-2	16-pt. 24V sink/source	
D2-32ND3-2	32-pt. 5-15V sink/source	
D2-32ND3	32-pt. 24V sink/source	

32 pt module with optional ZIPLink wiring system

AC input modules

D2-08NA-1	8-pt. 110VAC
D2-08NA-2	8-pt. 220VAC
D2-16NA	16-pt. 110VAC

DC output modules

D2-04TD1	4-pt. 12-24V sink, 4A/pt
D2-08TD1	8-pt. 12-24V sink
D2-08TD2	8-pt. 12-24V source
D2-16TD1-2	16-pt. 12-24V sink
D2-16TD2-2	16-pt. 12-24V source
F2-16TD1P	16-pt. 12-24 VDC sink
F2-16TD2P	16-pt. 12-24 VDC source
D2-32TD1	32-pt. 12-24V sink
D2-32TD2	32-pt. 12-24V source

16 pt module with removable terminal block

AC output modules

D2-08TA	8-pt. 18-220VAC
F2-08TA	8-pt. 20-125VAC, high current
D2-12TA	12-pt. 18-110VAC

Relay output modules

D2-04TRS	4-pt. 4A/pt. 8A/module
D2-08TR	8-pt. 1A/pt. 4A/module
F2-08TR	8-pt. 8 form A, 10A/common
F2-08TRS	8-pt. 5 form A, 3 form C, 7A/pt
D2-12TR	12-pt. 12 form A, 1.5A/pt

Removable fuses

Combination

D2-08CDR	4-pt. DC in, 4-pt. relay out

Analog and Temperature modules

Wide range of low cost analog and thermocouple modules

Analog input modules

F2-04AD-1	4-ch. 4-20mA
F2-04AD-2	4-ch. 0-5V, 0-10V, -5 to +5V, -10 to +10V
F2-04AD-1L	4-ch. 4-20mA (uses 12VDC supply)
F2-04AD-2L	4-ch. 0-5V, 0-10V, -5 to +5V, -10 to +10V (uses 12VDC supply)
F2-08AD-1	8-ch. 4-20mA
F2-08AD-2	8-ch. 0-5V, 0-10V, -5 to +5V, -10 to +10V

Analog output modules

F2-02DA-1	2-ch. 4-20mA
F2-02DA-2	2-ch. 0-5V, 0-10V, -5 to +5V, -10 to +10V
F2-02DA-1L	2-ch. 4-20mA (12VDC supply)
F2-02DA-2L	2-ch. 0-5V, 0-10V, -5 to +5V, -10 to +10V (uses 12VDC supply)
F2-02DAS-1	2-ch. 4-20mA, 16-bit isolated
F2-02DAS-2	2-ch. 0-5V, 0-10V 16-bit isolated

F2-08DA-1	8-ch. 4-20mA, sink/source selectable
F2-08DA-2	8-ch. 0-5V, 0-10V

Combination analog

F2-4AD2DA	4-ch. in/2-ch. out 4-20mA
F2-8AD4DA-1	8-ch. in/4-ch. out 4-20mA
F2-8AD4DA-2	8-ch. in/4-ch. out 0-5V, 0-10V

Temperature

F2-04RTD	4-ch. RTD input 0.15C resolution
F2-04THM	4-ch. 16-bit thermocouple and millivolt

Communication modules

Ethernet	H2-ECOM Master/Slave Ethernet 10Base-T or H2-ECOM100 Ethernet 100Base-T
Ethernet Fiber	H2-ECOM-F Master/Slave Ethernet 10Base-FL
DeviceNet	F2-DEVNETS-1 - DeviceNet Base Controller (Slave)
Profibus	H2-PBC - Profibus Base Controller (Slave)
SDS	F2-SDS-1 - Smart Distributed System Base Controller (Slave)
Serial/Modbus	D2-DCM - RS-232/422 *DirectN*ET master/slave, Modbus RTU slave
CoProcessor	F2-CP128 - BASIC Comm. CoProcessor, 3 ports, 128K memory, RS-232/422/485 master/slave

Expansion I/O - Add up to four DL205 bases of expansion I/O to the D2-260 CPU or up to two bases for D2-250-1. It's deterministic and low cost.

Ethernet Remote I/O - Use a 10 Mbit Ethernet Remote Master module (H2-ERM) in a local DL205 base and add up to 16 bases of DL205 I/O, 16 Terminator I/O systems or four DL405 local I/O systems (with Ethernet Base Controllers).

Remote I/O - Use one or more D2-RMSM remote I/O masters in a local DL205 base and connect up to seven remote DL205 bases on each (with D2-RSSS in slave). The bottom port of the D2-250(-1) and D2-260 CPUs can also act as a remote I/O master.

Four base sizes

3-slot base

D2-03B-1 110/220 VAC
D2-03BDC1-1 12/24 VDC

4-slot base

D2-04B-1 110/220 VAC
D2-04BDC1-1 12/24 VDC

6-slot base

D2-06B-1 110/220 VAC
D2-06BDC1-1 12/24 VDC
D2-06BDC2-1 125 VDC

9-slot base

D2-09B-1 110/220 VAC
D2-09BDC1-1 12/24 VDC
D2-09BDC2-1 125 VDC

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

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DL205: 11 Reasons Why This Is The Most Practical PLC Money Can Buy!

DirectSOFT5

1 2-for-1 prices

Check out our prices on everything from I/O modules to CPUs and you'll see that our everyday list prices are among the lowest in the industry. For instance, you can buy two of our D2-260 systems for the price of one of Allen-Bradley's CompactLogix CPUs. Will that help your budget?

2 Practical built-in communication includes easy-to-use ASCII instructions

Our D2-260 CPU offers two built-in communication ports. The top port supports programming and operator inter-faces. The bottom port supports the same, as well as ASCII input and output (bar code readers, label printers, scales, servo drives), Modbus RTU master/slave, and Remote I/O master. All that just in the CPU!

3 Practical communication

Many communication modules are available for DL205 PLCs, including Ethernet, DeviceNet, Profibus, and a general purpose serial communi-cation module that supports HMIs, program-ming, operator panels, Modbus RTU slave and *Direct*NET slave.

Loop faceplates provide a quick look at several loops

Trend for variou Including SP, P

Auto-tune can elimin frustration of trying to t

CPU Counter Pulse Analog Relay A

D2-260 CPU
Communicate to ASCII devices from the bottom CPU port

4 Practical counting/pulse

Our high-speed counter module (H2-CTRIO) has four independ-ently configurable timer/counter channels (up to 100 kHz) and two pulse output generators (up to 25 kHz). The easy-to-use configuration tool is included in our PLC programming software, so it's a snap to integrate with your other application logic. For counting on a shoestring budget, the 2-CTRINT module offers two 5 kHz counters, one up/down counter, or a variable pulse train output.

5 Programming software includes auto-tune PID

Program the DL205 family of PLCs with *Direct*SOFT5. Customers tell us that it's one of the easiest PLC programming packages to use!

- Point and click or function key editing
- Can use nicknames or data points for writing programs
- I/O cross reference and element usage windows for keeping track of addresses used

The D2-260 CPU has over 280 instructions, including:

- New *IBox* pre-programmed function blocks
- Floating-point math
- Time and event-based drum sequencers
- ASCII input or output
- Timed and hardware triggered subroutines

*Direct*SOFT5

Auto-tune PID

Some of the traditional PLC companies require a separate ladder program for each PID loop and for loop scheduling. We make it automatic. Get up and running faster!

- Fill out a chart for alarms and ramp/soak
- Automatic loop scheduling
- Programming software includes the loop tune screen with trending (shown to the left)
- Loop auto-tuning, which allows the CPU to automatically determine the near-optimum loop settings

Ethernet to other control systems and business systems networks

6 Expansion I/O

In addition to remote I/O and Ethernet remote I/O, the DL205 family supports local expansion I/O! Up to four DL205 bases can be connected (30 meters total) to a local base that contains a D2-260 CPU (two expansion bases with a D2-250-1 CPU). With expansion I/O, all bases are updated synchronously with each I/O scan for a deterministic system.

Local Expansion

7 Super flexible coprocessor module

Create custom BASIC programs to interface to barcode readers, VF drives or other intelligent ASCII devices. The module comes with 128K memory, 26 MHz CPU and three independent communication ports.

8 Practical low-cost analog

Do you need up to 16-bit resolution, up to eight channels of input or output, combination, RTD or thermocouple modules? We've got it all! And many of our modules have selectable unipolar or bipolar voltage range options (0-5V, 0-10V, ±5V or ±10V) too.

9 High current modules

We offer a wide range of high current relay modules that can support up to 10A per point.

10 Practical temperature sensing

The DL205 series features a four-channel thermocouple module (F2-04THM) that is jumper-configurable for the nine most popular thermocouple types, as well as four common voltage ranges.

Numerous DL205 modules can be used with our *ZIP*Link connection systems. Connect even 32-point modules in seconds!

11 Practical high-density modules and ZipLink connections

DL205 I/O modules offer a wide range of points per module including 4-pt., 8-pt., 12-pt., 16-pt. and 32-pt. modules. To help you wire them fast and inexpensively, we offer *ZIP*Link quick connection cables and terminal blocks that allow you to connect the PLC I/O modules to terminal blocks in seconds. These easily pay for themselves by reducing wiring costs. We also offer relay, fused and LED *ZIP*Link modules. For information on our 5-second wiring solution, see *ZIP*Links in the **Terminal Blocks and Wiring** section.

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

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DL205 - Great Fit For On/Off Sequential Control

1 2-for-1 prices on I/O

Our I/O prices are incredibly low. You can often buy three of our modules for the price of a single Allen-Bradley CompactLogix module! This gives the DL205 a cost advantage on small I/O systems as well as large systems. Over 19 discrete modules are available on the DL205 system, ranging from 4-point modules to 32-point densities.

-
-
-
-
-

2 Practical built-in communications now includes ASCII in and out

The D2-260 CPU offers two built-in communication ports. Connect a text panel or touch panel to one port and a bar code reader or scale to the second port, or use any supported protocol for PLC networking.

3 Expands from 8 I/O to 8,000 I/O

The DL205 PLC family is highly expandable. It offers four base sizes that can be connected via local expansion I/O, serial remote I/O and Ethernet remote I/O to create a system as large as 8,192 I/O addressed by a single D2-260 CPU.
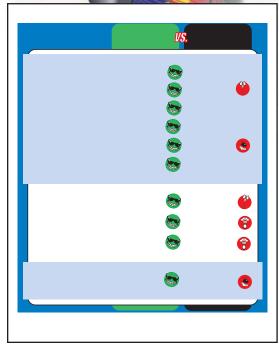
D2-260 CPU
Communicate to ASCII devices from the bottom CPU port

4 Locate I/O anywhere

Reduce your wiring cost by locating I/O near your field devices. Up to four expansion bases of I/O (all synchronously updated each scan) can be placed 30 meters (total run) from the local base. High speed 10baseT Ethernet bases (H2-EBC) can each be located up to 100 meters from a local base with an Ethernet Remote Master module (H2-ERM). Fiber optic versions of these Ethernet modules allow this distance to be increased to 2,000 meters.

Serial remote I/O bases can be located up to 1,200 meters (at 19.2K baud) from the local base.

DirectSOFT5

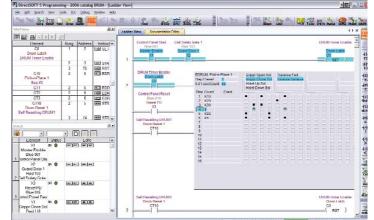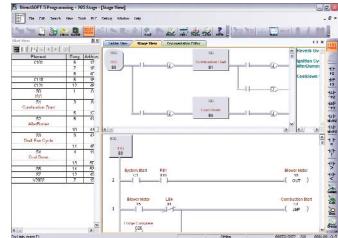## 5 Great sequential instructions

Think of our drum instruction as a software emulation of a mechanical cam switch or a programmable limit switch. The rotation (steps) of the drum is controlled by time or events (inputs or control relays). As the drum sequences through the steps in your application, up to 16 preconfigured outputs/control relays change state. Drums are an efficient way to program sequential operations and our drums are made super easy to program with point and click editing.

DL205 drum timer instruction

6 RLL, *IBox* and RLL+ Programming

Our Relay Ladder Logic (RLL) incorporates *IBoxes*, intelligent modularized instructions, that perform simple to complex ladder logic. RLL +, or "stage" programming, incorporates instructions that allow you to break your program into "stages" or states of a flow chart. Stage may also help reduce your memory requirements and scan time.

Stage programming combines RLL instructions with flow chart thinking.

Traditional Wiring **VS.** **ZIPLink™ Wiring**

For more information on our "5-second wiring solution", check out the Terminal Blocks and Wiring section.

7 High-density modules save space and money, and can be wired in seconds using *ZIP*Links

The DL205 modules offer a variety of I/O density from four I/O points per module up to 32 I/O points per module. These modules are small and can get cramped when wiring. So we developed a very low cost and fast way to wire them using *ZIP*Links. *ZIP*Link products include terminal block, feedthrough terminals, relay terminals, fuse terminals and LED terminals (good for high density inputs).

this module can be used with
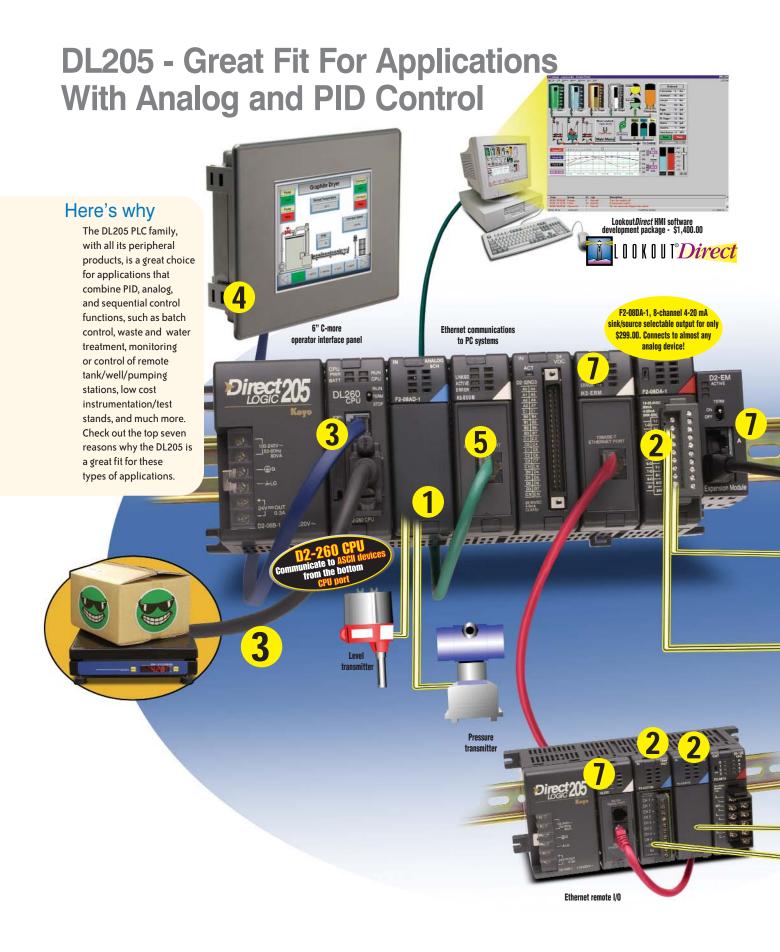
ZIPLINK CONNECTION SYSTEMS

Want to save wiring time?
Look for this symbol. Numerous DL205 modules can be used with our *ZIP*Link connection systems for easy 5-second wiring solutions!

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

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DL205 - Great Fit For Applications With Analog and PID Control

LookoutDirect HMI software development package - $1,400.00

Here's why

The DL205 PLC family, with all its peripheral products, is a great choice for applications that combine PID, analog, and sequential control functions, such as batch control, waste and water treatment, monitoring or control of remote tank/well/pumping stations, low cost instrumentation/test stands, and much more. Check out the top seven reasons why the DL205 is a great fit for these types of applications.

F2-08DA-1, 8-channel 4-20 mA sink/source selectable output for only $299.00. Connects to almost any analog device!

6" C-more operator interface panel

Ethernet communications to PC systems

D2-260 CPU
Communicate to ASCII devices from the bottom CPU port

Level transmitter

Pressure transmitter

Ethernet remote I/O

DirectSOFT5

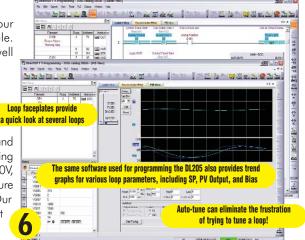**Auto-tune PID and RLL in one simple-to-use programming package**

1 2-for-1 prices on analog I/O

Our analog I/O prices are incredibly low. Often, you can buy two of our modules for the price of a single Allen-Bradley CompactLogix module. This allows the DL205 to be cost advantaged on small I/O systems as well as large systems.

2 Analog and temperature modules connect to almost any device.

The DL205 offers many analog modules, including thermocouple (16-bit) and RTD (16-bit). Our modules support an incredible range of signals including 4-20 mA (sinking and sourcing), 0-5V, 0-10V, -5V to +5V, and -10V to +10V, allowing the DL205 PLC to connect to almost any device including pressure transmitters, proportional valves, AC drives, panel meters and more. Our 16-bit thermocouple module can also be configured to measure 16-bit input signals of -5 VDC to +5 VDC, 0-156 mv, -156 mv to +156 mv.

Loop faceplates provide a quick look at several loops

The same software used for programming the DL205 also provides trend graphs for various loop parameters, including SP, PV Output, and Bias

Auto-tune can eliminate the frustration of trying to tune a loop!

For more information on *Direct*SOFT PLC programming software, see the Software section.

3 Built-in operator interface connectivity, device networking, and ASCII communications

The D2-250-1 and D2-260 offer two built-in communication ports. Connect a text panel or touch panel to one port and a bar code reader or scale to the second port. The bottom port also supports networking protocols such as *Direct*NET and Modbus RTU master/slave.

4 *C-more* panels for a low cost window into your application

Our *C-more* panels have some great features for process applications. Key features include Factory symbol library (2,000 bit mapped graphical symbols), PID faceplates, recipe download objects, meters, trend graphs, bar graphs, thumbwheel switch objects, data logging and more.

Variable frequency drive controlled mixer

Valve positioner transmitter

Expansion I/O

5 Ethernet supports high end computer systems

Need to connect to a high speed HMI or computer system? We offer 10Base-T and fiber optic Ethernet communication modules. The H2-ECOM is priced at $285.00 and the fiber optic version H2-ECOM-F is only $355.00. Or get 100 Mbit speed with the H2-ECOM100 for only $299.00.

RTD

6 Built-in PID with auto-tune

The D2-260 with 16 built-in PID loops, and D2-250-1 with four built-in PID loops, allow you to do PID control with ease. Some of the traditional PLC companies require a separate ladder program for each loop and for loop scheduling. We made it automatic! Key features include: fill-in chart for alarms and ramp/soak and automatic loop scheduling. The loop tune and trend software is included in our *Direct*SOFT programming package. The loop auto-tuning allows the CPU to automatically determine the near optimum loop settings.

Thermocouple

7 Locate I/O anywhere

Reduce your wiring cost by putting the I/O next to thermocouples, sensors and other field devices by using expansion bases, remote bases, Ethernet remote bases and even fiber optic remote bases. Our analog and temperature modules work in all of these configurations.

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

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DL205 - Great Fit For Communication-Intensive Applications

Here's why

The DL205 PLC family offers incredible connectivity options for a micro PLC, making it suitable for almost any communication-intensive application. Check out the top six reasons why the DL205 is a great fit for these types of applications:

❶ Built-in communications to operator interfaces, PLC networking, and more

The D2-250-1 and D2-260 CPUs offer two built-in communication ports that support a wide array of devices. The top port supports programming and operator interfaces. The bottom port on the D2-260 supports RS-232/422/485 networking, along with ASCII in/out, Remote I/O master and Modbus RTU master/slave. (If using D2-260 CPU you can connect this port directly to our GS series drives!)

❷ Telephone modem support

AUTOMATIONDIRECT offers an industrial telephone modem (MDM-TEL) that allows access to PLC data and programs via a telephone line. The rugged industrial telephone modem mounts on a DIN-rail and easily connects to our PLCs. Connecting telephone modems to PLCs can be tricky, but this industrial telephone modem can be hooked up in seconds. The modem allows for remote PLC programming (use our *Direct*SOFT programming package over the phone), long distance PLC-to-PLC communications, and PLC data reporting to a PC HMI.

The modem and PLC can replace a high-cost packaged Remote Telemetry Unit (RTU) that may already be using a high-priced PLC as its brain. It can also be used for PLC to PLC dialing triggered by a PLC output. Saves money on service calls, data acquisition and up-and-down time reporting.

❸ Custom communication built by you

The F2-CP128 is a universal communication CoProcessor module. Create custom BASIC programs to interface to barcode readers, VF drives, or other intelligent devices with various protocols. (Write your own driver to a unique serial device.) Comes with 128K memory, 26 MHz CPU and three independent communication ports. Two ports support master/slave RS-232/422/485 and the third supports RS-232.

Complex ASCII devices

❹ Built-in ASCII

The D2-260 CPU supports ASCII input and ASCII output. We designed powerful fill-in-the-blank instructions that are used within your RLL program to allow easy communication to or from ASCII devices.

Industrial DIN-rail mount telephone modem (MDM-TEL)

Program, troubleshoot or collect data over the telephone line via industrial modem!

Built-in RS-232/422/485 port supports modems, Modbus RTU to drives, operator interface, or ASCII in/out for scales, etc. (one device per port)

D2-DCM general purpose RS-232/R supports DirectNET, Modbus RTU slave p

D2-260 CPU Communicate to ASCII devices from the bottom CPU port

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

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❺ Industrial Ethernet switch/hub for more deterministic communications

You can use most off-the-shelf Ethernet hubs or switches with our Ethernet communication products. However, we wanted to offer an industrial Ethernet switch that would make your communications easy to set up and extremely reliable. This hub/switch (E-SW05U) is DIN-rail mountable, and powered by 24 VDC. Use it to connect our DL205, DL405 or Terminator I/O and our GS1 and GS2 drives via our Ethernet drive card (GS-EDRV), all on the same network.

405 I/O with Ethernet base controller

205 I/O with Ethernet base controller

Terminator I/O with Ethernet base controller

AutomationDirect GS2 VFD with Ethernet communication card

Drives, servos, etc.

H2-ECOM Ethernet Communication

H2-ERM Ethernet remote master

Industrial DIN-rail mount Ethernet Switch (E-SW05U)

F2-CP128 Communication CoProcessor ($349.00)

RS422 port protocols

Program DL205 PLCs and C-more panels over an Ethernet network!

PC connected via Ethernet

Multiple C-more panels on Ethernet network

❻ Ethernet communications for touch panels and PLCs

Have you ever wanted to program multiple PLCs and touch panels over Ethernet, or have multiple touch panels connected to a single PLC? Not a problem. Use our general purpose H2-ECOM module in the DL205 base and connect it to multiple *C-more* panels, along with a PC with *Direct*SOFT, via a standard off-the-shelf Ethernet hub! And for super-high speed peer communications between PLCs or to a PC, use the H2-ECOM100 for 100 Mbit rates.

DL205 - Great Fit For Simple Data Acquisition and Supervisory Control

Here's why

The DL205 PLC family, along with our other value packed products, gives you the components to build powerful and cost-effective data acquisition with supervisory control systems. These can range from a handful of I/O points to thousands of I/O points.

3-for-1 prices makes the DL205 the low price winner ❶

Data acquisition systems often require many data points to be collected. This may include dozens, hundreds or perhaps thousands of discrete, analog or temperature inputs. This type of system can be extremely expensive with traditional PLCs or SCADA (Supervisory Control and Data Acquisition) systems. Previous pages describe how you can often buy two or three DL205 I/O modules (discrete and analog) for the price of one module from some traditional suppliers. Add our DataWorx data acquisition software and you can afford to do more when using AUTOMATIONDIRECT.
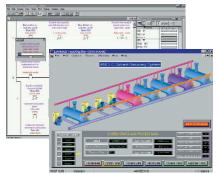
High-speed, low-cost Ethernet connects I/0 and VFDs ❷

The DL205 supports a wide range of Ethernet-based products for connecting additional field I/O (our Terminator I/O, DL205 I/O, DL405 I/O) or even variable speed drives to your monitoring or control system! All of our Ethernet products are priced so you can take advantage of Ethernet for almost any application.

Program our PLCs and touch panels over Ethernet ❸

Our DL205, DL405 systems and *C-more* panels can be programmed over an Ethernet network with the same low cost software that you buy every day from AUTOMATIONDIRECT to program non-networked PLC systems and touch panels.

Directsoft RLL programming and PC-based HMI (such as LookoutDirect) over Ethernet to multiple PLCs

High-speed Ethernet links PLC systems to a supervisory system ❹

Use off-the-shelf Ethernet hubs to communicate between multiple PLCs (peer-to-peer between PLCs) and a supervisory system. You can also communicate among our PLCs that support Ethernet. We even offer a DIN-rail mount, industrial high-performance Ethernet hub/switch for very strict deterministic requirements. Now that's cost-effective distributed control!

AutomationDirect industrial Ethernet hub/switch Part # E-SW05U $272.00 (or use any off-the-shelf hub)

Ethernet interface GS-EDRV ($200.00)

Connect our GS family of VFDs to a PLC via Ethernet

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

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A base of DL205 I/O on DeviceNet via DeviceNet Base Controller module F2-DEVNETS-1

Devicenet

Profibus

Ethernet/Profibus/DeviceNet Supervisory Master PC

A base of DL205 I/O on Profibus via Profibus Base Controller module (H2-PBC)

Low cost DeviceNet and Profibus slaves ⑤

Many I/O systems are required to support traditionally high-cost DeviceNet and Profibus networks. Now you can beat these often artificially inflated prices with one of our DeviceNet or Profibus slave modules in the CPU slot of a DL205 base. This allows you to attach our wide variety of low-cost I/O systems to new and existing DeviceNet and Profibus networks.

Locate operator panels anywhere ⑥

Multiple serial communication ports available on our PLCs allow you to locate operator panels near the operator.

10" C-more

Ethernet

Local Expansion

up to 30 meters

6" C-more

Locate I/O anywhere ⑦

Reduce your wiring cost by placing I/O near your field devices. Up to four expansion bases of I/O (all synchronously updated each scan) can be placed up to 30 meters from the PLC CPU base. High-speed 10Base-T Ethernet bases (H2-EBC) can be located up to 100 meters from a local base with an Ethernet remote master module (H2-ERM). Fiber optic versions of these Ethernet modules allow this distance to be increased to 2,000 meters. Serial remote I/O bases can be located up to 1,200 meters (at 19.2 Kbaud) from the local base. All of these remote bases support the DL205's discrete, analog and temperature modules.

Locate I/O 2,000 meters from CPU base with fiber optic Ethernet products!

up to 30 meters

DL205 - Great Fit For Applications That Need Counting and/or Pulse Output

Here's why

The DL205 PLC family offers two different modules for applications that require counting and pulse output features. Read on to see which module best fits your application needs

The D2-CTRINT offers:

One 5 kHz up/down counter or quadrature input

Phase A

Phase B

or two 5 kHz counters

or one 5 kHz pulse output to a stepper or servo drive

Counting or pulse output

Simple but sweet!

The DL205 counter interface module (D2-CTRINT) is a great way perform basic counting or pulse output with a DL205 system. Basically, this is a discrete I/O module that counts or generates pulse and has been designed into the DL205 CPUs, hence the name Counter Interface. The D2-CTRINT can be configured to perform any one of the following operations:

- Quadrature encoder input for clockwise and counter-clockwise position
- Two, 5 kHz high-speed counters
- Programmable pulse output with external interrupts and separate acceleration and deceleration profiles for positioning and velocity control (5K pulses max per second)
- Four external interrupt inputs for immediate responses to tasks
- Pulse catch feature allowing the CPU to read four inputs, each having a pulse width as small as 5 μsec
- Programmable filters for reading up to 4 input signals to ensure input signal integrity

Limitations: There are some limitations. Most often, this module can be used for only one of the functions listed. It cannot use the pulse output and counter features together for closed loop control. Some features are not available when used with certain DL205 CPUs. Only one D2-CTRINT module can be used per system and it must be placed in the I/O slot next to the CPU. All programming is done through RLL logic.

alternatives

2

High-performance counting and pulse output with fill-in-the-blank software

The DL205 high-speed counter module (H2-CTRIO) is our high-performance, high-feature offering for counting and pulse output. This module comes with a software utility that makes configuring the module as simple as clicking on features and filling in the blanks. No ladder logic is needed to operate this as a counter module, although you may use some RLL to coordinate your PLC program.

Key features include:

- Two quadrature encoder inputs or four 100 kHz high-speed counters (32-bit count range for +/-2.1 billion counts)
- Two programmable pulse outputs support Trapezoid, Velocity S-curve, or program controlled Dynamic Positioning, or four discrete isolated outputs for responding to counter presets (128 presets)
- Pulse catch feature (allows the module to read four inputs, each having a pulse width as small as 5 μsec)
- Programmable filters for reading up to four input signals to ensure input signal integrity
- Can use multiple modules in local DL205 base (any slot except slot 0)

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

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

Pulse out

The H2-CTRIO offers:

Two 100 kHz up/down counters or quadrature inputs

or *four 100 kHz counters*

AND

Two 25 kHz pulse outputs for stepper or servo drives

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

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

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Pressure Sensors

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DL205 - Great Fit For Applications That Need Simple Stepper or Servo Control

Here's why

There are many process applications that require accurate motion control at a fast pace, without expecting exact precision and blazing speed. The DL205 PLC, with the counter/pulse output modules' high speed counting capability and high frequency pulse output (H2-CTRIO), offers a viable stepper and servo control solution for open-loop motion control.

C-more Touch panel

Here's how

When coupled with our *Sure*Servo or *Sure*Step motion products, the resulting system is extremely cost-effective.

A DL205-based motion control system is very well-suited to applications such as:

- cut-to-length
- indexing tables or conveyors

AutomationDirect DL205 PLC with H2-CTRIO module using pulse output feature

Pulse output from AutomationDirect H2-CTRIO module

AutomationDirect *Direct*SOFT PLC programming software screens

DirectSOFT5

(see section 9 of this catalog)

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

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www.sureservo.com

Rotary indexing liquid fill application

PLC with CTRIO module

CTRIO pulse output signals

Fill spout

Stepper or servo drive

Stepper motor inside housing

Circular turn table

The *Sure*Servo family of brushless servo systems from AUTOMATIONDIRECT is fully digital and offers a rich set of features at dynamite prices. Choose from **eight standard servo motors** that can be **used in combination with one of three standard servo drives**.

These servos are designed for flexibility and quick implementation. *Sure*Servo drives accept a wide range of command sources:

Sure servo ™
(see section 16 of catalog)

• Built-in motion controller with preset position, velocity or torque
• Select presets with switch inputs and/or the multi-drop Modbus serial interface
• Position commands with "pulse and direction"or CW/CCW format
• Encoder follower
• Analog voltage Velocity or Torque command
• Eight standard systems from 100 W to 3 kW
• Use with *Direct*LOGIC PLCs or any other host control
• Drives feature on-board indexer and adaptive tuning modes
• Free set-up software
• 30-day money-back guarantee
• 2 year warranty

For configuration, tuning and diagnostics, use the drive's integrated keypad/display or take advantage of the free *Sure*Servo Pro™ PC-based software. Tune the system easily with adaptive auto-tuning selections or manual mode. Adapt to diverse applications with configurable I/O,including 8 digital inputs, 5 digital outputs, 2 analog monitors and a scalable encoder output.

Sure step ™
Ease of use out of the box!

(see section 16 of catalog)

The *SureStep stepping family* has four standard motors to handle a wide range of automation applications such as woodworking, assembly, and test machines. Our square frame or high torque style stepping motors are the latest technology, resulting in the best torque to volume. We have **NEMA 17, 23, and 34 mounting** flanges and holding torque ranges from 83 oz-in to 434 oz-in. A 20-foot extension cable with locking connector is a standard accessory to interface any of the four stepping motors to the microstepping drive, and can be easily cut to length if desired.

DL205 WinPLC - Great Fit For Control With Advanced Data Handling and Versatile Connectivity

What is a WinPLC ?

The WinPLC is a hybrid PC-PLC solution that brings the best of the PLC and the PC Control worlds together. The WinPLC module fits into the CPU slot of the popular DL205 series PLC. The WinPLC offers both deterministic control and connectivity to control devices and business systems. With the WinPLC, you'll benefit from:

- PLC reliability
  - Diskless operation
  - Non-volatile program and data memories
  - Direct backplane access to I/O
- Microsoft Windows connectivity
- PC-Style Data Management Tools
- 4 MB ROM/2 MB RAM or 8 MB ROM/8 MB RAM models

Advanced data handling

Think & Do software handles advanced math functions, formulas, string data and array manipulation in simple, plain-language format. Think & Do gives you the power and flexibility of custom programming for math and data management in the same development environment as the control logic. No complex RLL or PLC coprocessor required! Save time and money both developing and maintaining your applications with Think & Do's powerful data tools. Just "fill in the blanks" for most data operations, including up to 64 PID loops.

Why is the WinPLC a great fit for data handling and connectivity?

If your application requires complex math, data manipulation (even string arrays) or integrated connectivity as well as I/O control, a WinPLC is the best solution. Check out the top reasons why the DL205 WinPLC is a great fit for these types of applications.

Built-in and expansion serial ports

Up to 10 serial ports

With one native port and up to three 3-port serial modules (H2-SERIO), a WinPLC can handle up to 10 serial ports. Try that with a traditional PLC!! There isn't a better way to combine serial data with I/O control. Unlike most RLL programming, the Think & Do PC control software is designed for easy communication programming and string data manipulation.

Connect to our C-more or C-more micro operator panels
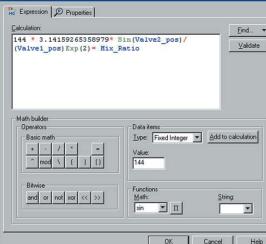
Connect to our Industrial Modem*

PLC-style I/O

A WinPLC can use any of the standard DL205 discrete and analog I/O modules, up to 256 I/O in the local base, and more when using the H2-ERM to master an additional base. Modules in the local base allow the WinPLC direct backplane access to those I/O.

*Note: Serial modems for communication (see Communications Products section). WinPLCs are programmed via the Ethernet port

High performance counting module with pulse output

Our high-speed counter module (H2-CTRIO) has four independently configurable timer/counter channels (up to 100 kHz) and two pulse output generators (up to 25 kHz). The easy-to-use configuration tool is included For more details, see the H2-CTRIO pages in this section.

Advanced programming environment

Develop your project with the leader in PC control software, using Think & Do Live! or Think & Do Studio. Enjoy the powerful features of Think & Do to develop applications for the WinPLC. See the PC Control in the Software section of this catalog for details on Think & Do's intuitive flowchart programming software.

<table>
<tr><td colspan="2">WinPLC CPU Module
For both Think & Do Studio and Think & Do Live!</td></tr>
<tr><td><i>WPLC</i></td><td><i>Memory</i></td></tr>
<tr><td>H2-WPLC3-EN</td><td>8 MB ROM/8 MB RAM   (100MHz)</td></tr>
</table>

For qualified OEMs or software developers, the WinPLC comes in a CE-only version for VisualBasic and C++ programmers developing custom code.

If you are interested in the CE-only version, visit www.hosteng.com for details.

AutomationDirect's
Industrial Ethernet Switch (E-SW05U) for reliable, deterministic communications in industrial environments.

Up to business LAN
(Network traffic from business LAN restricted by managed switch)

Built-in standard Ethernet connectivity

The WinPLC has an integrated 10 MB Ethernet port. Use OPC or DDE to link WinPLC's with an HMI or other application. Or, share tags with any PC or WinPLC running Think & Do software. WinPLCs are compatible with the new DataWorx data acquisition software. See the software catalog section.

Distributed I/O

Control an expansion base of I/O with an H2-ERM (Ethernet Remote Master) in the local base connected to Ethernet Base Controllers (EBC), for slave I/O in your choice of DL205, DL405 or Terminator I/O.

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PLCs

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Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

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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 product offering starting on page 5–23.

STEP 2 Select a CPU, programming tool and cable
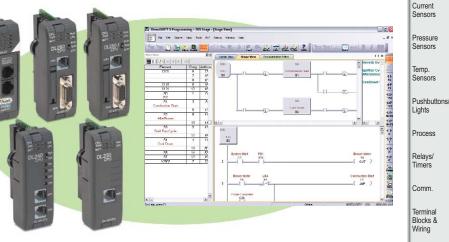
The DL205 family offers four traditional CPUs: the D2-260, D2-250-1, D2-240 and D2-230. The WinPLC, a Windows® CE-based CPU, is also covered in this step. Please take the time to understand the features and specifications of each CPU model (i.e. built-in communications ports protocols, instructions, etc.).

To program the DL205 CPUs, choose between the Windows-based *Direct*SOFT programming software and PC cable or handheld programmer. The WinPLC requires Think & Do Studio or Think & Do Live! for programming. CPU-slot slave 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-ECOM(100) Ethernet communications module, or the D2-DCM serial communications module. These modules add more ports for networking or connection to an HMI, etc. The H2-SERIO serial communications module can be used with the WinPLC to add more communications ports.

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

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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.

Three Ways to Order: Phone, Fax, or Online

Step 1: Review the DL205 Product Family

CPUs

D2-260 – 30.4K words total memory
  2 communications ports
  16 built-in PID loops with auto-tuning
D2-250-1 – 14.8K words total memory
  2 communications ports
  4 built-in PID loops with auto-tuning
D2-240 – 3.8K total memory
  2 communications ports
D2-230 – 2.4K total memory
  1 communications port
Windows CE CPUs -
  WinPLC (H2-WPLC*-**)

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)
  125 VDC (D2-06BDC2-1)
9-slot base (includes power supply)
  1 10/220 VAC (D2-09B-1)
  12/24 VDC (D2-09BDC1-1)
  125 VDC (D2-09BDC2-1)

Local expansion modules

(D2-250-1 or D2-260 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. 24 VDC sink/source
  (D2-16ND3)
32-pt. 24 VDC sink/source
  (D2-32ND3)
32-pt. 5-12 VDC sink/source
  (D2-32ND3-2)

(Discrete inputs continued next column)

AC input
8-pt. 110 VAC (D2-08NA-1)
16-pt. 110 VAC (D2-16NA)
8-pt. 220 VAC (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. 24 VDC sink (Fault protected)
  (F2-16TD1P)
16-pt. 24 VDC 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. 1.5A/pt (D2-12TR)
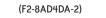
Combination discrete modules

4-pt. 24 VDC 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-ECOM (-F))
  (H2-ECOM 100)
Data Communications Module
  (D2-DCM)

Remote I/O modules

Ethernet
Ethernet Remote Master Module
  (H2-ERM(-F))
Ethernet Base Controller (slave)
  (H2-EBC(-F))
  (H2-EBC 100)
Serial
Remote Master Module (D2-RMSM)
Remote Slave Module (D2-RSSS)

Specialty modules

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

CPU-slot slave controllers

Ethernet Base Controller (H2-EBC)
DeviceNet Slave (F2-DEVNETS-1)
Profibus Slave (H2-PBC)
SDS Slave (F2-SDS-1)

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 infor-
mation on **DIN**nector terminal blocks,
ZIPLink connection systems and other
connection accessories for use with the
DL205 system.

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PLCs
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C-more & other HMI
AC Drives
AC Motors
Power Transmiss.
Steppers/ Servos
Motor Controls
Proximity Sensors
Photo Sensors
Limit Switches
Encoders
Current Sensors
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Step 2: Select the CPU, Programmer and Cable

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, then select the D2-250-1 or the D2-260 CPU which support local expansion of up to two or four additional bases, respectively.

The D2-240, D2-250-1 and D2-260 support the Ethernet and serial Remote Master module that are used to build a remote I/O network. Port 2 on the D2-250-1 and D2-260 can also serve as a remote I/O master.

Performance

If you are using basic Boolean instructions and speed is not the primary concern, then the D2-230 or D2-240 will do the job. For applications that require fast scan times, additional communications or advanced instructions, choose the D2-250-1 or D2-260 CPU. The D2-260 is our fastest CPU for performing even the most basic of math or data instructions, and will provide better overall performance than the other DL205 CPUs.

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 *Direct*SOFT and/or a Handheld Programmer, you may have to upgrade the software/firmware to accommodate the D2-260.

Built-in CPU communications

Every DL205 CPU provides at least one built-in RS-232 communication port. If you're using an operator interface, then you should choose the D2-240, D2-250-1 or D2-260 CPU. The D2-240, D2-250-1 and D2-260 CPUs offer two built-in communication ports. The D2-240 supports our *Direct*NET™ slave protocol on the bottom port, which provides a quick and easy network connection to any *Direct*NET master. If you need the most flexibility possible, then consider the D2-250-1 or D2-260 CPU. These CPUs offer built-in *Direct*NET slave support capability on the top and bottom ports, and *Direct*Net/Modbus RTU master/slave support on the bottom. The bottom port supports baud rates up to 38.4K baud. The D2-260 provides support for ASCII IN/OUT communications.

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 a D2-240, D2-250-1 or D2-260 CPU. The D2-DCM module can also be added to these CPUs to provide an additional serial communications port.

DL 205 family CPUs

| D2-260 | D2-250-1 | D2-240 | D2-230 | H2-WPLC*-** |

The WinPLC brings PLC and PC technologies together by providing a Windows CE operating system environment for DL205 hardware. See the WinPLC pages later in this section for details on the WinPLC.

DL205 CPU Specifications

DL205 CPU Comparison				
System Capacity	**D2-230**	**D2-240**	**D2-250-1**	**D2-260**
Total memory available (words)	2.4K	3.8K	14.8K	30.4
Ladder memory (words)	2048 EEPROM	2560 EEPROM	7680 Flash	15872 Flash
V-memory (words)	256	1024	7168	14592
Battery backup	Yes	Yes	Yes	Yes
Total CPU memory I/O pts. available *(actual I/O pts. depend on I/O configuration method selected)*	256	896 *(320 X + 320 Y + 256 CR)*	2048 *(512 X + 512 Y + 1024 CR)*	8192 *(1024 X + 1024 Y + 2048 CR + 2048 GX + 2048 GY)*
Local I/O (pts.)	256	256	256	256
Local Expansion I/O (pts.)	none	none	768 (2 exp. bases max) *(Including local I/O)*	1280 (4 exp. bases max.) *(Including local I/O)*
Serial Remote I/O (pts.)	N/A	896 max. *(Including local I/O)*	2048 max. *(Including local and exp.I/O)*	8192 max. *(Including local & exp. I/O)*
Remote I/O channels	N/A	2	8 (7+1 CPU port)	8 (7+1 CPU port)
I/O per remote channel	N/A	2048 *(limited to 896)*	2048	2048
Ethernet Remote I/O	N/A	Yes	Yes	Yes
Discrete I/O pts.	N/A	896 max. *(Including local I/O)*	2048 max. *(Including local and exp.I/O)*	8192 *(Including local and exp.I/O)*
Analog I/O channels	N/A	Map into V-memory	Map into V-memory	Map into V-memory
Remote I/O channels	N/A	Limited by power budget	Limited by power budget	Limited by power budget
I/O per remote channel	N/A	16,384 *(limited to 896)*	16,384 *(16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions)*	16,384 *(16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions)*
Performance				
Contact execution (Boolean)	3.3µs	1.4µs	0.61µs	0.61µs
Typical scan (1K Boolean)	4-6ms	10-12ms	1.9ms	1.9ms
Programming and Diagnostics				
RLL Ladder Style	Yes	Yes	Yes	Yes
RLL*PLUS*/Flowchart Style (Stages)	Yes/256	Yes/512	Yes/1024	Yes/1024
Run time editing	Yes	Yes	Yes	Yes
Supports Overrides	No	Yes	Yes	Yes
Variable/fixed scan	Variable	Variable	Variable	Variable
Instructions	113	129	174	231
Control relays	256	256	1024	2048
Timers	64	128	256	256
Counters	64	128	128	256
Immediate I/O	Yes	Yes	Yes	Yes
Subroutines	No	Yes	Yes	Yes
For/Next loops	No	Yes	Yes	Yes
Timed Interrupt	No	Yes	Yes	Yes
Integer Math	Yes	Yes	Yes	Yes
Floating-point Math	No	No	Yes	Yes
Trigonometric functions	No	No	No	Yes
Table Instructions	No	No	No	Yes
PID	No	No	Yes, 4 loops	Yes, 16 loops
Drum Sequencers	No	No	Yes	Yes
Bit of Word	No	No	Yes	Yes
ASCII Print	No	No	Yes	Yes
Real-time clock/calender	No	Yes	Yes	Yes
Internal diagnostics	Yes	Yes	Yes	Yes
Password security	Yes	Multi-level	Multi-level	Multi-level
System and user error log	No	No	Yes	Yes
Communications				
Built-in ports	Port 1 RS-232	Port 1 RS-232 and Port 2 RS-232	Port 1 RS-232 and Port 2 RS-232/422	Port 1 RS-232 and Port 2 RS-232/422/485)
K-sequence (proprietary protocol)	Yes	Yes	Yes	Yes
*Direct*NET™	No	Yes	Yes	Yes
Modbus RTU master/slave	No	No	Yes	Yes
ASCII communications	No	No	OUT	IN/OUT
Maximum baud rate	9600	19.2K port 2	38.4K port 2	38.4K port 2

D2-260 Key Features

D2-260 CPU
D2-260   <--->

D2-260 can serve as network master   **Easily connect programming devices or HMI to CPU ports**

MODBUS® RTU or DirectNET™ network protocol

Connect operator interfaces to port 1 on the slaves

Use port 2 on D2-260 or D2-250-1 to network slaves

Use D2-DCM module if D2-240 is slave or if D2-250-1/D2-260 port 2 is occupied
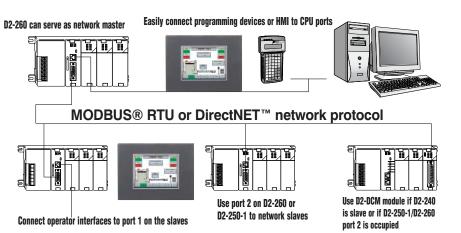
D2-260: Our most powerful DL205 CPU

Our D2-260 CPU provides all the capabilities of the other DL205 CPUs (as well as our D4-450 CPU), 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.

Release 4.0 or higher of *Direct*SOFT is required to program the D2-260. If you're using a handheld programmer, version 2.10 of the handheld programmer firmware is required. Here are a few key features about the D2-260 CPU:

Local expansion I/O

The D2-260 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.

Powerful built-in CPU communications

The D2-260 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* or DV-1000 operator interface panel, or as a single K-sequence or *Direct*NET slave. The 15-pin bottom port (port 2) supports RS-232 or RS-422/RS485. This port offers several different protocol options such as:
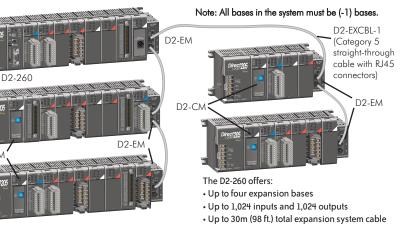
- K-sequence
- *Direct*NET Master/Slave
- Modbus RTU Master/Slave
- ASCII In/Out Communications

Port 2 can also serve as a remote I/O master. The D2-260 supports the Ethernet Communication module and Data Communication Module for additional communications ports.

16 PID loops with auto-tuning

The D2-260 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 *Direct*SOFT 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. See the D2-250-1 CPU section for a PID loop control block diagram.

D2-260 local expansion system

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

D2-260

D2-CM

D2-EM

D2-EM

D2-CM

D2-EM

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

The D2-260 offers:
- Up to four expansion bases
- Up to 1,024 inputs and 1,024 outputs
- Up to 30m (98 ft.) total expansion system cable

D2-260 Key Features

Full array of instructions

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

The D2-260 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
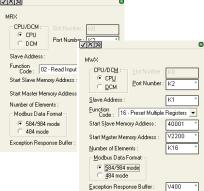
For a complete list of instructions supported by all DL205 CPUs, see the end of this section.
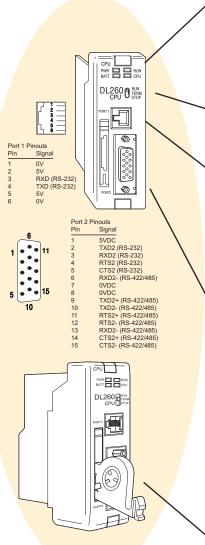
Modbus RTU instructions

The D2-260 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 Slave Exception Codes. These flexible instructions allow the user to select the following parameters within one instruction window:

- 584/984 or 484 Modbus data type
- Slave node (0-247)
- Function code
- Modbus starting master / slave 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)

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 slave, *Direct*NET™ slave, Modbus RTU slave
Devices	Can connect w/HPP, *Direct*SOFT, *C-more*, DV-1000, O/I panels, or any *Direct*NET master
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 slave, *Direct*NET Master/Slave, Modbus RTU Master/Slave, ASCII IN/OUT, Remote I/O Master
Devices	Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, DV-1000, other O/I panels, any *Direct*NET or Modbus RTU master or slave, or ASCII devices
Specs.	HD15 connector RS-232, RS-422/485* 300/600/1200/2400/4800 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

*ZIP*Link communications adapter modules

*ZIP*Link cables and communications adapter modules offer fast and convenient screw terminal connection for the bottom port of the D2-260 CPU. 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

On-board memory

The D2-260 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 D2-260 can be used as a master for serial remote I/O networks (see the D2-RSSS later in this section for details).

D2-260 Key Features

ASCII communications instructions

The D2-260 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 D2-260 can decipher ASCII embedded within a supported protocol (K-Sequence, *Direct*Net, Modbus, Ethernet) via the CPU ports, H2-ECOM or D2-DCM.

Here's how the D2-260 can receive ASCII input strings:

1. **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.

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

3. If a D2-260 PLC is a master on a network, the Network Read instruction (RX) can be used to read embedded ASCII data from a slave device via a supported communications protocol using port 2, H2-ECOM or D2-DCM. The RX instruction places the data directly into V-memory.

Here's how the D2-260 can write ASCII output strings:

1. **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.

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.

3. **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.

4. If a D2-260 PLC is a master on a network, the Network Write instruction (WX) can be used to write embedded ASCII data to an HMI or slave device directly from V-memory via a supported communications protocol using port 2, H2-ECOM or D2-DCM.

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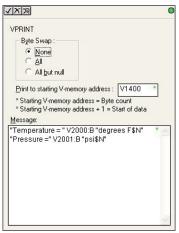
ASCII Find (AFIND) - Finds where a specific portion of the ASCII string is located in continuous V-memory addresses. Forward and reverse searches are supported.

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 master device via a communications protocol. The AIN and AEX instructions have a built-in byte swap feature.

Example of VPRINT instruction in *Direct*SOFT

D2-250-1 Key Features

D2-250-1 CPU
D2-250-1   <--->

D2-250-1 can serve as network master

Easily connect programming devices or HMI to CPU ports

DirectNET™ or MODBUS® RTU network

Connect operator interfaces to port 1 on the slaves

Use port 2 on D2-260 or D2-250-1 to network slaves

Use D2-DCM module if D2-240 is slave or if D2-250-1/D2-260 port 2 is occupied

D2-250-1 replaces D2-250

Our D2-250-1 CPU replaces the D2-250 CPU. The D2-250-1 offers all the features and functionality of the D2-250 with the addition of local I/O expansion capability. The D2-250-1 offers an incredible array of features for a CPU that costs so little.
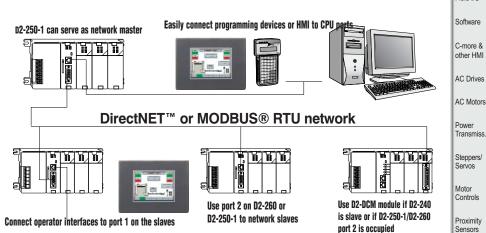
Release 2.1 or higher of *Direct*SOFT is required to program the D2-250-1. Release 4.0 or higher is required if you intend to use local expansion I/O.

If you're using a handheld programmer, at least version 2.10 of the handheld programmer firmware is required.

A few key features of the D2-250-1 CPU follow.

Local expansion I/O

The D2-250-1 supports local expansion up to three total bases (one CPU base and two 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.

Powerful built-in CPU communications

The D2-250-1 offers two communication ports that provide a vast array of communication possibilities. The top RS-232 port is for programming, connection to a *C-more* operator interface panel or DV-1000, or to serve as a single *Direct*NET slave. The 15-pin bottom port (port 2) supports RS-232 or RS-422. This port offers several different protocol options such as:

- K-sequence
- *Direct*NET master/slave
- Modbus RTU master/slave

Port 2 can also serve as a remote I/O master. The D2-250 supports the Ethernet Communication Module and Data Communication Module for additional communications ports.

Four PID loops with auto-tuning

The D2-250-1 CPU can process up to 4 PID loops directly in the CPU. You can select from various control modes including automatic, manual, and cascade control. There are 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 *Direct*SOFT 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. See the next page for a PID loop control block diagram.

D2-250-1 local expansion system

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

D2-CM

D2-EM

D2-250-1 CPU

D2-EM

D2-CM

D2-EM

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

The D2-250-1 offers:
- up to two expansion bases
- up to 768 physical I/O points
- up to 30m (98 ft.) total expansion system cable

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

D2-250-1 Key Features

Full array of instructions

The D2-250-1 supports over 210 powerful instructions, such as:

- Four types of drum sequencers
- Leading and trailing edge triggered one-shots
- Bit-of-word manipulation
- Floating point conversions
- Four PID loops

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

On-board memory

The D2-250-1 has 7.6K words of flash memory on board for your program plus 7.1K words of V-memory (data registers). With flash memory, you don't have to worry about losing the program due to a bad battery. If you have critical data stored in the capacitor backed V-memory, simply purchase the optional lithium battery (D2-BAT-1) to permanently maintain these parameters.

Built-in remote I/O connection

In addition to providing outstanding communications capabilities, the bottom port on the D2-250-1 can also be a master for remote I/O networks. If you need extra I/O at a remote distance from the CPU, you can use this port to add up to seven of our remote slave stations (see the D2-RSSS for additional information later in this section.)
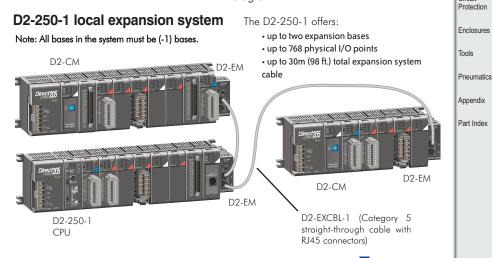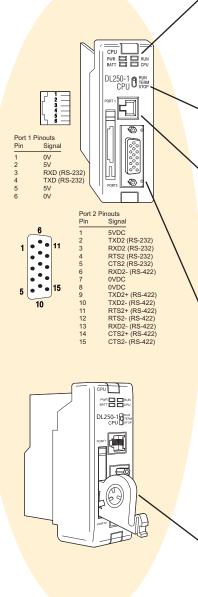
ZIPLink communications adapter modules
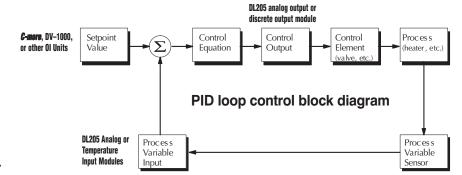
ZIPLink cables and communications adapter modules offer fast and convenient screw terminal connection for the bottom port of the D2-250-1 CPU. The adapter modules are RS232/422 DIP switch selectable and are offered with or without indicating LEDs and surge protection. See the Terminal Blocks and Wiring Solutions section in this catalog for more information.

ZL-CMA15L shown

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)
7	0VDC
8	0VDC
9	TXD2+ (RS-422)
10	TXD2- (RS-422)
11	RTS2+ (RS-422)
12	RTS2- (RS-422)
13	RXD2- (RS-422)
14	CTS2+ (RS-422)
15	CTS2- (RS-422)

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, DirectSOFT) to select the mode of operation
STOP	Forces CPU out of RUN mode

Port 1	
Protocols	K-sequence slave, DirectNET™ slave, Modbus RTU slave
Devices	Can connect w/HPP, DirectSOFT, C-more, DV-1000, O/I panels, or any DirectNET master
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 slave, DirectNET Master/Slave, Modbus RTU Master/Slave, ASCII OUT, Remote I/O Master
Devices	Can connect w/many devices, such as PCs running DirectSOFT, DSData, HMI packages, C-more, DV-1000, other O/I panels, any DirectNET or Modbus RTU master or slave, or ASCII devices
Specs.	HD15 connector RS-232/422 300/600/1200/2400/4800 9600/19.2 K/38.4 Kbaud 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, 3.0 V Lithium battery, 560 mA, battery number CR2354

Note: Batteries are not needed for program back-up. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage.

PID loop control block diagram

C-more, DV-1000, or other OI Units → Setpoint Value → Σ → Control Equation → Control Output → Control Element (valve, etc.) → Process (heater, etc.)

DL205 analog output or discrete output module

DL205 Analog or Temperature Input Modules → Process Variable Input ← Process Variable Sensor

D2-230/240 Key Features

D2-240 CPU
D2-240   <--->

D2-240: for basic applications

The D2-240 provides a subset of the D2-250-1's capabilities. If you need a good CPU with multiple communications ports, and complex math or PID isn't required, then the D2-240 is the CPU for you!

Built-in memory

There is 2.5K of EEPROM program memory in the D2-240. No additional memory is required.

If you have critical data stored in the capacitor backed V-memory, simply purchase the optional lithium battery (D2-BAT) to permanently maintain these parameters as well.

Powerful instructions

The D2-240 instructions cover most of the capability of our more powerful D2-250-1, and allow you to cover a wide variety of applications. Instructions include Boolean logic, data manipulation, integer math, interrupts, subroutines, FOR/NEXT loops, etc. For a complete list of instructions, see the back of this section.
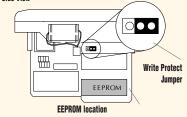
Two built-in RS-232 communications ports

The D2-240 offers two communication ports. The top port can be used for a direct connection to a personal computer

for programming, to our handheld programmer, *C-more*, or to the DV-1000. The bottom port is a slave-only port and supports our *Direct*NET™ or K-sequence protocol at speeds up to 19.2 Kbaud. If you're using an operator interface or if you plan on connecting the system to a network later on, then you can choose the D2-240. The D2-240 also supports the D2-DCM Data Communication Module and the H2-ECOM Ethernet Communication Modules.

DL205 spare EEPROM chips

There may be cases where you want to have a spare EEPROM chip available. For example, maybe you need to upgrade a customer's machine with your latest enhancements. You can purchase extra EEPROM chips (two per pack). These can be installed in the CPU (D2-230/D2-240 only) and programmed, or they can be programmed directly with the DL205 handheld programmer.

CPU Side View

Write Protect Jumper

EEPROM

EEPROM location

EEPROM	D2-EE-1	D2-EE-2
CPU	*D2-230*	*D2-240*
CPU Program Storage Capacity	2.0K	2.4K
Writing Cycle Life	10,000	10,000
Write Inhibit	CPU jumper	CPU jumper
Memory Clear Method	Electrical	Electrical

D2-230 CPU
D2-230   <--->

D2-230: our lowest price DL205 CPU

The D2-230 is our most economical CPU in the DL205 product family. If you are looking at the DL205 primarily because of the size, or for other reasons that don't require lots of CPU horsepower, then give the D2-230 a try.

Built-in EEPROM memory

There is 2.0K of EEPROM program memory in the D2-230. No additional memory is required.

If you have critical data stored in the capacitor-backed V-memory, simply purchase the optional lithium battery (D2-BAT) to permanently maintain these parameters as well.

One built-in communications port

The D2-230 has only one communication port. If you are considering any network connections in the future, you will need the D2-240, D2-250-1 or D2-260 CPU. The extra port may be worth the cost, especially during machine startup or troubleshooting sessions. The D2-230 does not support the Ethernet or Data Communications modules.

Basic instruction set

The D2-230 provides a subset of the D2-240's well-rounded instructions. The D2-230's instructions cover basic Boolean and simple integer math.
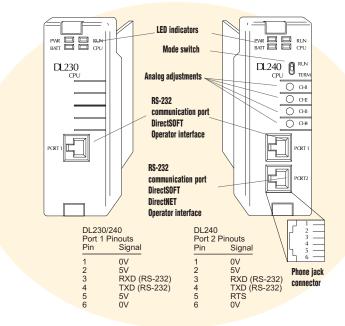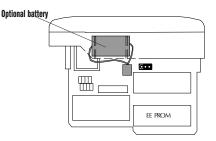
D2-230/240 Key Features
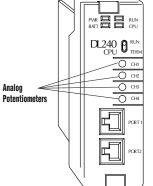
The diagram to the right shows the various hardware features found on the D2-230 and D2-240 CPUs.

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 (D2-240 only)		
RUN		Puts CPU into RUN mode
TERM		Allows peripherals (HPP, *Direct*SOFT) to select the mode of operation
Port 1		
Protocols		K-sequence slave
Devices		Can connect w/HPP, *Direct*SOFT™, *C-more*, DV-1000
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 (D2-240 only)		
Protocols		K-sequence slave, *Direct*NET slave
Devices		Can connect w/many devices, such as PCs running *Direct*SOFT, DSData, HMI packages, *C-more*, DV-1000, or any *Direct*NET master
Specs.		6P6C phone jack connector 300/600/1200/2400/4800 9600/19.2k baud Odd 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		CR14250SE

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.

DL230/240 Port 1 Pinouts

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

DL240 Port 2 Pinouts

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

CPU side view

Four external potentiometers for adjustments

There are four potentiometers on the face plate of the D2-240 CPU. They have a resolution of 256 steps and can be used to externally adjust four predefined V-memory locations inside the D2-240 CPU. You specify upper and lower limits for the values and the CPU takes care of the rest!

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.

*Direct*SOFT programming software

Our powerful Windows-based program-ming package makes it easy for you to program and monitor your DL205 PLC system. See the Software section in this catalog for detailed information on *Direct*SOFT.

*Direct*Soft Part Number	Description
PC-DSOFT5	Programs all *Direct*LOGIC PLC CPUs; offers *IBox* intelligent instructions
PC-DS100	Free version of *Direct*SOFT; programs all *Direct*LOGIC PLC CPUs; limited to 100 word program
Note: The D2-260 requires *Direct*SOFT version 4.0 or later	
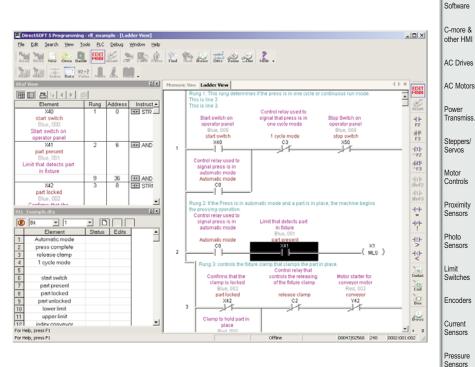
DL205 programming cables

Choose the proper cable to connect the DL205 CPU to your PC running *Direct*Soft.
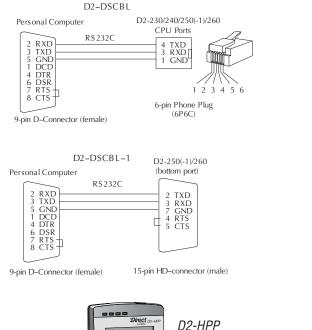
CPU	Port	Cable
D2-230	Only one	D2-DSCBL
D2-240	Top port	D2-DSCBL
	Bottom port	D2-DSCBL
D2-250-1	Top port	D2-DSCBL
	Bottom port	D2-DSCBL-1
D2-260	Top port	D2-DSCBL
	Bottom port	D2-DSCBL-1

Handheld programmer
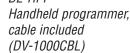
The D2-HPP handheld programmer connects to an RJ12 phone jack port on any of the DL205 CPUs. The handheld unit contains a zero force insertion socket that can be used to store programs on an optional EEPROM. Can be used with DL05, DL06, DL105, DL205, and D3-350 models.

Pin labeling conforms to IBM DTE and DCE standards

D2-DSCBL

Personal Computer   D2-230/240/250(-1)/260 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)/260 (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 WinPLC: Windows® CE-based CPU

DL205 WinPLC

H2-WPLC2-EN <--->
H2-WPLC3-EN <--->
PC-WPLC-START*
PC-WPLC-LIVE*

PC control with a WinPLC

The WinPLC provides a Windows® CE operating system environment in our DL205 CPU hardware. The small size and low cost of DL205 products is desirable, but the operating systems of the D2-230, 240, 250-1 and 260 CPUs are proprietary (like most PLCs). The WinPLC provides a hybrid PC-PLC solution that brings the best of the PLC and PC control worlds together. A WinPLC system is the best solution if your applications requires:

- Complex math
- Heavy serial communications (can use the H2-SERIO module)
- Advanced data manipulation
- Advanced handling of string or array data
- Up to 64 PID loops

Here's how it works

The WinPLC module is plugged into the CPU slot of the DL205 base. It uses Windows CE, a real-time operating system combined with the advantages of open standard software such as OPC, ActiveX and other Microsoft communications tools. The WinPLC offers both deterministic control and open communications. It uses advanced software development tools for control, data management, communication and integration with business systems. The WinPLC supports the following DL205 modules only:

- All discrete and analog modules
- Temperature input modules
- H2-SERIO serial communications module

Specifications	H2-WPLC2-EN	H2-WPLC3-EN
Processor	Hitachi SH3 Series 7708 Processor	
Processor Speed	100 MHz	
Pre-loaded Software	Runtime engine compatible with Think & Do Studio or Think & Do Live!	
Memory	4MB FLASH EE ROM, 2MB RAM, 64kB battery-backed RAM10Mbps	8MB FLASH EE ROM, 8MB RAM, 64kB battery-backed RAM10Mbps
Indicators	Power, Link/Act, Run, Error	
Local I/O Points	256 (224 if using H2-ERM in module slot for Ethernet remote I/O)	
Ethernet Remote I/O points	256 (using H2-ERM master in local WinPLC base and H*-EBC or T1H-EBC remote slave	
Port 0	RJ12, 6-pin modular, serial port, supports K-sequence, or any protocol from Windows CE	
Port 1	RJ45, 8-pin modular, Ethernet 10MBPS	
I/O Interface	Backplane to DL205 (Up to 9-Slot base), expandable with H2-ERM	
Power Consumption	680 mA at 5VDC	
Weight	6 oz.	
Operating Temperature	0–60°C	
Storage Temperature	-20-70°C	
Agency Listings	UL Listing	
Manufacturer	Host Automation Products, LLC.	

- H2-ERM module for Ethernet remote I/O (limited to one ERM and one EBC slave per system)
- H2-CTRIO Counter I/O module

DL205 specialty modules not listed above are not supported by the WinPLC.

Built-in Ethernet port

The WinPLC is programmed via a built-in 10 MB Ethernet port. WinPLCs can use OPC or DDE to link to an HMI or other application using this high-speed port; or, share tags with any controller running Think & Do software for coordinated control with a PC system. The built-in Ethernet port can also be used for peer-to-peer communications between multiple WinPLCs.

Built-in serial port

A built-in RS-232 serial port lets you connect a *C-more* or other operator interfaces to the WinPLC. You can also connect to devices such as barcode readers, weight scales or serial modems to the serial port. Unlike most RLL programming, the Think & Do programming method is designed for easy communication programming and string manipulation. Up to nine additional serial ports can be added to a WinPLC system by using the H2-SERIO serial communication module. For more information on the H2-SERIO module see "Additional Serial Ports for the WinPLC" later in this section.

Programming the WinPLC

Creating flowcharts (projects) for the WinPLC requires one of the following development packages running on a PC equipped with an Ethernet card: Think & Do Live! (PC-ENT-LIVE), the low-cost T&D Live! for WinPLC programming pack (PC-WPLC-LIVE), or Think & Do Studio (PC-ENT-SDD). Since each WinPLC includes its own run-time license, you can program as many WinPLCs as you need, at no additional cost. When you compile your project, the PC automatically downloads the flowcharts into the WinPLC. Then at runtime (or at power-up), the WinPLC will run the flowchart program.

CE-only version WinPLC

This version of the WinPLC is not preconfigured with any control software. It's for qualified OEMs or software developers who want to develop their control code in VB or C++. AUTOMATIONDIRECT does not sell this version of the WinPLC. If you are interested in the CE-only version, visit www.hosteng.com for details.

See the Think & Do PC Control software section in this catalog for information on the PC-WPLC-START Starter Kit, and the PC-WPLC-LIVE Think & Do Live! WinPLC programming package.

DL205 CPU-Slot Slave Controllers

Overview

There are currently four slave "base controllers" or "slave 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 slave controllers must be connected to a network master controller module or to a PC running PC-based control, HMI or SCADA software.

H2-EBC

Ethernet Base Controller Module

See page 5–52

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

Ethernet Slaves

H2-EBC slave

H4-EBC slave

T1H-EBC slave

H2-PBC

Profibus DP Slave Base Controller Module

See page 5–60

Profibus slave nodes

H2-PBC slave

H2-PBC slave

PLC or PC-based Profibus master

F2-DEVNETS-1

DeviceNet Slave Module

See page 5–62

DeviceNet slave nodes

F2-DEVNETS-1 slave

F2-DEVNETS-1 slave

PLC or PC-based DeviceNet master

F2-SDS-1

Smart Distributed System I/O

See page 5–64

SDS Slave I/O

F2-SDS-1 slave

F2-SDS-1 slave

PLC or PC-based SDS master
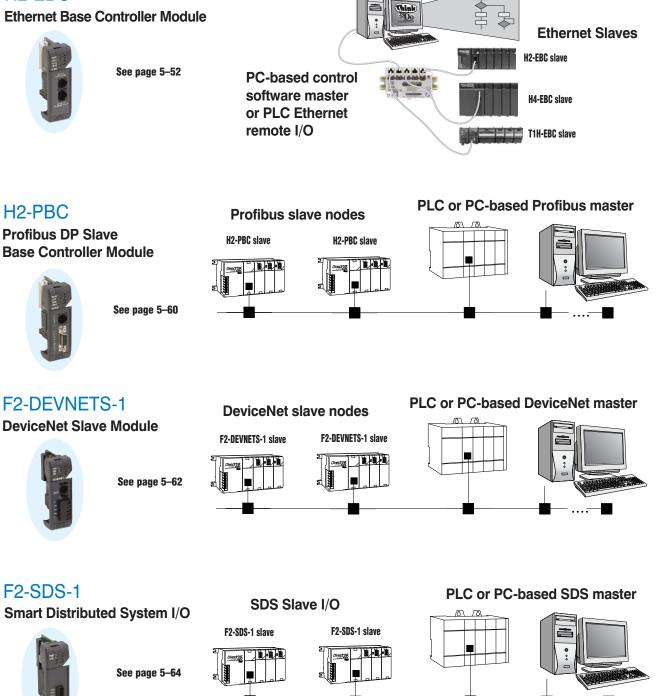
Step 3: Additional Communications Ports Needed?

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-ECOM(100) Ethernet communications module or the D2-DCM serial data communications module. Both modules' specifications and communications details are covered later in this section.
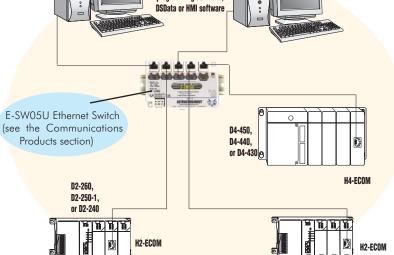
Ethernet networking with the H2-ECOM(100)

The D2-260, D2-250-1 and D2-240 CPUs support the H2-ECOM(100) 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-ECOM(100) module supports the industry standard 10Base-T with an RJ45 port. The H2-ECOM-F has ST-style bayonet connectors for 10Base-FL fiber optic connections. The ECOM modules use standard cables, hubs and repeaters which are available from a large number of suppliers. A virtually unlimited number of PLCs can be connected to an Ethernet network using ECOM modules.

Serial networking with the D2-DCM

The D2-260, D2-250-1, and D2-240 CPUs support the D2-DCM Data Communications Module, which can serve as a *Direct*Net master/slave, *Direct*Net peer, or a Modbus RTU slave. 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 master, you can use *Direct*SOFT to program any PLC on the network.

H2-ECOM100 Ethernet network

PCs running DirectSoft PLC programming software, DSData or HMI software

E-SW05U Ethernet Switch (see the Communications Products section)

D4-450, D4-440, or D4-430

H4-ECOM

D2-260, D2-250-1, or D2-240

H2-ECOM

H2-ECOM
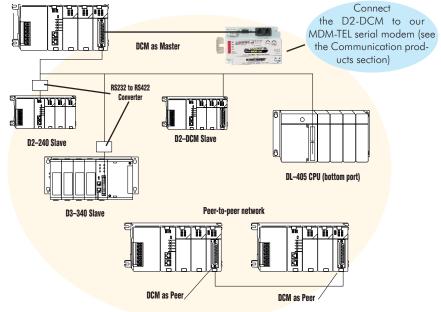
The H2-ECOM(100) can be used for:
- High-speed peer-to-peer networking of PLCs (any PLC can initiate communications)
- CPU programming with *Direct*SOFT Programming Software
- High-speed data acquisition via HMI, DSData Server, Lookout*Direct* or other HMI software
- Virtually unlimited number of network nodes
- Very easy to setup

D2-DCM serial network

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

DCM as Master

RS232 to RS422 Converter

D2–240 Slave

D2–DCM Slave

DL–405 CPU (bottom port)

D3–340 Slave

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 master)
- Peer-to-peer networking of two DCM modules (each can serve as a master or slave)
- CPU programming with *Direct*SOFT Programming Software
- Data acquisition via HMI, DSData Server, Lookout*Direct* or other HMI software
- A slave on a Modbus RTU network
- Connection to a serial modem (MDM-TEL)

Additional Serial Ports for the WinPLC

H2-SERIO serial communications module for the WinPLC

Do you need serial communications ports in addition to the built-in serial port on the WinPLC? Do you need to connect to multiple *C-more* or other operator interface panels? Would you like to connect devices such as barcode readers, weight scales or serial modems to your WinPLC system? If so, then select the H2-SERIO serial communications module. This module is used exclusively with the WinPLC.

Protocols supported

The H2-SERIO module supports serial ASCII communications and can also serve as a Modbus RTU slave.

Up to ten serial ports

The WinPLC has one built-in serial port. Each H2-SERIO module has three serial ports on board. Up to three H2-SERIO modules can be used per WinPLC system. That's a total of ten serial ports that can be used in one WinPLC system to handle all of your serial communications needs.

Separate communication parameters for each port

Use Think & Do software packages to set baud rate, parity, data bits, and stop bits for each serial port. Choose from 300 to 57.6 Kbaud communication speeds. Think & Do Studio or Think & Do Live! allows each port to be designated as a Modbus slave or a generic serial device. Each port on the H2–SERIO module is capable of full hardware handshaking.

Note on processing large amounts of serial data
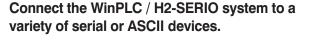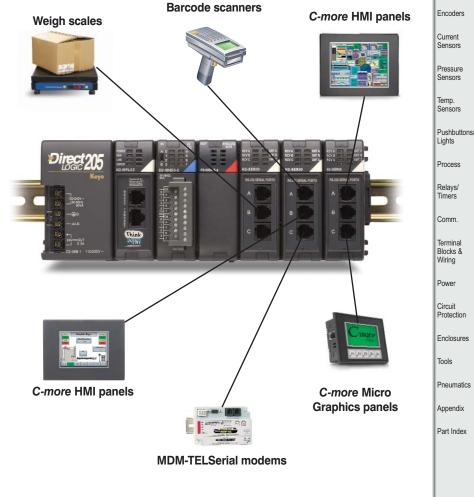
While the H2-SERIO module will support virtually any serial device, processing large amounts of serial data will increase the system response time. This is important to consider when using multiple H2-SERIO modules, especially in a WinPLC local base with an H2-ERM or H2-CTRIO module.

Connect the WinPLC / H2-SERIO system to a variety of serial or ASCII devices.

Weigh scales

Barcode scanners

C-more HMI panels

C-more HMI panels

MDM-TELSerial modems

C-more Micro Graphics panels

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

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)*

Storage temperature for the DV-1000 is −4º to 158ºF (-20º to 70ºC)

*** Operating temperature for the Handheld Programmer is 32º to 122ºF (0º to 50ºC)*

Operating temperature for the DV-1000 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, D2-08TA, 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
- D2-ACC-3 – Spare terminal screws for 12-pt. and 16-pt. I/O modules
- D4-IO3264R – Ribbon cable connector for 32-pt. modules.
- D4-IO3264S – Solder-type connector for 32-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 page 4-78 or see the Terminal Blocks and Wiring Solutions section in this catalog.

I/O Availability

I/0 Availability Table									
PLC CPU / CPU-Slot Controller		**D2-230**	**D2-240**	**D2-250-1**	**D2-260**	**WinPLC**	**Profibus**	**H2-EBC**	**F2-SDS-1**	**F2-DEVNETS-1**
Discrete Modules	**Catalog Pages**	4-31	4-31	4-29	4-26	4-34	4-60	4-52	4-64	4-62
DC Sink/Source In	4-78	√	√	√	√	√	√	√	√(except 32-pt.)	√
DC Output	4-83	√	√	√	√	√	√	√	√(except 32-pt.)	√
AC Input	4-80	√	√	√	√	√	√	√	√	√
AC Output	4-88	√	√	√	√	√	√	√	√	√
Relay Out	4-90	√	√	√	√	√	√	√	√	√
DC In / Relay Out	4-95	√	√	√	√	√	√	√	√	√
Analog Modules										
Analog Current In	4-96	√	√	√	√	√	√	√	√	√
Analog Voltage In	4-99	√	√	√	√	√	√	√	√	√
Analog Current Out	4-104	√	√	√	√	√	√	√	√	√
Analog Voltage Out	4-108	√	√	√	√	√	√	√	√	√
Analog Isolated Current Out	4-106	√	√	√	√	√	√	√	√	√
Analog Isolated Voltage Out	4-110	√	√	√	√	√	√	√	√	√
Combination Analog	4-112	√	√	√	√	√	√	√	√	√
Temperature Input	4-102	√	√	√	√	√	√	√	√	√
Speciality Modules										
Local Expansion	4-48			√	√					
Communications	4-56		√	√	√					
Remote I/O	4-55		√	√	√	√(H2-ERM)				
CoProcessor	4-66		√	√	√					
Counter I/O (CTRIO)	4-68		√	√	√	√		√		
Counter Interface	4-76	√	√	√	√					

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

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

Select the H2-CTRIO 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 CTRIO 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.

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

Step 5: Choose an I/O Configuration

I/O configurations

The DL205 system offers local, 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 in local, local expansion or remote I/O configurations. The (-1) bases are required for local I/O expansion that is supported only by the D2-250-1 and D2-260 CPUs. The (-1) bases can be used with all DL205 CPUs and the WinPLC. (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

All of the DL205 CPUs support local I/O. The D2-230 and D2-240 CPUs are limited to one base of local I/O. (The D2-250-1 and the D2-260 CPUs support 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 D2-260 supports local expansion up to five total bases (one CPU base and four expansion bases) and the D2-250-1 supports local expansion up to three total bases (one CPU base and two expansion bases). The D2-230/240 CPUs and WinPLCs do not support local expansion I/O. 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 Master module (H2-ERM) is placed in an I/O slot of the local CPU base. Ethernet Base Controller (EBC) modules serve as the remote slave units and are placed in the CPU slot of one or more remote bases. You can use standard DL205 modules in the remote bases. The Remote Slaves are connected to the Master using Category 5 UTP cables for cable runs up to 100 meters. Use repeaters to extend distances and hubs to expand the number of nodes. Our fiber optic version uses industry standard 62.5/125 ST-style fiber optic cables and can be run up to 2,000 meters.

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

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

ERM Workbench is an easy-to-use Windows-based software utility for configuring the ERM and its remote slaves.

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

Serial remote I/O

The DL205 Serial Remote I/O system also allows you to locate I/O bases at a remote distance from the CPU.

The Remote Master module (D2-RMSM) is placed in an I/O slot of the local CPU base. The Remote Slave module (D2-RSSS) is placed in the CPU slot of one or more remote bases. You can use standard DL205 modules in the remote bases. The Remote Slaves are connected to the Master module in a daisy-chain manner over a twisted pair communication cable. You can assign input and output addresses to the remote I/O points by using setup logic in your RLL program. The Remote Master polls the slaves and sends the remote I/O information to the CPU. The communication between the Remote Master and the CPU is asynchronous to the CPU scan. For this reason, Remote I/O applications should be limited to those that do not require the Remote I/O points to be updated with every scan.

The number of bases supported depends on your choice of Remote I/O communications protocol, Remote Master (RM-NET) or Slice Master (SM-NET). In SM-NET mode, the communications port on the D2-RSSS remote slave can be used to connect to an operator interface or to program/monitor the CPU with *Direct*SOFT; however the communication will not be as fast as using a CPU port.

Remote master protocol (RM-NET)– allows you to connect up to seven remote bases to a single master. The baud rate is fixed at 38.4 Kbaud with a total allowable distance of 3,900 feet.

Slice master protocol (SM-NET)– allows you to connect up to 31 remote bases to a single master. The baud rate is selectable over several ranges with a maximum baud rate of 614.4 Kbaud.

Local and Local Expansion I/O Configurations

Local I/O configurations

Local I/O Configuration

CPU	Total I/O	Max. Inputs	Max. Outputs
D2-230	128	128	128
D2-240	256	256	256
D2-250-1	256	256	256
D2-260	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.
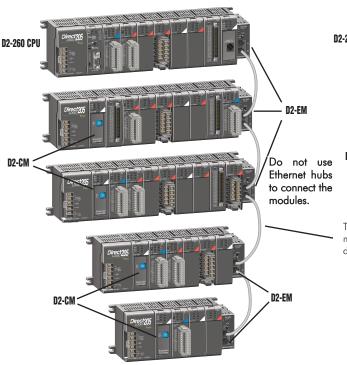
Local expansion I/O configurations using D2-EM and D2-CM modules

D2-260 local expansion system

The D2-260 supports 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 (98 ft.). For more information, refer to the Expansion Module specification pages later in this section.

D2-250-1 local expansion system

The D2-250-1 supports local expansion up to three total bases (one CPU base and two expansion bases). The CPU base can be located at any point in the expansion system layout. The maximum total expansion system cable length is 30m (98 ft.).

D2-260 CPU

D2-CM

D2-CM

D2-CM

D2-EM

D2-EM

Do not use Ethernet hubs to connect the modules.

D2-250-1 CPU

D2-CM

D2-EM

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.

Local Expansion I/O Configuration

CPU	# of Exp. Bases	Total I/O	Max. Inputs	Max. Outputs
D2-250-1	2	768	512	512
D2-260	4	1280	1024	1024

DL-230, DL240 CPUs and WinPLCs do not support local expansion systems
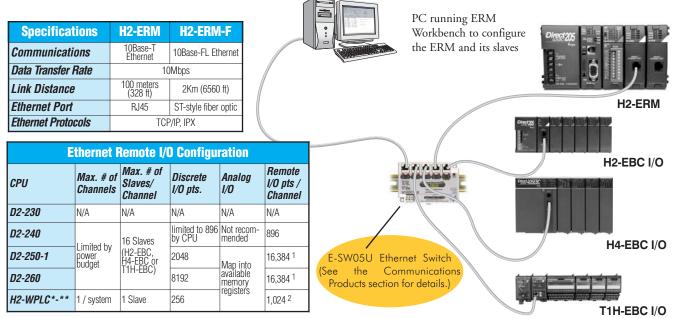
Remote I/O Configurations

Ethernet remote I/O configuration using H2-ERM and EBC slaves

Specifications	H2-ERM	H2-ERM-F
Communications	10Base-T Ethernet	10Base-FL Ethernet
Data Transfer Rate	10Mbps	
Link Distance	100 meters (328 ft)	2Km (6560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	

PC running ERM Workbench to configure the ERM and its slaves

H2-ERM

H2-EBC I/O

H4-EBC I/O

E-SW05U Ethernet Switch (See the Communications Products section for details.)

T1H-EBC I/O

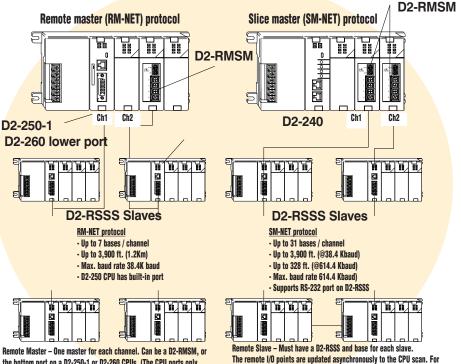| Ethernet Remote I/O Configuration					
CPU	Max. # of Channels	Max. # of Slaves/ Channel	Discrete I/O pts.	Analog I/O	Remote I/O pts / Channel
D2-230	N/A	N/A	N/A	N/A	N/A
D2-240	Limited by power budget	16 Slaves (H2-EBC, H4-EBC or T1H-EBC)	limited to 896 by CPU	Not recom-mended	896
D2-250-1			2048	Map into available memory registers	16,384 [1]
D2-260			8192		16,384 [1]
H2-WPLC*-**	1 / system	1 Slave	256		1,024 [2]

[1] 16,384 I/O pts. can be achieved with 16 fully expanded H4-EBC slaves using V-memory and bit-of-word instructions.
[2] 1024 I/O points can be achieved using 1 fully expanded H4-EBC slave.

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

Serial remote I/O configuration using D2-RMSM and D2-RSSS

Serial Remote I/O Configuration			
CPU	D2-240	D2-250-1	D2-260
Max. # of Channels	2	7	7
Max. I/O pts. per Channel	896 (limited by CPU)	2,048	2,048
RM-NET[1] Bases per Channel	7	7	7
SM-NET[1] Bases per Channel	31	31	31
Total Remote I/O pts.	896 (limited by CPU)	2,048	8,192

Remote master (RM-NET) protocol

Slice master (SM-NET) protocol

D2-RMSM

D2-RMSM

D2-RMSM

Ch1 Ch2

D2-250-1
D2-260 lower port

D2-240   Ch1 Ch2

D2-RSSS Slaves

RM-NET protocol
- Up to 7 bases / channel
- Up to 3,900 ft. (1.2Km)
- Max. baud rate 38.4K baud
- D2-250 CPU has built-in port

D2-RSSS Slaves

SM-NET protocol
- Up to 31 bases / channel
- Up to 3,900 ft. (@38.4 Kbaud)
- Up to 328 ft. (@614.4 Kbaud)
- Max. baud rate 614.4 Kbaud)
- Supports RS-232 port on D2-RSSS

Remote Master – One master for each channel. Can be a D2-RMSM, or the bottom port on a D2-250-1 or D2-260 CPUs. (The CPU ports only support RM-NET.)

Remote Slave – Must have a D2-RSSS and base for each slave. The remote I/O points are updated asynchronously to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the I/O points to be updated on every scan.

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 D2-250-1 and D2-260 CPUs automatically examine 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 D2-250-1 and D2-260 CPUs allow you to manually assign I/O addresses for any or all I/O slots on the local or expansion bases. This feature is useful if you have a standard configuration that you 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-ERM) 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 (D2-RMSM) 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 supported by the D2-250-1 and D2-260 is especially useful when adding an I/O module between existing I/O modules or removing a module.
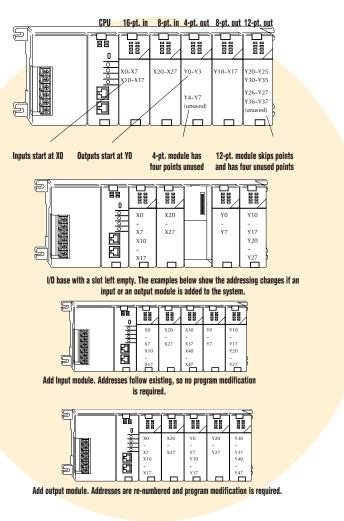
You should always add extra modules to the right of existing modules of the same type to avoid any re-addressing of your I/O points.

CPU | 16-pt. in | 8-pt. in | 4-pt. out | 8-pt. out | 12-pt. out

X0–X7
X10–X17 | X20–X27 | Y0–Y3 / Y4–Y7 (unused) | Y10–Y17 | Y20–Y25 Y30–Y35 / Y26–Y27 Y36–Y37 (unused)

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

X0 - X7 X10 - X17 | X20 - X27 | | Y0 - Y7 | Y10 - Y17 Y20 - Y27

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.

X0 - X7 X10 - X17 | X20 - X27 | X30 - X37 X40 - X47 | Y0 - Y7 | Y10 - Y17 Y20 - Y27

Add Input module. Addresses follow existing, so no program modification is required.

X0 - X7 X10 - X17 | X20 - X27 | Y0 - Y7 Y10 - Y17 | Y20 - Y27 | Y30 - Y37 Y40 - Y47

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

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 a D2-230 CPU

DL205 analog modules map into the CPU as 16-point discrete modules. (They actually consume discrete I/O points.) With a D2-240, D2-250(-1) or D2-260 CPU, analog I/O modules can reside in any I/O slot. If you are using a D2-230 CPU, then the analog module must start on one of the word addresses boundaries. (You may have to rearrange your modules to ensure this happens.)

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[1]	✓	✓	✓
Local Expansion[2] (D2-260 & D2-250-1 only)			
Base Expansion Unit (D2-EM)	✓	✓	
Base Controller Unit (D2-CM)		CPU slot only	
Remote I/O			
Remote Master	✓		
Remote Slave Unit			CPU slot only
Ethernet Remote Master	✓		
CPU Device			
Ethernet Base Controller	CPU slot only		
WinPLC	CPU slot only		
DeviceNET	CPU slot only		
Profibus	CPU slot only		
SDS	CPU slot only		
Specialty modules			
Counter Interface (D2-CTRINT)	Slot 0 only		
Counter I/O (H2-CTRIO)[3]	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] With a D2-230 CPU, the analog module must start on one of the word address boundaries.
[2] When used in expansion bases, the analog update is asynchronous to the PLC.
[3] H2-CTRIO will not work in slot 0 when used with the DL-240, DL-250-1, DL-260. The H2-CTRIO is not supported in expansion bases at this time. The H2-CTRIO will work in slot 0 if used with one of the H2-WPLC units.

I/O Module Point Usage

DC INPUT		RELAY OUTPUT		SPECIALTY MODULES	
D2-08ND3	8 in	D2-04TRS	8* out	D2-EX	None
D2-16ND3-2	16 in	D2-08TR	8 out	D2-CM	None
D2-32ND3	32 in	F2-08TR	8 out	F2-08SIM	8 in
D2-32ND3-2	32 in	F2-08TRS	8 out	D2-CTRINT	8 in 8 out
		D2-12TR	16** out	H2-CTRIO	None
AC INPUT				D2-DCM	None
				F2-DEVNETS-1	None
D2-08NA-1	8 in	**COMBINATION**		F2-SDS-1	None
D2-08NA-2	8 in			H2-EBC	None
D2-16NA	16 in	D2-08CDR	8 in*/8 out*	H2-EBC-F	None
				H2-ECOM	None
DC OUTPUT		**ANALOG**		H2-ECOM-F	None
				F2-CP128	None
D2-04TD1	8* out	F2-04AD-1 & 1L	16 in	H2-PBC	None
D2-08TD1	8 out	F2-04AD-2 & 2L	16 in		
D2-08TD2	8 out	F2-08AD-1	16 in		
D2-16TD1-2	16 out	F2-08AD-2	16 in	**REMOTE I/O**	
D2-16TD2-2	16 out	F2-02DA-1 & 1L	16 out		
F2-16TD1P	16 in/16 out	F2-02DA-2 & 2L	16 out		
F2-16TD2P	16 in/16 out	F2-4AD2DA	16 in/16 out	H2-ERM	None
D2-32TD1	32 out	F2-8AD4DA-1	32 in/32 out	D2-RMSM	None
D2-32TD2	32 out	F2-8AD4DA-2	32 in/32 out	D2-RSSS	None
		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.

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	D2-260 (CPU)	330	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	DV-1000	150	0
	Handheld programmer	D2-HPP	200	0
E	Maximum Current Required		1730	80
F	Remaining Current Available		2600-1520=1080	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	D2-04BDC-2, D2-06BDC2-1, D2-09BDC2-1
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10MΩ at 500 VDC		
Input Voltage Range	85-132 VAC (110 range) 170-264 VAC (220 range) 47-63Hz	10.2-28.8 VDC (24 VDC) with less than 10% ripple	100-264 VDC (125 VDC) with less than 10% ripple
Auxiliary 24 VDC Output	300mA max.	none	300mA max.
Maximum Inrush Current	30A	10A	20A
Maximum Power	80 VA	25W	30W

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 Consumed

Device	5V(mA)	24V Auxiliary
Operator Interface		
DV-1000	150	0
C-more Micro-Graphic	210	0

Power Supplied

Device	Price	5V(mA)	24V Auxiliary	Device	Price	5V(mA)	24V Auxiliary
Bases				**Bases**			
D2-03B-1	<--->	2600	300	D2-06BDC1-1	<--->	2600	None
D2-03BDC1-1	<--->	2600	None	D2-06BDC2-1	<--->	2600	300
D2-04B-1	<--->	2600	300	D2-09B-1	<--->	2600	300
D2-04BDC1-1	<--->	2600	None	D2-09BDC1-1	<--->	2600	None
D2-06B-1	<--->	2600	300	D2-09BDC2-1	<--->	2600	300

Power Consumed

Device	5V(mA)	24V Auxiliary
CPUs		
D2-230	120	0
D2-240	120	0
D2-250-1	330	0
D2-260	330	0
H2-WPLC*-**	680	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
Analog Modules		
F2-04AD-1	50	80
F2-04AD-1L	50	90 mA @ 12V
F2-04AD-2	60	80
F2-04AD-2L	60	90 mA @ 12V
F2-08AD-1	50	80
F2-08AD-2	50	80
F2-02DA-1	40	60 (note 1)
F2-02DA-1L	40	70 @ 12V (note 1)
F2-02DA-2	40	60
F2-02DA-2L	40	70 @ 12V
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-CTRIO	400	0
D2-DCM	300	0
F2-DEVNETS	160	0
F2-SDS-1	160	0
H2-PBC	530	0
H2-EBC(-F)	450, (640)	0
H2-ECOM(-F)	450, (640)	0
H2-ECOM100	300	0
F2-CP128	235	0
Remote I/O		
H2-ERM(-F)	320, (450)	0
D2-RMSM	200	0
D2-RSSS	150	0
Programming Devices		
D2-HPP	200	0

*requires external 5VDC for outputs
Note 1: Add an additional 20 mA per output loop.

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.
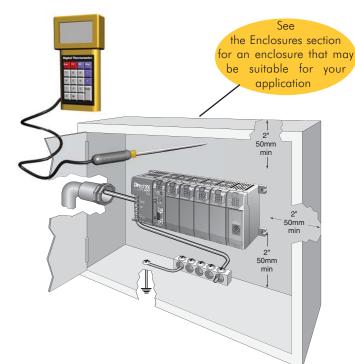
Plan for safety

This catalog should never be used as a replacement for the user manual. The user manual, D2-USER-M (sold separately or 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.
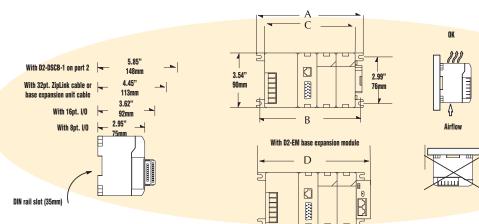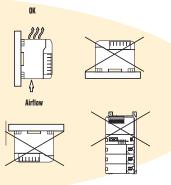
Base dimensions and mounting

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

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

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-DSCB-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

OK

Airflow

With D2-EM base expansion module
D

Company Info.
PLCs
Field I/O
Software
C-more & other HMI
AC Drives
AC Motors
Power Transmiss.
Steppers/ Servos
Motor Controls
Proximity Sensors
Photo Sensors
Limit Switches
Encoders
Current Sensors
Pressure Sensors
Temp. Sensors
Pushbuttons/ Lights
Process
Relays/ Timers
Comm.
Terminal Blocks & Wiring
Power
Circuit Protection
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Appendix
Part Index

Local Expansion Modules

Base Expansion Module
D2-EM `<--->`

Expansion Base Controller Module
D2-CM `<--->`

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*	Max. Inputs	Max. Outputs
D2-260	4	1280	1024	1024
D2-250-1	2	768	512	512
D2-240				
D2-230	These CPUs do not support local expansion systems.			
H2-WPLC*-**				

* Includes CPU base and local expansion bases

Local expansion modules

The D2-260 supports local expansion up to five total bases (one CPU base + four expansion bases), and the D2-250-1 supports local expansion up to three total bases (one CPU base + two 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.

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.
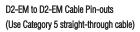
Local expansion requires (-1) bases

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.
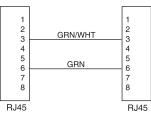
D2-EXCBL-1 local expansion base cable

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 (98 ft.).

8-pin RJ45 Connector
8P8C

1 2 3 4 5 6 7 8

D2-EM to D2-EM Cable Pin-outs
(Use Category 5 straight-through cable)

```
1          1
2          2
3   GRN/WHT   3
4          4
5   GRN      5
6          6
7          7
8          8
RJ45       RJ45
```

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.
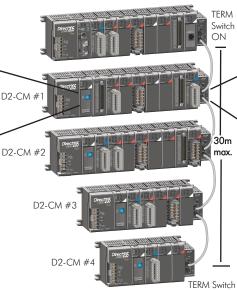
D2-260 expansion system

EXP. Base No.

D2-CM #1

D2-CM #2

D2-CM #3

D2-CM #4

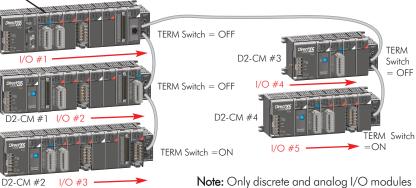TERM Switch ON

30m max.
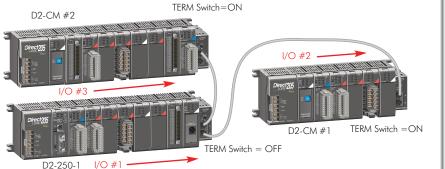
TERM Switch = ON

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

D2-260 expansion system

The D2-260 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 (98 ft.). The red text and arrows in the example to the right indicate the I/O addressing order.

The D2-260 CPU base can be located at any base position in the expansion system.

I/O #1

TERM Switch = OFF

D2-CM #1   I/O #2

TERM Switch = OFF

D2-CM #2   I/O #3

TERM Switch =ON

D2-CM #3

TERM Switch = OFF

I/O #4

D2-CM #4

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.

D2-250-1 expansion system

The D2-250-1 supports local expansion up to three total bases (one CPU base + two expansion bases) and up to a maximum of 768 total I/O points. All discrete I/O Points update every CPU scan while analog I/O are updated asynchronously to the CPU scan. If the analog update time is critical to the application, it is recommended to install the analog modules in the CPU base. The D2-250-1 does not support the use of specialty modules located in the expansion bases. The maximum total expansion system cable length is 30m (98 ft.). The red text and arrows in the example to the right indicate the I/O addressing order.

D2-CM #2

TERM Switch=ON

I/O #2

I/O #3

D2-250-1   I/O #1

TERM Switch = OFF

D2-CM #1   TERM Switch =ON

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

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Ethernet Vs. Serial Remote I/O

I/O throughput

I/O throughput is defined as the time it takes from when an output is set in the ladder logic to when its corresponding input value is equal. This includes the PLC scan time, I/O backplane update time, and I/O module response times.

Testing I/O throughput times

A test was performed by our partner, Host Automation Products, to compare the difference between H2-ERM Ethernet remote I/O and D2-RMSM serial remote I/O throughput times. Host Automation Products supplies the H2-ERM, H2-EBC, H2-ECOM, etc. as well as *Direct*SOFT and DSData Server software.

I/O groups tested

Discrete I/O - D2-16TD1-2 discrete outputs of slot 2 are tied to the D2-16ND3-2 discrete inputs of slot 0.

Analog I/O - F2-02DAS-2 analog output channel 1 is tied to the F2-04AD-2 analog input channel 1 of slot 3. The analog values were scaled from the full 16- bit range down to 12 bit range.

Each group was run independently through the following cycle 256 times:
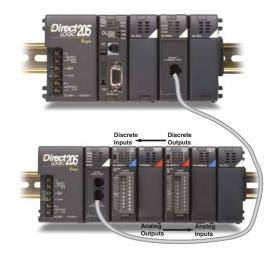
Step 1: Set all outputs to OFF for a random number of scans

Step2: Set all outputs to a random value for a random number of scans

Step 3: Set all outputs to ON for a random number of scans

Step 4: Set all outputs to a random value for a random number of scans

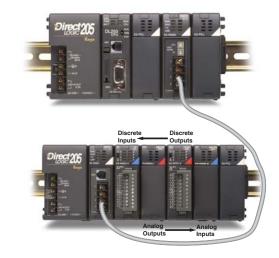Since these four steps are repeated 256 times, there are actually 1,024 samples of I/O throughput.

Test results

The results are listed in the tables at the right. As the number of H2-ERM slaves and I/O points increase, the I/O throughput times will remain flat until 64 analog inputs, 64 analog outputs, or 1,024 discrete I/O points are exceeded. As the number of D2-RMSM slaves and I/O points increase, the I/O throughput times increase proportionally.

H2-ERM / H2-EBC Ethernet Remote I/O System

D2-RMSM / D2-RSSS Serial Remote I/O System

Discrete I/O Test	I/O Throughput Times			
Remote I/O System	Min.	Max.	Avg.	Std. Dev.
H2-ERM / H2-EBC	45ms	71ms	53.32ms	6.14ms
D2-RMSM / D2-RSSS	36ms	56ms	42.29ms	5.81ms

Analog I/O Test	I/O Throughput Times			
Remote I/O System	Min.	Max.	Avg.	Std. Dev.
H2-ERM / H2-EBC	46ms	113ms	62.94ms	14.48ms
D2-RMSM / D2-RSSS	64ms	321ms	117.38ms	37.44ms

Ethernet Remote I/O Master Modules

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

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Ethernet Remote I/O Master Module

H2-ERM   <--->
H2-ERM-F <--->

Overview

The Ethernet Remote Master H2-ERM (-F) connects 240, 250-1 and 260 CPU systems to slave I/O over a high-speed Ethernet link. The H2-ERM can also be used in a WinPLC system, but only one H2-ERM can be used with one slave per system.

Need a lot of I/O?

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

Note: Applications requiring an extremely large number of T1H-EBC analog I/O or H4-EBC 16-channel analog I/O, could exceed the buffer capacity of a single H2-ERM module. In these cases, an additional H2-ERM may be required.

Specifications	H2-ERM	H2-ERM-F
Communications	10BaseT Ethernet	10BaseFL Ethernet
Data Transfer Rate	10Mbps	
Link Distance	100 meters (328 ft)	2K meters (6560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	
Power Consumption	320mA @5VDC	450mA @5VDC
Manufacturer	Host Automation Products, L.L.C.	

Simple connections

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

The PLC, ERM and EBC slave modules work together to update the remote I/O points. These three scan cycles are occurring at the same time, but asynchronously. 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 slaves. 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 slave 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 slaves. ERM workbench supports two methods of configuring the ERM I/O network:
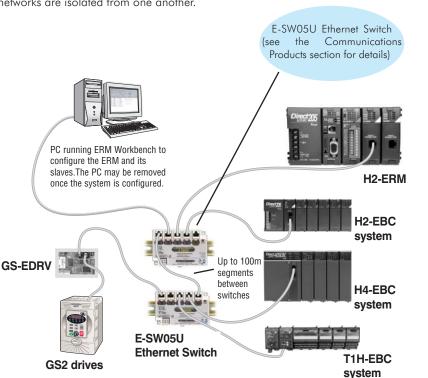
- ERM Workbench PLC Wizard greatly simplifies the configuration procedure when a PLC is used as the CPU interface.
- ERM Workbench configures the I/O network whether the CPU interface is a PLC or WinPLC, and allows access to all ERM I/O network parameters.

ERM Workbench Software

E-SW05U Ethernet Switch (see the Communications Products section for details)

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

GS-EDRV

GS2 drives

E-SW05U Ethernet Switch

Up to 100m segments between switches

H2-ERM

H2-EBC system

H4-EBC system

T1H-EBC system

Ethernet Base Controller Modules

Ethernet Base Controller Modules (EBC)

H2-EBC <--->
H2-EBC100 <--->
H2-EBC-F <--->

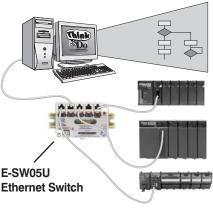| Specifications	H2-EBC	H2-EBC100	H2-EBC-F
Communications	10Base-T Ethernet	10/100Base-T Ethernet	10Base-FL Ethernet
Data Transfer Rate	10 Mbps max.	100 Mbps max.	10 Mbps max.
Link Distance	100 meters (328 ft)	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port / Protocols	RJ45, TCP/IP, IPX	RJ45, TCP/IP, IPX, Modbus TCP/IP, DHCP, HTML configuration	ST-style fiber optic , TCP/IP, IPX
Serial Port / Protocols	RJ12, K-Sequence, ASCII IN/OUT	RJ12, K-Sequence, ASCII IN/OUT Modbus RTU	None
Power Consumption	450 mA	300 mA	640 mA
Manufacturer	Host Automation Products, L.L.C.		

**E-SW05U
Ethernet Switch**

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

The H2-EBC(100) and H2-EBC-F Ethernet Base Controller modules provide a low-cost, high-performance Ethernet link between DL205 I/O and your PC-based control system or WinPLC/DL205/ DL405 CPUs using the H*-ERM module for remote I/O. The H2-EBC100 can also be used to connect your DL205 I/O to a Modbus TCP/IP client (master). The H2-EBC module supports industry standard 10BaseT Ethernet communications. The H2-EBC100 supports industry standard 10/100BaseT Ethernet communications, and the H2-EBC-F module supports 10BaseFL (fiber optic) Ethernet communications standards. The EBC modules are compatible with TCP/IP, IPX and Modbus TCP/IP (H2-EBC100 only) protocols for flexible PC communications. EBC modules offer:

- Lower cost on your *Direct*LOGIC I/O system when compared to competitive I/O
- Virtually unlimited number of I/O points
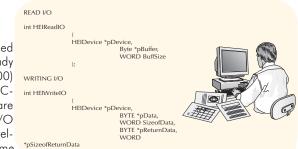
Off-the-shelf solutions

You can purchase PC-based control software that is ready to use with the H2-EBC(100) or H2-EBC-F 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-EBC(100)'s serial port.

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-EBC(100) or H2-EBC-F. The software interface libraries are provided for WIN32, WIN16, and DOS operating systems. The source code is available to developers under a non-disclosure agreement. Visit the technical support link at our Web site, 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
*pSizeofReturnData
    );
```

Easy to use, reliable and fast

The H2-EBC(100) and H2-EBC-F 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 and H2-CTRIO specialty modules. All EBC modules can be configured using NetEdit3, a free Windows software utility. The H2-EBC100 also supports HTML configuration.

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.

Vendor	Product	Web Address
AutomationDirect	KEPDirect EBC I/O Server	www.automationdirect.com
Phoenix Contact	Think & Do Live!, Think & Do Studio	www.phoenixcon.com/software
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.
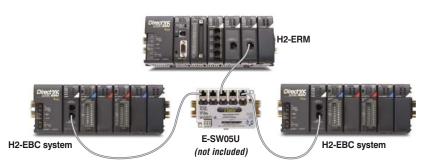
Ethernet Remote I/O Kits

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

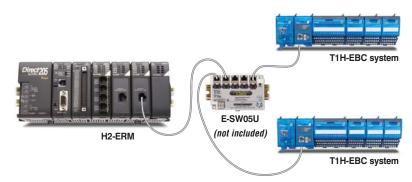Enclosures

Tools

Pneumatics

Appendix

Part Index

Ethernet Remote I/O Kits

H2-ERKIT-x

T12-ERKIT-x

H2-ERKIT-x Ethernet Remote I/O Kits

An H2-ERKIT-x Ethernet Remote I/O Kit includes one H2-ERM Ethernet Remote Master module and up to "x" number of H2-EBC Ethernet Base Controller modules by adding -1, -2, -3, etc. as the part number suffix. (See the table below.) An H2-ERKIT-2 is shown below, which includes one H2-ERM and two H2-EBC modules. All other necessary hardware, including the CPU, I/O modules, bases, cables and Ethernet hub (if required), is sold separately.

H2-ERM

H2-EBC system   **E-SW05U (not included)**   **H2-EBC system**

Example of an Ethernet remote I/O system using an H2-ERKIT-2. CPU, bases, I/O modules, Ethernet hub, etc. are sold separately.

Overview

The DL205 PLC Ethernet Remote I/O system is available at prices that are better than many serial remote I/O combinations. This means you can make the switch from Serial PLC Remote I/O to Ethernet Remote I/O and gain all the ease-of-use, diagnostics, and perform-ance of Ethernet connectivity, for little or no additional installation cost.

Additionally, the Ethernet Remote I/O kits are offered at a considerable savings when compared to purchasing the Ethernet Remote Master (ERM) and Slaves (EBC) separately.

Kits are available starting as small as one ERM (Master) and one EBC (Slave). The Ethernet Remote I/O kits are offered in both DL205 and Terminator I/O combi-nations to provide an easy way to choose the Ethernet Remote I/O products that best fit your application.

Example kit shown : H2-ERKIT-2 includes one H2-ERM and two H2-EBCs.

H2-ERKIT-2 =   **+**   **+**

H2-ERM   **H2-EBC**   **H2-EBC**

H2-ERKIT-x Ethernet Remote I/O Kits

Kit Number	Kit Contents	Price
H2-ERKIT-1	1 H2-ERM + 1 H2-EBC	<--->
H2-ERKIT-2	1 H2-ERM + 2 H2-EBCs	<--->
H2-ERKIT-3	1 H2-ERM + 3 H2-EBCs	<--->
H2-ERKIT-4	1 H2-ERM + 4 H2-EBCs	<--->
H2-ERKIT-5	1 H2-ERM + 5 H2-EBCs	<--->
H2-ERKIT-6	1 H2-ERM + 6 H2-EBCs	<--->
H2-ERKIT-7	1 H2-ERM + 7 H2-EBCs	<--->
H2-ERKIT-8	1 H2-ERM + 8 H2-EBCs	<--->
H2-ERKIT-9	1 H2-ERM + 9 H2-EBCs	<--->
H2-ERKIT-10	1 H2-ERM + 10 H2-EBCs	<--->

Ethernet Remote I/O Kits

T12-ERKIT-x Ethernet Remote I/O Kits

A T12-ERKIT-x Ethernet Remote I/O Kit includes one H2-ERM Ethernet Remote Master module and up to "x" number of T1H-EBC Ethernet Base Controller modules by adding -1, -2, -3, etc. as the part number suffix. (See the table to the right.)

A T12-ERKIT-2, shown below, includes one H2-ERM and two T1H-EBC modules. All other necessary hardware, including the CPU, I/O modules, bases, cables and Ethernet hub (if required), is sold separately.

T1H-EBC system

H2-ERM

E-SW05U
(not included)

T1H-EBC system

Example of an Ethernet remote I/O system using a T12-ERKIT-2. CPU, bases, I/O modules, Ethernet hub, etc. are sold separately.

T12-ERKIT-x Ethernet Remote I/O Kits		
Kit Number	**Kit Contents**	**Price**
T12-ERKIT-1	1 H2-ERM + 1 T1H-EBC	<--->
T12-ERKIT-2	1 H2-ERM + 2 T1H-EBCs	<--->
T12-ERKIT-3	1 H2-ERM + 3 T1H-EBCs	<--->
T12-ERKIT-4	1 H2-ERM + 4 T1H-EBCs	<--->
T12-ERKIT-5	1 H2-ERM + 5 T1H-EBCs	<--->
T12-ERKIT-6	1 H2-ERM + 6 T1H-EBCs	<--->
T12-ERKIT-7	1 H2-ERM + 7 T1H-EBCs	<--->
T12-ERKIT-8	1 H2-ERM + 8 T1H-EBCs	<--->
T12-ERKIT-9	1 H2-ERM + 9 T1H-EBCs	<--->
T12-ERKIT-10	1 H2-ERM + 10 T1H-EBCs	<--->

Example kit: T12-ERKIT-2 includes one H2-ERM and two T1H-EBCs.

T12-ERKIT-2 = H2-ERM + T1H-EBC + T1H-EBC

Serial Remote I/O Master/Slave Modules

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

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Part Index

Remote I/O Master Module
D2-RMSM   <--->

Remote I/O Slave Module
D2-RSSS   <--->

Overview

You can use remote I/O in addition to the I/O in the local base. The remote master is located in the CPU base and communicates with the remote slaves via shielded twisted-pair cable. To use a remote I/O system, you will need the following:

Remote master

One master can be used for each channel. It can be a D2-RMSM, or the bottom port on a D2-250-1 or D2-260 CPU. (The CPU port only supports RM-NET.)
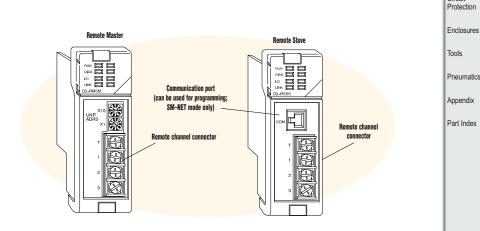
Remote slave

A D2-RSSS and I/O base must be used for each slave.

The remote I/O points are updated asynchronously to the CPU scan. For this reason, remote I/O applications should be limited to those that do not require the I/O points to be updated on every scan.

Remote Master Specifications	
Module Type	Intelligent device
Number of Masters per CPU	Two maximum for D2-240 and eight (seven + one CPU port) for the D2-250(-1) and D2-260 (built-in master feature in D2-250(-1) and D2-260 bottom port can be used as a master for RM-NET and would count as one master if used). D2-230 does not support remote I/O.
Maximum Number of Channels	CPU dependent as above
	Channels may be split between RM-NET and SM-NET if necessary.

Channel Capacity:	RM-NET	SM-NET
Maximum # Slaves	7	31
Baud Rates	19.2K, 38.4K baud	Selectable (19.2K, 38.4K, 153.6K, 307.2, 614.4K baud)
Transmission Distance	3,900 ft. (1.2Km)	3,900 feet (1.2Km) @ 19.2 K or 38.4K baud
		1,968 feet (600m) @ 153.6K baud
		984 feet (300m) @ 307.2K baud
		328 feet (100m) @ 614.4K baud

Communication to Slaves	RS-485 via twisted pair with shield @ 38.4 Kbaud
Recommended Cable	Belden 9841 or equivalent - 120 ohm impedance, 12pF/ft
Terminal Type	Fixed
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Internal Power Consumption	200 mA maximum
Manufacturer	Koyo Electronics

Remote Slave Specifications	
Maximum Slave Points per CPU	No remote I/O for D2-230 D2-240, D2-250(-1), D2-260 support a maximum of 2048 points per channel. However, actual I/O available is limited by available I/O points and number of local I/O being used. The D2-240 has a total of 320 X input, 320 Y outputs, and 256 control relays available to share between local and remote I/O. The D2-250(-1) has a total of 512 X inputs, 512 Y outputs and 1024 control relays to share between local and remote I/O. The D2-260 has 1024 X inputs, 1024 Y outputs, 2048 control relays, 2048 GX inputs and 2048 GY outputs to share between local and remote I/O points.
I/O Addresses Used	I/O modules in slave bases do not automatically consume any standard input and output points. You select which points are consumed by setup instructions in your RLL program.
Terminal Type	Fixed
Communications Port	RS-232, 9.6 Kbaud (same as top port on CPUs, SM-NET mode only)
Base Power Requirement	200 mA maximum
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	Koyo Electronics

Serial Data Communications Module

Data Communications Module

D2-DCM <--->

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
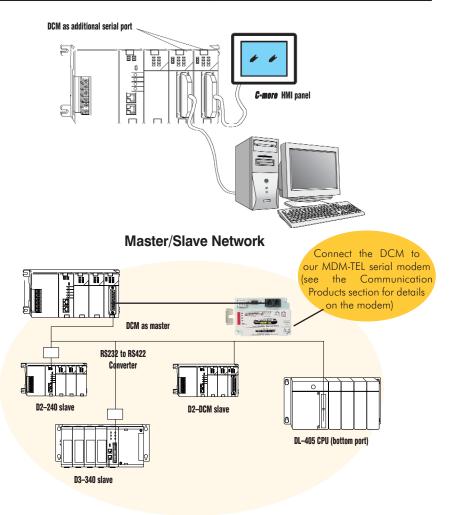- Network interface to a Modbus® network using the RTU protocol

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 master or network slave.

Specifications	
Module Type	Intelligent
Modules per CPU	7 maximum, any slot except slot 0, CPU base only
CPUs Supported	D2-240 (firmware V1.8 or later), D2-250-1 and D2-260
Communications	RS-232/422 signal levels, *Direct*NET Master/Slave, K-sequence or Modbus RTU Slave 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	300 mA maximum at 5 VDC, (supplied by base power supply)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	Koyo Electronics

DCM as additional serial port

C-more HMI panel

Master/Slave Network

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

DCM as master

RS232 to RS422 Converter

D2–240 slave

D2–DCM slave

D3–340 slave

DL–405 CPU (bottom port)

Modbus RTU interface

The DCM can be used as a slave 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 D2-250-1 and D2-260 CPUs can act as a Modbus master.

Serial Module for WinPLC and EBC Systems

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

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Comm.

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Serial Communications Module for WinPLCs & EBCs

H2-SERIO   **<--->**

H2-SERIO Specifications	
Module Type	Intelligent module for use with H2–WPLC*-** or PC/EBC system
# of Serial Ports per Module	3
# of modules supported per WinPLC	3
# of modules supported per EBC node	3
Protocols Supported	Serial ASCII and Modbus RTU slave
Connector	RJ12 jack
Power Consumption	210 mA @ 5 VDC
Operating Environment	0 to 60°C (32°F to 140°F), 5% to 95% RH (non-condensing)
Manufacturer	Host Automation Products, L.L.C.

Serial I/O module for WinPLCs

Add serial ports to your WinPLC system by simply plugging the H2-SERIO modules into the DL205 I/O base. This serial module is used exclusively with the WinPLC. The WinPLC communicates with the H2–SERIO module across the DL205 backplane.

Up to ten serial ports on a WinPLC system

The WinPLC has one built-in serial port. You can add as many as nine additional serial ports for Think & Do Studio or Think & Do Live! applications requiring multiple serial devices, such as barcode scanners. Connect to just about any serial device that communicates ASCII protocol. The H2-SERIO can also serve as a Modbus RTU slave.

Processing large amounts of serial data with a WinPLC

While the H2-SERIO 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 modules, especially in a WinPLC local base with an H2-ERM or H2-CTRIO.

Separate communications parameters for each port

Use Think & Do software packages to set baud rate, parity, data bits, and stop bits for each serial port. Choose from 300 baud to 57.6K baud communication speeds. Think & Do Studio or Think & Do Live! allows each port to be designated as a Modbus slave or a generic serial device. Each port on the H2–SERIO module is capable of full hardware hand-shaking.
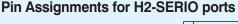
Easy serial communications

All Think & Do PC control software products include advanced string and array functions that make transmitting, receiving and manipulating serial data a snap.

Using H2-SERIO in a PC-based control EBC system

Think & Do Studio version 6.5 supports the use of up to three H2-SERIO modules per EBC node in a PC-based control system. The master must be a PC running Studio 6.5 or later. This does not apply to a WinPLC system with an ERM module used for remote I/O.

The Think & Do features listed on this page for the WinPLC (receiving and manipulating data) also apply to a PC running the Think & Do software.

Pin Assignments for H2-SERIO ports

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)

RJ12 (6P6C) Female Modular Connector

Ethernet Communications Modules

Ethernet Communications Module

H2-ECOM   <--->
H2-ECOM100 <--->
H2-ECOM-F   <--->

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)
- 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 master. 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 our KEP*Direct* I/O Server to link to your favorite HMI/SCADA, data historian, MES or ERP software to *Direct*LOGIC PLCs. Our Lookout*Direct* HMI and our DataWorx data collection software include ECOM drivers. *Direct*SOFT Programming Software

can be used to monitor or update the program in any *Direct*LOGIC PLC on the network.

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, and fiber optic cables can be run up to 2,000 meters. Fiber optic cables virtually eliminate electrical noise problems. Use repeaters to extend distances and expand the number of nodes.

Our HA-TADP (10/100Base-T) PC network adapter card and E-SW05U Ethernet switch is compatible with the ECOM modules. See the Communications Products section for information on these items.

ECOM starter kit

The H2-ECOM-START gives you everything you need to make your first Ethernet network simple to build. It contains an H2-ECOM module and instruction manual, a network adapter card (PCI) for your PC, a crossover cable, and a Software Product Showcase Demo CD. The CD contains demo versions of our software products that support the ECOM Modules. See the Software Products section for information on the available software packages.

H2-ECOM100 *IBox* communications instructions

Over 25 Communications *IBox* instructions are available when using the H2-ECOM100 with a DL250-1 or DL260 PLC and *Direct*SOFT5 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(-F) modules

See the following page for example Communications *IBox* instructions.

The H2-ECOM100 supports the Industry Standard Modbus TCP Client/Server Protocol

Message in

Message is sent out of port only connected to device

See the Communications section for details on the E-SW05U Ethernet Switch

Specifications	H2-ECOM	H2-ECOM100	H2-ECOM-F
Communications	10Base-T Ethernet	10/100Base-T Ethernet	10Base-FL Ethernet
Data Transfer Rate	10 Mbps max.	100 Mbps max.	10 Mbps max.
Link Distance	100 meters (328 ft)	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port	RJ45	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	TCP/IP, IPX, Modbus TCP, DHCP, HTML configuration	TCP/IP, IPX
Power Consumption	450 mA @ 5VDC	300 mA @ 5 VDC	640 mA @ 5 VDC
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 (master) or as a server (slave) 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.
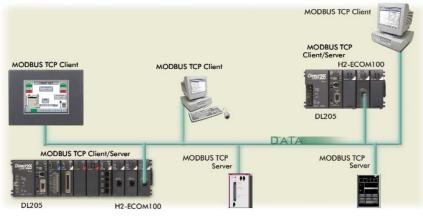
Modbus TCP communications architecture

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 (DL240/250-1/260, all H2 series ECOMs and all *Direct*SOFT versions). If you're using our new DirectSOFT5 programming software, a DL250-1 or DL260 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 DL250-1/260 and DSOFT5 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 DL50-1/260 CPU and *Direct*SOFT5 are required to use the *IBox* instructions.

ECOM100 Send EMail IBox
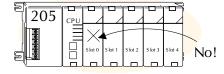
NetEdit3 software

NetEdit3 Software ships free with the ECOM User Manual. 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. You don't have to use an IP address, but you can if it's necessary for your network. 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 *Direct*SOFT 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 D2-240, D2-250, D2-250-1 or D2-260 CPUs with the ECOM modules. The D2-230 CPU and D2-CM bases do not support the ECOM modules.

PROFIBUS™ Slave Base Controller

PROFIBUS™ Slave Base Controller

H2-PBC <--->

Specifications	
Module Location	CPU slot of any DL205 base
Module Type	CPU device
Maximum Expansion	126 stations, 32 stations per segment, 9 repeaters in a row
Communications	RS-485 PROFIBUS, PROFIBUS-DP. Baud rate selectable from 9.6 Kbaud to 12 Mbaud.
Module Connectors	PROFIBUS 9-pin D-shell, RJ-12 serial (for configuration only*)
Internal Power Consumption	530 mA maximum at 5VDC (supplied by base power supply)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	Host Automation Products, L.L.C.

* The serial port is used only for configuration of the H2-PBC firmware.

Overview

If you are using a PROFIBUS™ controller network, the DL205 I/O sub-system can help reduce the cost of your overall application. The H2-PBC module allows the micro-modular DL205 I/O sub-system to be linked with a PROFIBUS master controller. PROFIBUS is a control bus that provides a common method to connect automation equipment with devices on a single network and significantly reduces hardwiring costs. PROFIBUS provides specifications for information exchanged between nodes, such as controller data associated with low level device and configuration parameters that are individually related to system operations.

How it works

The H2-PBC module is a PROFIBUS slave, which can be plugged into the CPU slot of the DL205 micro-modular family of I/O bases. The module reports all identification data, diagnostic information, and parameters that control the module operation. The H2-PBC module scans and reports all discrete and analog I/O data to a PROFIBUS Master. The AC externally-powered DL205 I/O base units contain a 24 VDC, 0.3A power supply for simple wiring of sensors and actuators into the DL205 I/O modules, and for controlling them with a PROFIBUS Master. Using our Profibus I/O sub-system will increase installation flexibility and save on wiring costs. The H2-PBC module supports all DL205 discrete and analog I/O modules and the H2-CTRIO module.

The PROFIBUS Slave Base Controller also offers the following:

- **Cost-effectiveness:** Hardwiring cost is reduced with a single network for devices.
- **Easy connectivity**: Low-cost installation is easy to implement and maintain.
- **Diagnostics**: Advanced error diagnostics not commonly available in traditional systems are supported.
- **High baud rates**: Baud rates bring response time down to 10ms per device.
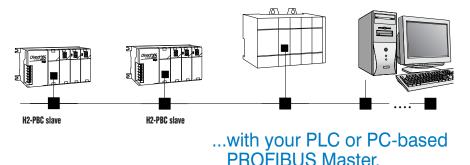- **LED indicators**: Provide quick indication of DL205 power and operating mode.

Please Note:

1. The PROFIBUS Slave Base Controller module H2-PBC is a PTO-certified PROFIBUS-compliant slave I/O interface product.
See www.profibus.com for more information.

2 For use with Think & Do Software, we recommend the SST PROFIBUS PCI Master Card, part number 5136-PFB-PCI. (AutomationDirect does not provide this interface).
See www.mysst.com for more information.

Connect our micro-modular DL205 I/O…

H2-PBC slave   **H2-PBC slave**   . . . .

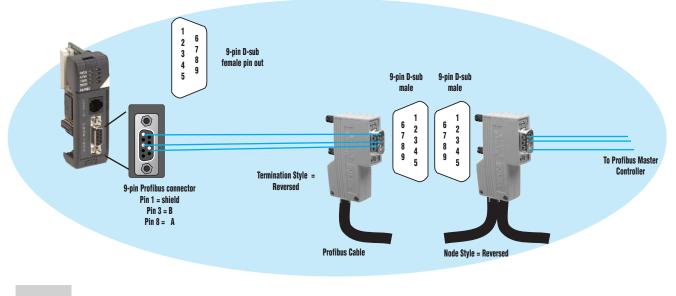## …with your PLC or PC-based PROFIBUS Master.

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

PROFIBUS Slave Base Controller

Baud	Max. Segment Length		Max. Expansion	
	Feet	*Meters*	*Feet*	*Meters*
9.6 Kbps	3278	1,000	3,2786	1,0000
19.2 Kbps	3278	1,000	3,2786	1,0000
93.75 Kbps	3278	1,000	3,2786	1,0000
187.5 Kbps	3278	1,000	3,2786	1,0000
500 Kbps	1311	400	1,3114	4,000
1.5 Mbps	655	200	6,557	2,000
3 Mbps	327	100	3,270	1,000
6 Mbps	327	100	3,270	1,000
12 Mbps	327	100	3,270	1,000
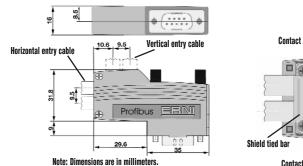
Recommended Cables	
Siemens	6XV1 830 0AH10
Belden	3079A

9-pin D-sub female pin out

9-pin D-sub male

9-pin D-sub male

9-pin Profibus connector
Pin 1 = shield
Pin 3 = B
Pin 8 = A

Termination Style = Reversed

Profibus Cable

Node Style = Reversed

To Profibus Master Controller

ERNI ER*bic* connectors for Profibus networks

ERNI ER*bic* connectors are available for the Profibus Base Controller. They are available in node and termination reversed styles for DL205 and PC connections, horizontal or vertical cable entry, and termination or daisy-chain configurations.

ERNI ER*bic* connectors		
Part No.	*Description*	*Device*
104577	Profibus-certified reverse node horizontal connector. 9-pin Male D-Sub	H2-PBC or any Profibus ISA/PCI Personal Computer Master/Slave Card
104322	Profibus-certified reversed termination horizontal connector. 9-pin Male D-Sub	H2-PBC or any Profibus ISA/PCI Personal Computer Master/Slave Card

Horizontal entry cable

Vertical entry cable

Note: Dimensions are in millimeters.

Contact A   Contact B

Shield tied bar

Contact A   Contact B

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

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Appendix

Part Index

DeviceNet™ Slave Module

DeviceNet™ Slave Module

F2-DEVNETS-1 <--->

wiring costs. The F2-DEVNETS-1 module supports all DL205 discrete and analog I/O modules.

The DeviceNet slave module also offers:

- **Cost effectiveness**: Hardwiring cost is reduced with a single network for devices.
- **Easy connectivity**: Low-cost four wire installation is easy to implement and maintain.
- **Innovative technology**: Power is integrated into the device.
- **Diagnostics**: Advanced error diagnostics not commonly available in traditional systems are available.
- **Highly dependable**: Fast response and high reliability are featured for demanding applications.
- **LED indicators**: Provide quick indication of DL205 power and operating mode.

Overview

If you are using a DeviceNet™ controller network, the DL205 I/O sub-system will help reduce the cost of your overall application. The F2-DEVNETS-1 (slave) module allows the popular micro-modular DL205 I/O sub-system to be linked with a DeviceNet master controller. DeviceNet is a low-cost control bus that provides a common method to connect automation equipment with devices on a single network. DeviceNet and it significantly reduces hard wiring costs. The DeviceNet standard provides specifications for information exchanged between nodes, such as controller data associated with low level device and configuration parameters individually related to system operations.

How it works
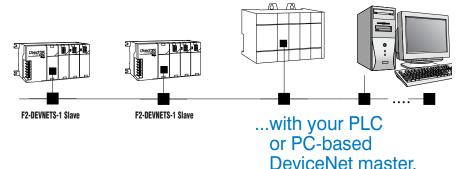
The F2-DEVNETS-1 module is a DeviceNet slave, which can be plugged into the CPU slot of the DL205 micro-modular family of I/O bases. This module maintains a database with all the identification data, diagnostic information, and parameters that control the module operation. The F2-DEVNETS-1 module scans and reports all discrete and analog I/O data to a DeviceNet Master. The AC externally powered DL205 I/O base units contain a 24 VDC, 0.3A power supply for simple wiring of sensors and actuators into the DL205 I/O modules, and for controlling them with a DeviceNet Master. Using our DeviceNet I/O sub-system will increase installation flexibility and save on

F2-DEVNETS-1 Interface Specifications	
Module Type	CPU device
DeviceNet Compatibility	Predefined Group 2 Master/Slave communications.
Number of I/O	(256 inputs, 256 outputs max.) Defined by number of slots per base. (1024 inputs, 1024 outputs max.) Defined by DeviceNet slave specifications
Module Location	CPU slot of any DL205 base
Maximum Field Devices per bus	64 (see table on next page)
Node Address / CAN Baud Rate	Jumper selectable
Communication to Field Devices	Standard 4-wire shielded cable to cabinet connector, molded 4-wire cable @ up to 500 Kbps to field devices
Module Connector	ODVA approved pluggable screw connector
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Internal Power Consumption	160 mA @ 5VDC
Manufacturer	FACTS Engineering

Connect our micro-modular DL205 I/O…

F2-DEVNETS-1 Slave   **F2-DEVNETS-1 Slave**

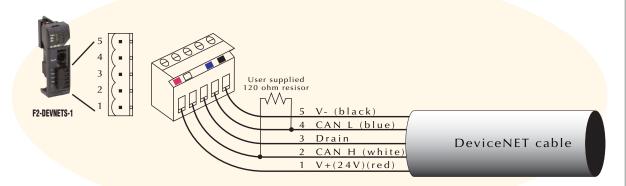## …with your PLC or PC-based DeviceNet master.

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

DeviceNet Slave Module

I/O base and network considerations

All discrete and analog I/O modules are supported by the F2-DEVNETS-1 slave module. Choose your DL205 base(s) and I/O modules using the the information in this section.

DL205 Style of I/O Modules Supported	
Discrete Types	**Analog Types**
4-point Input	4-channel Input
8-point Input	8-channel Input
16-point Input	2-channel Output
32-point Input	8-channel Output
4-point Output	4-channel In/ 2 channel Output
8-point Output	4-channel thermocouple
16-point Output (includes 12 pt)	4-channel RTD
32-point Output	
4-point Input/4 point Output	

F2-DEVNETS-1

5
4
3
2
1

User supplied
120 ohm resisor

5 V- (black)
4 CAN L (blue)
3 Drain
2 CAN H (white)
1 V+(24V)(red)

DeviceNET cable

F2-DEVNETS-1 features

The F2-DEVNETS-1 module replaces the F2-DEVNETS module and adds the following enhancements:

- DIP Switch selectable node address and CAN baud rate
- ODVA approved pluggable screw connectors
- 1,024 inputs and 1,024 outputs as defined by DeviceNet Slave specifications (256 physical inputs and 256 physical outputs defined by the number of slots per I/O base)

The F2-DEVNETS-1 can be used as a direct replacement for the previous F2-DEVNETS through a simple jumper selection procedure.

Trunk Length		Baud Rate	Branch Length		Devices
Feet	*Meters*	*Bits/sec*	*Feet*	*Meters*	
328	100	500K	20	6	64
820	250	250K	20	6	64
1,640	500	125K	20	6	64

For other DeviceNet specifications, compatible products and latest DeviceNet information, contact:
Open DeviceNet Vendor Association
Contact: Executive Director Katherine Voss
Phone: 734/975-8840 • Fax: 734/922-0027
Internet address: http://www.odva.org
e-mail: odva@odva.org
ODVA, Inc. • 1099 Highland Drive, Suite A, Ann Arbor, MI. 48108

Please Note:

1. *The DeviceNet Slave module F2-DEVNETS-1 is an ODVA certified DeviceNet-compliant slave I/O interface product.*
   See www.odva.com for more information.

2. *For use with Think & Do Software, we recommend the SST DeviceNet PCI Master Card, part number 5136-DNP-PCI. (AutomationDirect does not provide this interface.)*
   See www.mysst.com for more information.

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

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Part Index

Smart Distributed System (SDS) I/O

Smart Distributed System Module
F2-SDS-1   <--->

Overview

If you are already using or planning to implement an SDS™ controller network, using the F2-SDS-1 module and I/O sub-system can help reduce the cost of your overall application. The Smart Distributed System™ (SDS) provides a means to connect automation equipment and devices on a single network, which eliminates expensive hardwiring. This standard communication media and software provides a low-cost method for controllers and devices to communicate low-level data at high speeds. The SDS standard provides specifications for information exchange between nodes, as well as device-level diagnostics not normally found in other I/O systems. The F2-SDS-1 module allows the well-proven micro-modular DL205 I/O system to be controlled by your SDS master controller.
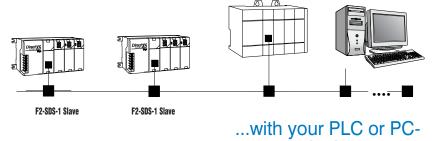
How it works

The F2-SDS-1 module plugs into the CPU slot of any DL205 I/O base. The module maintains a database with all identification data, diagnostic information, and parameters that are configured within the base and control the operation of the SDS slave module and the I/O. The F2-SDS-1 slave will monitor and report discrete and analog I/O module data to an SDS Master. All AC externally powered DL205 I/O base units contain a 24 VDC, 0.3A power supply for simple wiring of sensors and actuators into the DL205 I/O modules, and for controlling them with an

SDS Master. The F2-SDS-1 module supports all DL205 discrete and analog I/O modules. The SDS also offers:

- **Cost effectiveness**: SDS offers inexpensive controller and industrial DL205 I/O sub-system.
- **Easy connectivity**: SDS is a low-cost wiring system that's easy to implement and maintain.
- **Innovative technology**: Power is integrated into the device.
- **Diagnostics**: SDS offers advanced error diagnostics not commonly found in traditional systems.
- **High baud rates**: Baud rate brings response time down to 0.10ms per device.
- **LED indicators**: Provides indication of DL205 Smart Distributed System.

F2-SDS-1 Interface Specifications	
Module Type	CPU device
Module Location	CPU slot of any DL205 base
Number of I/O	Defined by number of slots per base
Maximum Field Devices per Bus	126 (see table next page)
Max SDS Addresses per CPU	8 discrete, 64 analog
Communication to Field Devices	Standard 4-wire shielded cable to cabinet connector, molded 4-wire cable @ up to 1Mbps to field devices.
Module Connector	5-position removable terminal (European style)
Operating Environment	0ºC to 60ºC (32ºF to 140ºF), 5% to 95% humidity (non-condensing)
Internal Power Consumption	160 mA @ 5VDC
Manufacturer	FACTS Engineering

Connect our micro-modular DL205 I/O…

F2-SDS-1 Slave   F2-SDS-1 Slave
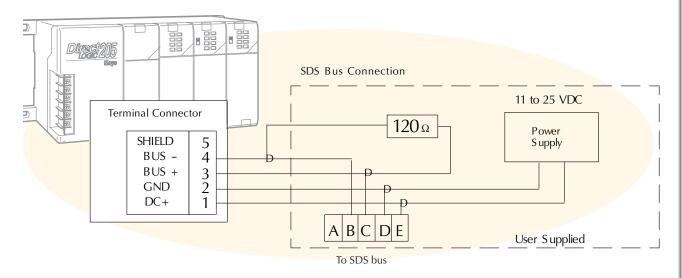
…with your PLC or PC-based SDS master.

Ask for our D2-INST-M Installation and I/O Manual for complete information about DL205 I/O modules, power budgeting, and installation and wiring. This catalog does not cover CPU-slot controllers.

SDS I/O

I/O base and network considerations

All discrete (except 32-pt.) and analog I/O modules are supported by the F2-SDS-1 slave module. Specialty modules are not supported by the F2-SDS-1 module.

DL205 Style of I/O Modules Supported	
Discrete Types	*Analog Types*
4-point Input	4-channel Input
8-point Input	8-channel Input
16-point Input	2-channel Output
4-point Output	4-channel In/ 2 channel Output
8-point Output	4-channel Temperature
16-point Output (includes 12 pt)	
4-point Input/4 point Output	

Trunk Length		Baud Rate	Branch Length		Devices
Feet	*Meters*	*Bits/sec*	*Feet*	*Meters*	
75	22.8	1M	1	0.3	64
300	91.4	500K	3	0.9	126
600	182.8	250K	6	1.8	126
1,500	457.2	125K	12	3.6	126

Other SDS specifications, compatible products, and latest SDS literature information are made available through:

Honeywell MICRO SWITCH Division
Internet: http://www.honeywell.com
e-mail:info@micro.honeywell.com

Comments to:
SDS Council, IL50/B4-523
Honeywell Micro Switch Division
11 West Spring Street
Freeport, IL 61032

Phone: (800)537-6945 • Fax: (815) 235-5623

Company Info.

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Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

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Part Index

CoProcessor Module

Triple-port BASIC CoProcessor

F2-CP128 <--->

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.
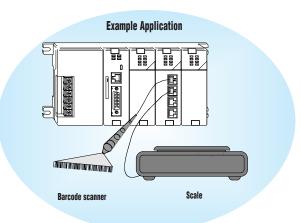
BASIC CoProcessor applications

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 master and slave 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 Port3*: 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 master and slave 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	235 mA @ 5VDC
Operating Environment	0ºC - 60ºC (32ºF - 140ºF), 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

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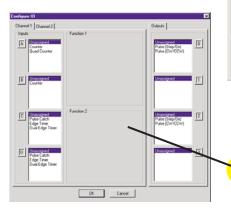Appendix

Part Index

DL205 High-Speed Counter I/O Module

Overview

The High-Speed Counter I/O (CTRIO) module is 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 CTRIO 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 module has its 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-CTRIO module is designed to work with incremental encoders or other field devices that send pulse outputs

CTRIO features

The CTRIO modules offer 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 100 kHz, or 4 single channel counters up to 100 kHz 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 (20 Hz - 25 kHz 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 runs under Windows 98/2000/XP and NT 4.0 SP5 or later.

CTRIO Workbench main configuration screen

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.

*Direct*LOGIC DL205 PLC

You can use the H2-CTRIO module with the D2-240, D2-250(-1) and D2-260 CPUs. (It is not supported in local expansion bases or in D2-RSSS serial remote I/O bases.)

DL205 Win PLC

The H2-CTRIO module can be used in DL205 WinPLC systems (H2-WPLC*-**).

PC-based Ethernet I/O control systems

The H2-CTRIO module can be used in PC-based control systems using the H2-EBC interface module

ERM to EBC systems

The H2-CTRIO module is supported in H2-EBC slaves in H*-ERM systems. This includes the supported DL205 CPUs and WinPLC systems.CTRIOs consume 96 inputs and 96 outputs when used in ERM/EBC expansion bases.

Profibus systems

The H2-CTRIO module can be used in Profibus systems using the H2-PBC slave interface module.

DL205 High-Speed Counter

I/O Specifications

General	
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	400mA 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	2500V I/O to Logic, 1000V among Input Channels and All Outputs

H2-CTRIO Input Specifications	
Inputs	8 pts sink/source 100 kHz max.
Minimum Pulse Width	5 μsec
Input Voltage Range	9-30 VDC
Maximum Voltage	30 VDC
Input Voltage Protection	Zener Clamped at 33 VDC
Rated Input Current	8 mA typical 12mA maximum
Minimum ON Voltage	9.0 VDC
Maximum OFF Voltage	2.0 VDC
Minimum ON Current	5.0 mA (9 VDC required to guarantee ON state)
Maximum OFF Current	2.0 mA
OFF to ON Response	Less than 3 μsec
ON to OFF Response	Less than 3 μsec

H2-CTRIO Output Specifications	
Outputs	4 pts, independently isolated, current sourcing or sinking FET Outputs: open drain and source with floating gate drive
Voltage range	5 VDC - 36 VDC
Maximum voltage	36 VDC
Output clamp voltage	60 VDC
Maximum load current	1.0 A
Maximum load voltage	36 VDC
Maximum leakage current	100 μA
Inrush current	5 A for 20 ms
OFF to ON Response	less than 3 μsec
ON to OFF Response	less than 3 μsec
ON state V drop	0.3 V max.
External power supply	for loop power only, not required for internal module function*
Overcurrent protection	15 A 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

* User supplied power source required for stepper drive configuration.

H2-CTRIO 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-CTRIO Output Resources	
Pulse output / Discrete outputs	Pulse outputs: 2 channels (2 outputs each channel) Discrete outputs: 4 pts.
Resource Options	Pulse outputs: pulse/direction or cw/ccw; Profiles:Trapezoid, S-Curve, Symmetrical S-Curve, Dynamic Position, Dynamic Velocity, Home Search, Velocity Mode, Run to Limit Mode and 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)

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

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Proximity Sensors

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DL205 High-Speed Counter

Status indicators

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

H2-CTRIO LED Diagnostic Definitions		
LED OK	*LED ER*	*Description*
ON	OFF	All is well - RUN Mode
ON	ON	Hardware Failure
Blinking	Blinking	Boot Mode - Used for Field OS Upgrades
Blinking	OFF	Program Mode
OFF	Blinking	Module Self-diagnostic Failure
OFF	ON	Module Error Due to Watchdog Timeout
OFF	OFF	No Power to Module

H2-CTRIO 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-CTRIO 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).
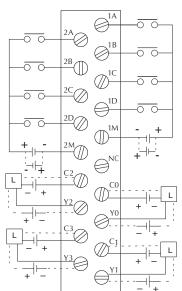
Remember that the internal jumpers can be used to connect the input commons or outputs/output commons together.
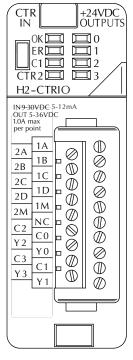
The module is configured, using CTRIO Workbench, to accommodate the user's application. The function of each input (counting, timing, reset, etc.) and output (pulse output, discrete output, etc.) is defined in the configuration of the module.

See the notes below for further details about power source considerations, circuit polarities, and field devices.

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 12 mA 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.*
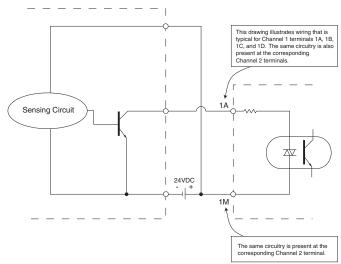
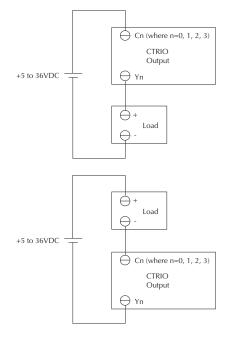# DL205 High-Speed Counter

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 CTRIO module. Refer to the sinking/sourcing appendix in this catalog for a complete explanation of sinking and sourcing concepts.
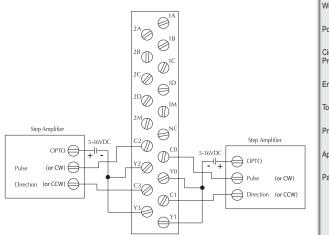
NPN Field Device (sink)

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.

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.

Pulse output schematic

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

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

Stepper/Servo drive wiring example

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

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

Company Info.

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DL205 High-Speed Counter
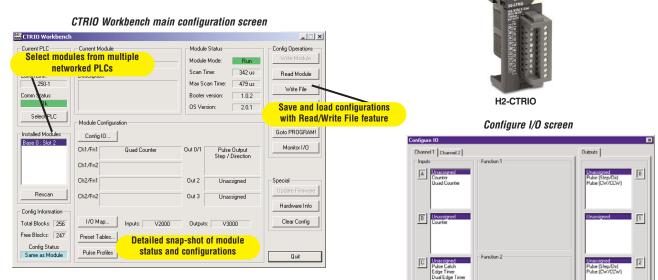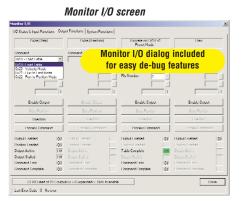
Fill-in-the-blank configuration software

The CTRIO Workbench is the software utility used to configure the CTRIO module 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 CTRIO Workbench utility ships with the CTRIO User Manual. You can also download the latest version free at the Host Engineering's Web site: www.hosteng.com.

CTRIO Workbench main configuration 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 conven-ient 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 configu-ration 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.

Monitor I/O screen

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.

H2-CTRIO

Configure I/O screen

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.

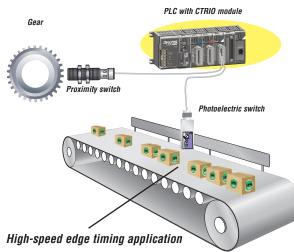*Scaling Wizard screen*

DL205 High-Speed Counter

High-speed input operations

The CTRIO module is capable of a wide variety of high-speed input and output operations, all within one module. With its flexible 2-channel input and separate 2-channel output design, the CTRIO 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. Check out these examples and see how they relate to your high speed application needs.

High-speed counting

The CTRIO can be configured for counting functions for the use of 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 CTRIO 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

PLC with CTRIO module

Motor Interface

Motor control lines

Gearbox, clutch and brake interface

CTRIO high-speed output

Encoder

Cutter interface

Material to be cut to length

Cutter assembly

High-speed timing application

Gear

PLC with CTRIO module

Proximity switch

Photoelectric switch

High-speed edge timing application
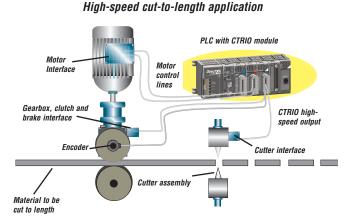
Using Configure I/O screen to configure CTRIO for high-speed timing

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

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

Point-click selections of hardwired connection for Counting, Reset, and Inhibit

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

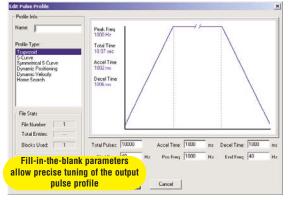Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

DL205 High-Speed Counter

Pulse output operations

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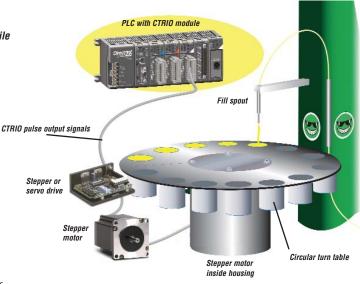

Rotary indexing liquid fill application

Pulse output for stepper/servo control

The CTRIO module is capable of multiple configurations for pulse output control, most often when connected to a stepper or servo drive system. The module can deliver a pulse output signal up to a maximum of 25 kHz on two channels 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, free form and Home Search. 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 profile is configured). They are Velocity Mode, Run to Limit Mode, and Run to Position Mode.

Example application
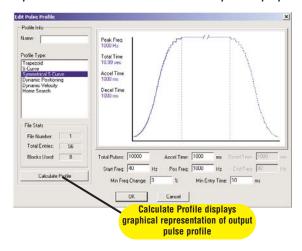
In a simple rotary indexing application, as shown above, a fixed Trapezoid profile is chosen. The CTRIO for this application is wired to a stepper drive for pulse-and-direction. The requirement for this application is to provide a smooth movement of the rotary table to allow product to be filled into individual containers at 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 CTRIO discrete input limit(s).
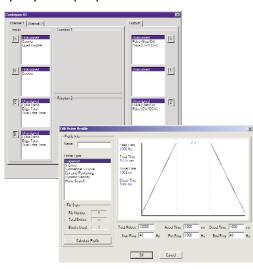
Example of S-Curve acceleration and deceleration pulse output profile

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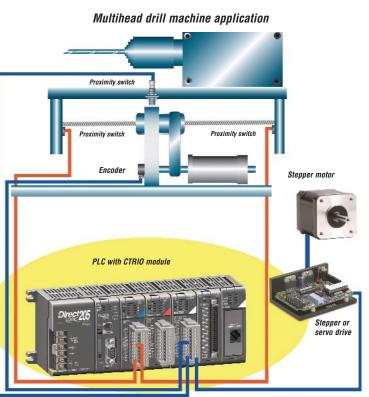
DL205 High-Speed Counter

Combining high-speed input and pulse output operations

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

Multihead drill machine application

Proximity switch

Proximity switch   *Proximity switch*

Encoder   *Stepper motor*

PLC with CTRIO module

Stepper or servo drive

High-Speed inputs and pulse output combinations

The flexible design of the CTRIO module allows for combining high-speed inputs and delivering high-speed pulse outputs signals simultaneously. There are limitations to this type of configuration in that the module does not internally support closed loop control. Providing closed loop control with the CTRIO involves additional PLC code to coordinate this control, making the application subject to the PLC CPU program scan. Simple position/speed monitoring via a high-speed counting input for non-critical response, while providing pulse outputs to a drive, is easily achievable for the CTRIO.
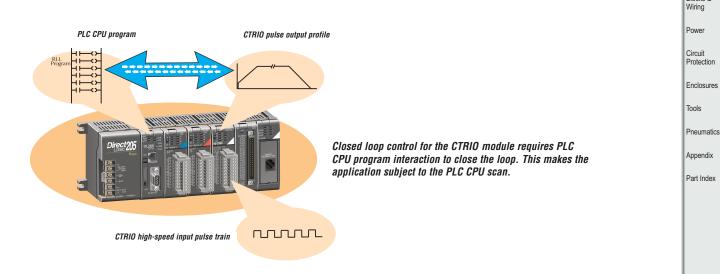
Example application

In the simple drill-head application shown above, the CTRIO pulse outputs are wired to a stepper and/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 CTRIO module output pulse train to the drive 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. Prox 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   **CTRIO pulse output profile**

RLL Program

Closed loop control for the CTRIO module requires PLC CPU program interaction to close the loop. This makes the application subject to the PLC CPU scan.

CTRIO high-speed input pulse train

Counter Interface Module

Counter
Interface Module

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 5 kHz high-speed counters offer 24 presets each. When the preset is reached, a CPU interrupt routine is executed. The D2-240, D2-250-1 and D2-260 support 2 channels, and the D2-230 supports 1 channel (max. count: 9,999,999).

Mode 20: Quadrature encoder input (up/down) for clockwise and counterclockwise position control supported by the D2-240/250-1/260 (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 D2-240/250-1/260 (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. The D2-240, D2-250-1 and D2-260 supports 4 interrupts, and the D2-230 supports 1 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 specifications	
Input	4 pts. sink/source 5 kHz max.
Minimum pulse width	100 μSec
Input Voltage Range	12 or 24 VDC ±15%
Maximum voltage	30 VDC
Rated input current	10 mA Typical 13 mA 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 30 μS
ON to OFF Response	Less than 30 μS

Output specifications

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

Mode 50: Pulse catch feature allows the CPU to read 4 inputs, each having a pulse width as small as 0.1ms. When an input pulse is detected, the input is set ON for the next scan and then resets. Supported by all DL205 CPUs.

Mode 60: Input filters are configurable (0-99ms) to ensure input signal integrity. The default input mode is a 10ms filter. The D2-240, D2-250-1 and D2-260 supports 4 pulse inputs, and the D2-230 supports 1 pulse input.
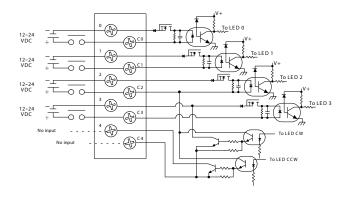
Mode 40 option - A Timed interrupt can be configured for time critical events. Interrupt 0 can be scheduled on a 3ms-999ms cycle. See the next page for more information on the timed interrupt.

General specifications

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	50 mA 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

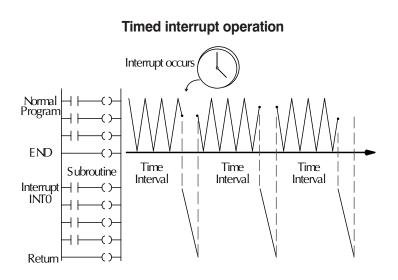## Timed Interrupt feature

There is an internal timed interrupt feature available in the D2-240/250-1/260 CPUs. *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 3 ms to 999 ms. 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	3 to 999 ms (1 ms increments)
Interrupt Subroutine	INT0

Timed interrupt operation

Wiring System for DL205 PLCs

Cut PLC wiring time to minutes instead of hours

The *ZIP*Link wiring system eliminates the normally tedious process of wiring PLC I/O to terminal blocks. Simply plug one end of a *ZIP*Link pre-wired terminal block cable into your I/O module and the other end into a *ZIP*Link connector module. It's that easy. *ZIP*Links use half the space, at a fraction of the total cost of terminal blocks.

*ZIP*Links are available in a variety of styles to suit your needs, including fused, relay and sensor/LED connector modules. *ZIP*Links are available for all DL205 Series PLC discrete and analog input and output modules.

For complete information see *ZIP*Links in the Terminal Blocks and Wiring Solutions section.

Specify your *ZIP*Link system

Use the Compatibility Matrix table below:

Step 1	Locate the I/O module part number.
Step 2	Locate Connector Module Type. (Feedthrough Module, Fuse Module, etc...)
Step 3	Select the cable length by replacing the # symbol with: Blank = 0.5m, -1 = 1.0m, -2 = 2.0m[1]

[1]*Note: Cable part number denotes compatibility between Connector Module and I/O Modules.*

ZIPLink Wiring System Compatibility Matrix for DL205 PLCs									
Step 2: Connector Module Type		**Feedthrough Modules**		**Fuse Modules**		**Relay Modules**	**Sensor Input Modules**		**Pigtail Cable**
Step 1: I/O Module	**Number of Terminals**	ZL-RTB20	ZL-RTB40	ZL-RFU20	ZL-RFU40	ZL-RRL16-24	ZL-LTB16-24	ZL-LTB32-24	
		Step 3: Cables							
Inputs									
D2-08ND3	10	ZL-D2-CBL10#							
D2-16ND3-2	19	ZL-D2-CBL19#					ZL-D2-CBL19#		ZL-D2-CBL19#P
D2-32ND3	40		ZL-D24-CBL40#					ZL-D24-CBL40#	ZL-D24-CBL40#P
D2-32ND3-2	40		ZL-D24-CBL40#					ZL-D24-CBL40#	ZL-D24-CBL40#P
D2-08NA-1	10	ZL-D2-CBL10#							
D2-08NA-2	10	ZL-D2-CBL10#							
D2-16NA	19	ZL-D2-CBL19#							ZL-D2-CBL19#P
Outputs									
D2-04TD1*	10	ZL-D2-CBL10#							
D2-08TD1	10	ZL-D2-CBL10#							
D2-08TD2	10	ZL-D2-CBL10#							
D2-16TD1-2	19	ZL-D2-CBL19#		ZL-D2-CBL19#		ZL-D2-CBL19#			ZL-D2-CBL19#P
D2-16TD2-2	19	ZL-D2-CBL19#		ZL-D2-CBL19#					ZL-D2-CBL19#P
D2-32TD1	40		ZL-D24-CBL40#		ZL-D24-CBL40#				ZL-D24-CBL40#P
D2-32TD2	40		ZL-D24-CBL40#		ZL-D24-CBL40#				ZL-D24-CBL40#P
D2-08TA	10	ZL-D2-CBL10#							
F2-08TA	10	ZL-D2-CBL10#							
D2-12TA	19	ZL-D2-CBL19#		ZL-D2-CBL19#					ZL-D2-CBL19#P
D2-04TRS*	10	ZL-D2-CBL10#							
D2-08TR	10	ZL-D2-CBL10#							
F2-08TRS*	19	ZL-D2-CBL19#							ZL-D2-CBL19#P
F2-08TR**	10	ZL-D2-CBL10#							
D2-12TR	19	ZL-D2-CBL19#		ZL-D2-CBL19#					ZL-D2-CBL19#P
Combo In/Out									
D2-08CDR	10	ZL-D2-CBL10#							

I/O Module

*Caution: The D2-04TD1, D2-04TRS, and F2-08TRS outputs are derated not to exceed 2 Amps per point and 2 Amps per common when used with the ZIPLink wiring system.

**The F2-08TR outputs are derated not to exceed 2 Amps per point and 4 Amps per common when used with the ZIPLink wiring system.

ZIPLink Connector Modules specifications begin on page 26-56

ZIPLink Cables specifications begin on page 26-74

Wiring System for DL205 PLCs

Step 1	Locate the I/O module part number.
Step 2	Locate Connector Module Type. (Feedthrough Module, Fuse Module, etc...)
Step 3	Select the cable length by replacing the # symbol with: Blank = 0.5m, -1 = 1.0m, -2 = 2.0m[1]

[1] *Note: Cable part number denotes compatibility between Connector Module and I/O Modules.*

ZIPLink Wiring System Compatibility Matrix for DL205 PLCs Continued

		Feedthrough Modules		Fuse Modules		Relay Modules	Sensor Input Modules			Pigtail Cable
Step 2: Connector Module Type										
Step 1: I/O Module	**Number of Terminals**	ZL-RTB20	ZL-RTB40	ZL-RFU20	ZL-RFU40	ZL-RRL16-24	ZL-LTB16-24	ZL-LTB32-24		
		Step 3: Cables								
Analog										
F2-04AD-1	10	ZL-D2-CBL10#								
F2-04AD-1L	10	ZL-D2-CBL10#								
F2-08AD-1	10	ZL-D2-CBL10#								
F2-04AD-2	10	ZL-D2-CBL10#								
F2-04AD-2L	10	ZL-D2-CBL10#								
F2-08AD-2	10	ZL-D2-CBL10#								
F2-02DA-1	10	ZL-D2-CBL10#								
F2-02DA-1L	10	ZL-D2-CBL10#								
F2-02DAS-1	10	ZL-D2-CBL10#								
F2-08DA-1	19	ZL-D2-CBL19#								ZL-D2-CBL19#P
F2-02DA-2	10	ZL-D2-CBL10#								
F2-02DA-2L	10	ZL-D2-CBL10#								
F2-02DAS-2	10	ZL-D2-CBL10#								
F2-08DA-2	10	ZL-D2-CBL10#								
F2-4AD2DA	10	ZL-D2-CBL10#								
F2-8AD4DA-1	19	ZL-D2-CBL19#								ZL-D2-CBL19#P
F2-8AD4DA-2	19	ZL-D2-CBL19#								ZL-D2-CBL19#P
F2-04RTD*										
F2-04THM*										

The F2-04RTD and F2-04THM modules are not supported by the ZIPLink wiring system. These modules require wire specific to the signal type.

ZIPLink Connector Modules specifications begin on page 26-56

ZIPLink Cables specifications begin on page 26-74
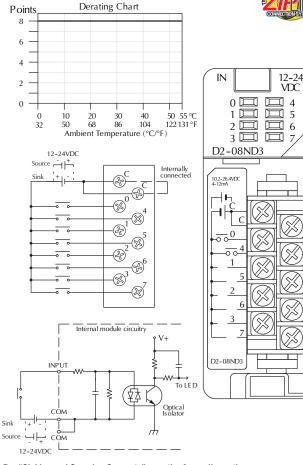
DC Input Modules

D2-08ND3 DC Input <--->	
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 @ 12 VDC 8.5 mA @ 24 VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	50 mA
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. (65 g)
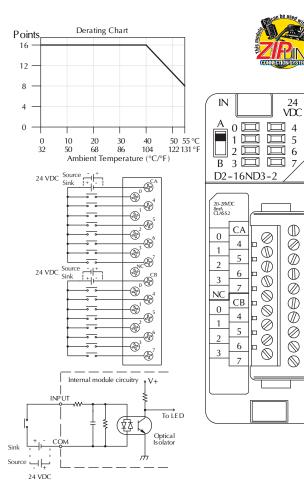
D2-16ND3-2 DC Input <--->	
Inputs per Module	16 (sink/source)
Commons per Module	2 isolated (8 I/O terminal points / com)
Input Voltage Range	20-28 VDC
Peak Voltage	30 VDC (10 mA)
ON Voltage Level	19 VDC minimum
OFF Voltage Level	7VDC maximum
AC Frequency	N/A
Input Impedance	3.9 kΩ
Input Current	6 mA @ 24 VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	100 mA
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. (65 g)

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

See page 4-78 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.
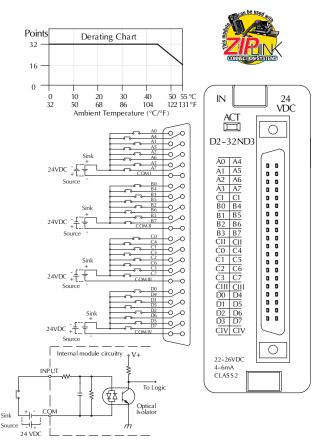
For "Sinking and Sourcing Concepts" see the Appendix section.

DC Input Modules

D2-32ND3 DC Input <--->

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	30 VDC
ON Voltage Level	19 VDC minimum
OFF Voltage Level	7 VDC maximum
AC Frequency	N/A
Input Impedance	4.8 kΩ
Input Current	8.0 mA @ 24 VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	1.5 mA
Base Power Required 5VDC	25 mA
OFF to ON Response	3 to 9 ms
ON to OFF Response	3 to 9 ms
Terminal Type (not included)	Removable 40-pin Connector[1]
Status Indicator	Module Activity LED
Weight	2.1 oz. (60 g)

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

See page 4-78 for part numbers of ZIPLink cables and connection modules compatible with this I/O module.

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

D2-32ND3-2 DC Input <--->

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	16 VDC
ON Voltage Level	4 VDC minimum
OFF Voltage Level	2 VDC maximum
AC Frequency	N/A
Input Impedance	1.0 kΩ @ 5-15 VDC
Input Current	4 mA @ 5 VDC 11 mA @ 12 VDC 14 mA @ 15 VDC
Maximum Input Current	16 mA @ 15.6 VDC
Minimum ON Current	3 mA
Maximum OFF Current	0.5 mA
Base Power Required 5VDC	25 mA
OFF to ON Response	3 to 9 ms
ON to OFF Response	3 to 9 ms
Terminal Type (not included)	Removable 40-pin connector[1]
Status Indicator	Module activity LED
Weight	2.1 oz (60 g)

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

See page 4-78 for part numbers of ZIPLink cables and connection modules compatible with this I/O module.

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

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

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Appendix

Part Index

Simulator/AC Input Modules

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

D2-08NA-1 AC Input <--->	
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	75 VAC minimum
OFF Voltage Level	20 VAC maximum
AC Frequency	47-63 Hz
Input Impedance	12 kΩ @ 60 Hz
Input Current	13 mA @ 100 VAC, 60 Hz 11 mA @ 100 VAC, 50 Hz
Minimum ON Current	5 mA
Maximum OFF Current	2 mA
Base Power Required 5VDC	50 mA
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. (70 g)

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.
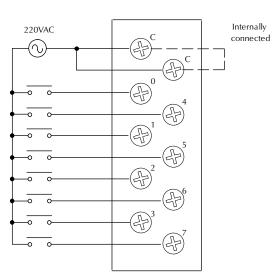

Derating Chart
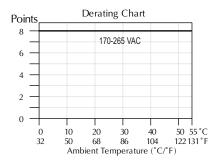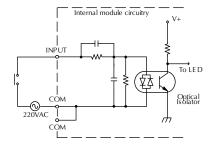
AC Input Modules

D2-08NA-2 AC Input <--->	
Inputs per Module	8
Commons per Module	1 (2 I/O terminal points)
Input Voltage Range	170-265 VAC
Peak Voltage	265 VAC
ON Voltage Level	150 VAC minimum
OFF Voltage Level	40 VAC maximum
AC Frequency	47-63 Hz
Input Impedance	18 kΩ @ 60 Hz
Input Current	9mA @ 220 VAC, 50 Hz 11 mA @ 265 VAC, 50 Hz 10 mA @ 220 VAC, 60 Hz 12 mA @ 265 VAC, 60 Hz
Minimum ON Current	10 mA
Maximum OFF Current	2 mA
Base Power Required 5VDC	100 mA
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. (70 g)
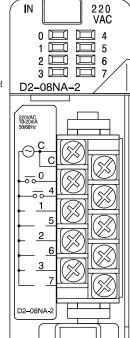
Operating Temperature	32ºF to 131ºF (0º to 55ºC)
Storage Temperature	-4ºF to 158ºF (-20ºC to 70ºC)
Humidity	35% to 95% (non-condensing)
Atmosphere	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Insulation Withstand Voltage	1,500 VAC 1 minute (COM-GND)
Insulation Resistance	10M $\simeq$s 500 VDC
Noise Immunity	NEMA 1,500V 1 minute SANKI 1,000V 1 minute
RFI	150 MHz, 430 MHz

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Derating Chart

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

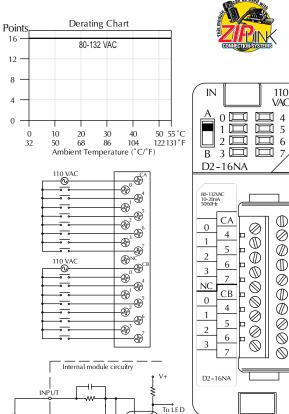Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

AC Input Modules

D2-16NA AC Input <--->	
Inputs per Module	16
Commons per Module	2 (isolated)
Input Voltage Range	80-132 VAC
Peak Voltage	132 VAC
ON Voltage Level	70 VAC minimum
OFF Voltage Level	20 VAC maximum
AC Frequency	47-63 Hz
Input Impedance	12 kΩ @ 60 Hz
Input Current	11 mA @ 100 VAC, 50 Hz 13 mA @ 100 VAC, 60 Hz 15 mA @ 132 VAC, 60 Hz
Minimum ON Current	5mA
Maximum OFF Current	2mA
Base Power Required 5VDC	100 mA
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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

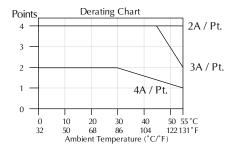*Note: When used with the ZIPLink wiring system, relay outputs are derated not to exceed 2 Amps per point max.*

DC Output Modules

D2-04TD1 DC Output `<--->`

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	40 VDC
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 @ 40 VDC
Max Inrush Current	6A for 100 ms, 15A for 10 ms
Minimum Load Current	50 mA

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

See page 4-78 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
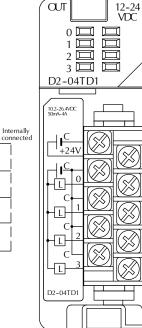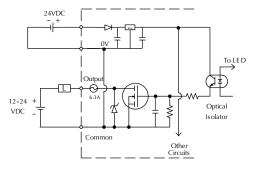
Load Current	Duration of output in ON state		
	7ms	40ms	100ms
0.1A	8000	1400	600
0.5A	1600	300	120
1.0A	800	140	60
1.5A	540	90	35
2.0A	400	70	–
3.0A	270	–	–
4.0A	200	–	–

At 40 mS duration, loads of 3.0A or greater cannot be used.

At 100 mS duration, loads of 2.0A 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 100 ms 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
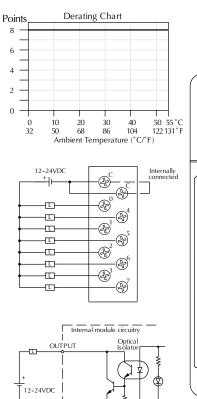
D2-08TD1 DC Output <--->	
Outputs per Module	8 (current sinking)
Commons per Module	1 (2 I/O terminal points)
Output Type	NPN open collector
Operating Voltage	10.2-26.4 VDC
Peak Voltage	40 VDC
ON Voltage Drop	1.5 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.5 mA
Max Load Current	0.3A/point; 2.4A/common
Max Leakage Current	0.1 mA @ 40 VDC
Max Inrush Current	1A for 10 ms
Base Power Required 5VDC	100 mA
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
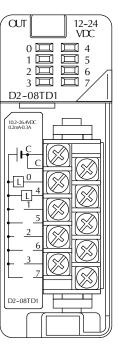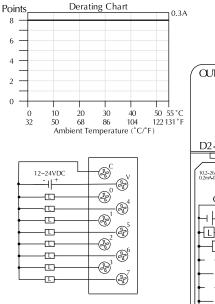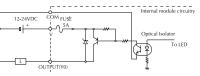
D2-08TD2 DC Output <--->	
Outputs per Module	8 (current sourcing)
Commons per Module	1
Output Type	PNP open collector
Operating Voltage	12 to 24 VDC
Output Voltage	10.8 to 26.4 VDC
Peak Voltage	40 VDC
ON Voltage Drop	1.5 VDC
AC Frequency	N/A
Minimum Load Current	N/A
Max Load Current	0.3A per point; 2.4A per common
Max Leakage Current	1.0 mA @ 40 VDC
Max Inrush Current	1A for 10 ms
Base Power Required 5VDC	100 mA
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)
Fuses	1 per common 5A fast blow, non-replaceable

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

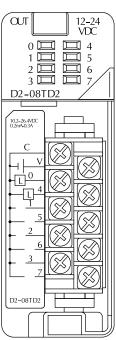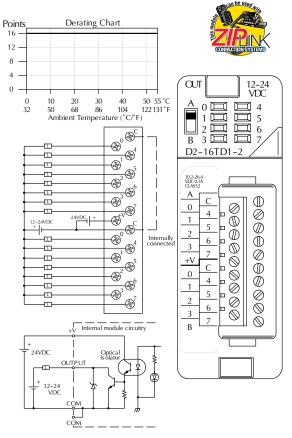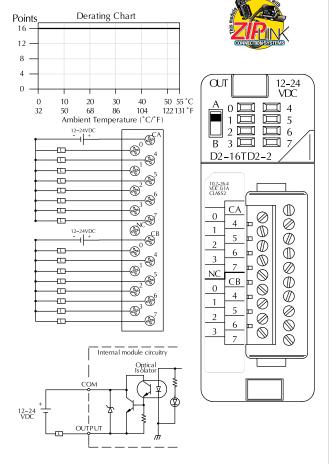See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

DC Output Modules

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

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Pneumatics

Appendix

Part Index

D2-16TD1-2 DC Output <--->	
Outputs per Module	16 (current sinking)
Commons per Module	1 (2 I/O terminal points)
Output Type	NPN open collector
External DC required	24 VDC ±4V @ 80 mA max
Operating Voltage	10.2-26.4 VDC
Peak Voltage	30 VDC
ON Voltage Drop	0.5 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.2 mA
Max Load Current	0.1A/point 1.6A/common
Max Leakage Current	0.1 mA @ 30 VDC
Max Inrush Current	150 mA for 10 ms
Base Power Required 5VDC	200 mA
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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

D2-16TD2-2 DC Output <--->	
Outputs per Module	16 (current sourcing)
Commons per Module	2
Output Type	NPN open collector
Operating Voltage	10.2-26.4 VDC
Peak Voltage	30 VDC
ON Voltage Drop	1.0 VDC maximum
AC Frequency	N/A
Minimum Load Current	0.2 mA
Max Load Current	0.1A/point 1.6A/module
Max Leakage Current	0.1 mA @ 30 VDC
Max Inrush Current	150 mA for 10 ms
Base Power Required 5VDC	200 mA
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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

DC Output Modules

D2-32TD1 DC Output <--->	
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	30 VDC
ON Voltage Drop	0.5 VDC maximum
Minimum Load Current	0.2 mA
Max Load Current	0.1A/point; 3.2A per module
Max Leakage Current	0.1 mA @ 30 VDC
Max Inrush Current	150 mA for 10 ms
Base Power Required 5VDC	350 mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (not included)	removable 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. 120 mA (all points on)

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

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

D2-32TD2 DC Output <--->	
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	30 VDC
ON Voltage Drop	0.5 VDC @ 0.1A
Minimum Load Current	0.2 mA
Max Load Current	0.1A/point; 0.8A/common
Max Leakage Current	0.1 mA @ 30 VDC
Max Inrush Current	150 mA @ 10 ms
Base Power Required 5VDC	350 mA
OFF to ON Response	0.5 ms
ON to OFF Response	0.5 ms
Terminal Type (not included)	Removable 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.

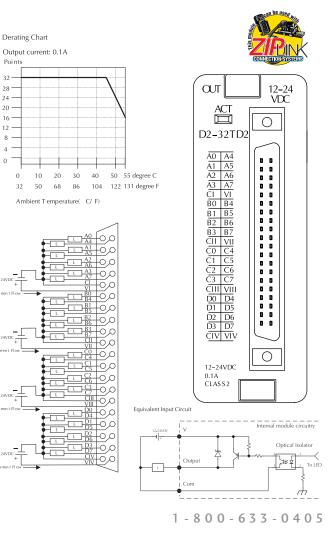See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

DC Output Modules

F2-16TD1P DC Output with Fault Protection <--->	
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	40 VDC
AC frequency	N/A
ON voltage drop	0.7 V (output current 0.5A)
Overcurrent trip	0.6 A min., 1.2 A max.
Maximum load current	0.25 A continuous, 0.5 A peak
Maximum OFF current	Jumper J6 installed: 200 μA; J6 removed: 30 μA
Base power required 5V	70 mA
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	24 VDC +/−10% @ 50 mA
External DC overvoltage shutdown	27 V, outputs are restored when voltage is within limits

F2-16TD2P DC Output with Fault Protection <--->	
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	40 VDC
AC frequency	N/A
ON voltage drop	0.7 V (output current 0.5A)
Overcurrent trip	0.6 A min., 1.2A max.
Maximum load current	0.25 A continuous, 0.5A peak
Maximum OFF current	Jumper J6 installed: 200 μA; J6 removed: 30 μA
Base power required 5V	70 mA
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	24 VDC +/−10% @ 50 mA
External DC overvoltage shutdown	27 V, outputs are restored when voltage is within limits

Module detects the following faults:

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

Module detects the following faults:

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

Derating Chart 0.25A

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.

Derating Chart 0.25A

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
D2-260	Version 2.60 or later

Note: This module does not currently support Think & Do 8.0. It does not support Think & Do Live! or Studio.

CPU	Firmware Required
D2-250-1	Version 4.80 or later
D2-260	Version 2.60 or later
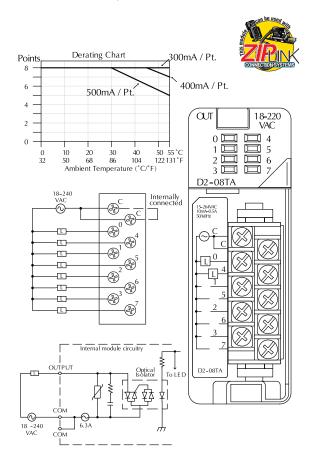
AC Output Modules

| D2-08TA AC Output <--->	
Outputs per Module	8
Commons per Module	1 (2 I/O terminal points)
Output Type	SSR (Triac)
Operating Voltage	15-264 VAC
Peak Voltage	264 VAC
ON Voltage Drop	< 1.5 VAC (>0.1A) < 3.0 VAC (<0.1A)
AC Frequency	47 to 63 Hz
Minimum Load Current	10 mA
Max Load Current	0.5A/point; 4A/common
Max Leakage Current	4mA (264 VAC, 60 Hz) 1.2 mA (100 VAC, 60 Hz) 0.9 mA (100 VAC, 50 Hz)
Max Inrush Current	10 mA for 10 ms
Base Power Required 5VDC	250 mA
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, 6.3A slow blow replaceable order D2-fuse-3
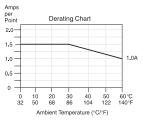
See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.
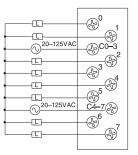

| F2-08TA AC Output <--->	
Outputs per Module	8
Commons per Module	2 (Isolated)
Output Type	SSR (Triac with zero crossover)
Operating Voltage	24-140 VAC
Peak Voltage	140 VAC
ON Voltage Drop	1.6 V(rms) @ 1.5A
AC Frequency	47 to 63 Hz
Minimum Load Current	50 mA
Max Load Current	1.5A / pt @ 30ºC 1.0A / pt @ 60ºC 4.0A / common; 8.0A / module @ 60ºC
Max Leakage Current	0.7 mA(rms)
Peak One Cycle Surge Current	15A
Base Power Required 5VDC	250 mA
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.
Fuses	None
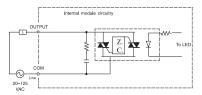
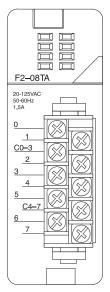See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

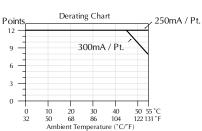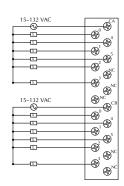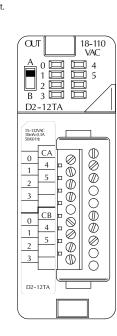Derating Note: All outputs can be run at the current per point shown.

1 - 8 0 0 - 6 3 3 - 0 4 0 5

AC Output Modules

D2-12TA AC Output   <--->

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	10 mA
Max Load Current	0.3A/point; 1.8A/common
Max Leakage Current	2mA (132 VAC, 60 Hz)
Max Inrush Current	10A for 10 ms
Base Power Required 5VDC	350 mA
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 3.15A slow blow, replaceable Order D2-FUSE-1 (5 per pack)

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

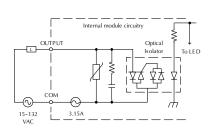**Note: When used with the ZIPLink wiring system, relay outputs are derated not to exceed 2 Amps per point max.**

Derating Chart

250mA / Pt.
300mA / Pt.

Points: 12, 9, 6, 3, 0
Ambient Temperature (°C/°F)

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

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

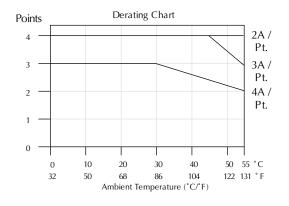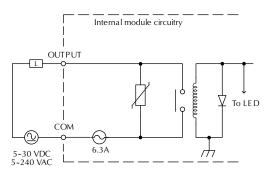Encoders

Current Sensors

Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

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Circuit Protection

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Appendix

Part Index

Relay Output Modules

D2-04TRS Relay Output <--->

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	10 mA
Max Load Current (resistive)	4A/point; 8A/module (resistive)
Max Leakage Current	0.1 mA @ 264 VAC
Max Inrush Current	5A for < 10 ms
Base Power Required 5VDC	250 mA
OFF to ON Response	10 ms
ON to OFF Response	10 ms
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	2.8 oz. (80 g)
Fuses	1 per point 6.3A slow blow, replaceable Order D2-FUSE-3 (5 per pack)

Typical Relay Life (Operations)

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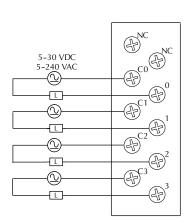
Type of Load	1A	2A	3A	4A
24 VDC Resistive	500k	200k	100k	50k
24 VDC Solenoid	100k	40k	—	–
110 VAC Resistive	500k	250k	150k	100k
110 VAC Solenoid	200k	100k	50k	–
220 VAC Resistive	350k	150k	100k	50k
220 VAC Solenoid	100k	50k	—	—

At 24 VDC, solenoid (inductive) loads over 2A cannot be used.
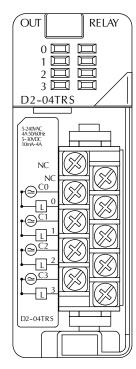
At 100 VAC, solenoid (inductive) loads over 3A cannot be used.

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

Derating Chart

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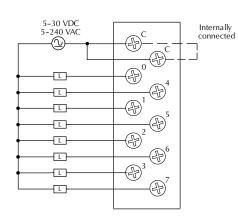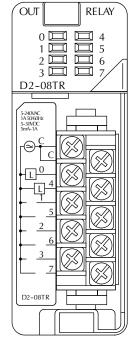
D2-08TR Relay Output <--->	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	1 (2 I/O terminals)
Output Type	Relay, form A (SPST)
Operating Voltage	5-30 VDC; 5-240 VAC
Peak Voltage	30 VDC, 264 VAC
ON Voltage Drop	N/A
AC Frequency	47 to 60 Hz
Minimum Load Current	5mA @ 5VDC
Max Load Current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

See page 4-78 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.

Typical Relay Life (Operations)

Voltage/Load	Current	Closures
24 VDC Resistive	1A	500k
24 VDC Solenoid	1A	100k
110 VDC Resistive	1A	500k
110 VDC Solenoid	1A	200k
220 VAC Resistive	1A	350k
220 VAC Solenoid	1A	100k

Derating Chart

Internal module circuitry

Relay Output Modules

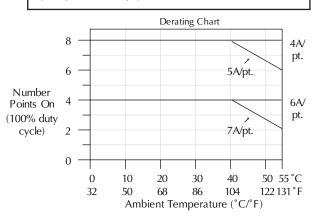| F2-08TRS Relay Output <--->	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	8 (isolated)
Output Type	3, Form C (SPDT) 5, Form A (SPST normally open)
Operating Voltage	7A @ 12-28 VDC, 12-250 VAC 0.5A @ 120VDC
Peak Voltage	150 VDC, 265 VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63Hz
Minimum Load Current	10mA @ 12 VDC
Max Load Current (resistive)	7A/point [3] (subject to derating)
Max Leakage Current	N/A
Max Inrush Current	12A
Base Power Required 5VDC	670 mA
OFF to ON Response	15 ms (typical)
ON to OFF Response	5ms (typical)
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	5.5oz. (156g)
Fuses	None

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Typical Relay Life[1] (Operations) at Room Temperature

Voltage & Type of Load [2]	Load Current		
	50mA	5A	7A
24 VDC Resistive	10M	600k	300k
24 VDC Solenoid	-	150k	75k
110 VDC Resistive	–	600k	300k
110 VDC Solenoid	–	500k	200k
220 VAC Resistive	–	300k	150k
220 VAC 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 24 VDC inductive load, you can significantly increase the life of the relay.

2) At 120 VDC 0.5A 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
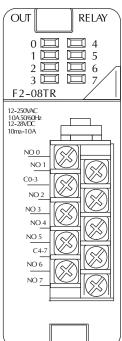
F2-08TR Relay Output <--->	
Outputs per Module	8
Outputs Points Consumed	8
Commons per Module	2 (isolated), 4-pts. per common
Output Type	8, Form A (SPST normally open)
Operating Voltage	7A @ 12-28 VDC, 12-250VAC; 0.5A @ 120 VDC
Peak Voltage	150 VDC, 265 VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63Hz
Minimum Load Current	10 mA @ 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	670 mA
OFF to ON Response	15 ms (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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

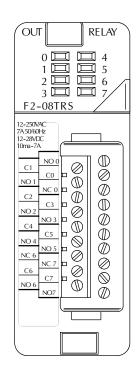| Typical Relay Life[1] (Operations) at Room Temperature			
Voltage & Type of Load [2]	**Load Current**		
	50 mA	**5A**	**7A**
24 VDC Resistive	10M	600k	300k
24 VDC Solenoid	-	150k	75k
110 VDC Resistive	–	600k	300k
110 VDC Solenoid	–	500k	200k
220 VAC Resistive	–	300k	150k
220 VAC Solenoid	–	250k	100k

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 24 VDC inductive load, you can significantly increase the life of the relay.
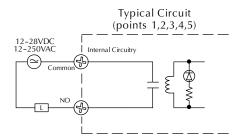
2) At 120 VDC 0.5A resistive load, contact life cycle is 200k cycles.

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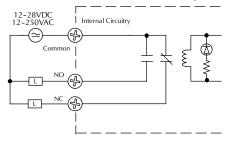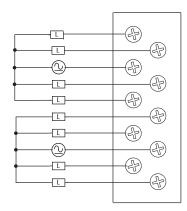

Derating Chart

OUT   RELAY

F2-08TR

Typical Circuit

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AC Motors

Power Transmiss.

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Photo Sensors

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Relay Output Modules

D2-12TR Relay Output <--->	
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	30 VDC; 264 VAC
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	450 mA
OFF to ON Response	10 ms
ON to OFF Response	10 ms
Terminal Type (included)	Removable; D2-16IOCON
Status Indicator	Logic side
Weight	4.6 oz. (130g)
Fuses	(2) 4A slow blow, replaceable Order D2-FUSE-4 (5 per pack)
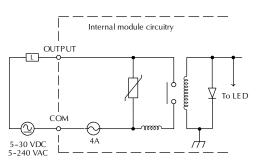
Typical Relay Life (Operations)

Voltage/Load	Current	Closures
24 VDC Resistive	1A	500k
24 VDC Solenoid	1A	100k
110 VDC Resistive	1A	500k
110 VDC Solenoid	1A	200k
220 VAC Resistive	1A	350k
220 VAC 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			

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Derating Chart
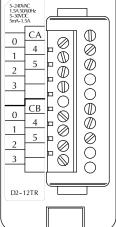
DC Input/Relay Output Module

D2-08CDR 4-pt. DC In / 4pt. Relay Out <--->	
General Specifications	
Base Power Required 5VDC	200 mA
Terminal Type (included)	Removable; D2-8IOCON
Status Indicator	Logic side
Weight	3.5 oz. (100 g)
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	30 VDC
ON Voltage Level	19 VDC minimum
OFF Voltage Level	7 VDC maximum
AC Frequency	N/A
Input Impedance	4.7 kΩ
Input Current	5mA @ 24 VDC
Maximum Current	8mA @ 30 VDC
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	30 VDC; 264 VAC
ON Voltage Drop	N/A
AC Frequency	47 to 63 Hz
Minimum Load Current	5 mA @ 5 VDC
Max Load Current (resistive)	1A/point ; 4A/module
Max Leakage Current	0.1 mA @ 264 VAC
Max Inrush Current	3A for < 100 ms 10 A for < 10 ms (common)
OFF to ON Response	12 ms
ON to OFF Response	10 ms
Fuses (output circuits)	1 (6.3A slow blow, replaceable); Order D2-FUSE-3 (5 per pack)

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.
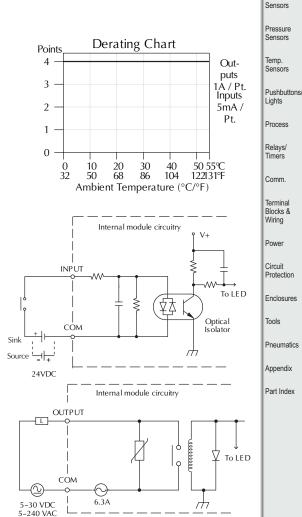
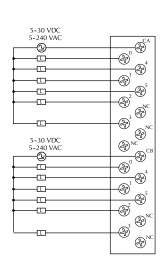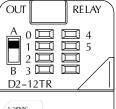| Typical Relay Life (Operations)		
Voltage/Load	**Current**	**Closures**
24 VDC Resistive	1A	500k
24 VDC Solenoid	1A	100k
110 VAC Resistive	1A	500k
110 VAC Solenoid	1A	200k
220 VAC Resistive	1A	350k
220 VAC Solenoid	1A	100k

Derating Chart

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

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PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

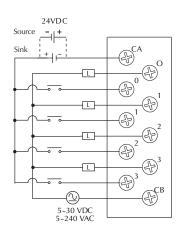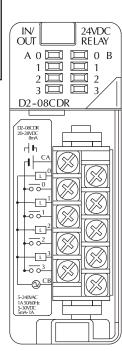Photo Sensors

Limit Switches

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Analog Current Input Modules

F2-04AD-1 4-Channel 4-20mA Analog In   <--->

This module requires a 24 VDC user power supply for operation. See the F2-04AD-1L on the next page if you want to use a 12 VDC supply. All other specifications are the same.

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 80 Hz, 2 poles (-12 dB per octave)
Input Impedance	250Ω ±0.1%, 1/2W current input
Absolute Maximum Ratings	-40 mA to +40 mA, current input
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	1 channel per scan maximum (D230 CPU); 4 channels per scan maximum (D2-240, D2-250(-1) and D2-260 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)	±12 counts max., @ 20 mA current input
Offset Calibration Error	±7 counts max., @ 4mA current input
Step Response	4ms 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	50 mA
External Power Supply	80 mA maximum, +18 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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

Note 1: Shields should be grounded at the signal source

More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032A, 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

F2-04AD-1L 4-Ch. 4-20mA Analog In <--->

This module requires a 12 VDC user power supply for operation. See the F2-04AD-1 on the previous page if you want to use a 24 VDC supply. All other specifications are the same.

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 80 Hz, 2 poles (-12 dB per octave)
Input Impedance	250 Ω ±0.1%, 1/2 W current input
Absolute Maximum Ratings	-40 mA to +40 mA, current input
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	1 channel per scan maximum (D2-230 CPU) 4 channels per scan maximum (D2-240, D2-250(-1) and D2-260 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)	±12 counts max., @ 20 mA current output
Offset Calibration Error	±7 counts max., @ 4 mA current input
Step Response	4 ms to 95% of F.S. change

Maximum Inaccuracy	±.5% @ 77ºF (25ºC) ±.65% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC maximum full scale (including max. offset change)
Recommended Fuse	0.032A, 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 5VDC	50 mA
External Power Supply	90 mA maximum, +10 to +15 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

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032A, 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 Current Input Modules

F2-08AD-1 8-Channel 4-20mA Analog In <--->	
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 200 Hz, (-6dB per octave)
Input Impedance	250Ω ±0.1%, 1/2W current input
Absolute Maximum Ratings	-45 mA to +45 mA
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	(D2-230 CPU) 1 channel per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs) 8 channels per scan maximum
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., @ 20 mA current input
Offset Calibration Error	±2 counts max., @ 4mA current input
Step Response	7ms to 95% of F.S. change

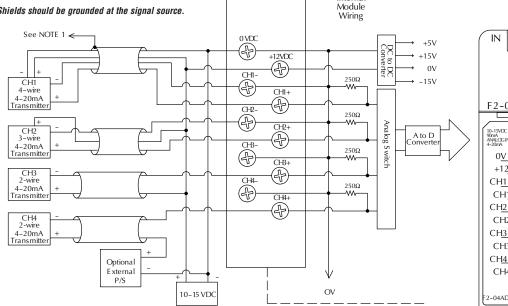|	
Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.25% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC maximum full scale (including max. offset change of two counts)
Recommended Fuse	0.032A, Series 217 fast-acting, current inputs
Digital Input Points Required	16 (X) input points (12 binary data bits, 3 channel ID bits, 1 broken transmitter bit)
Base Power Required 5VDC	50 mA
External Power Supply	80 mA maximum, +18 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

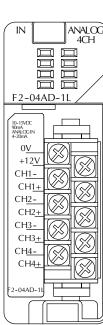See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

More than one external power supply can be used provided all the power supply commons are connected. A Series 217, 0.032A, 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

Automation Direct

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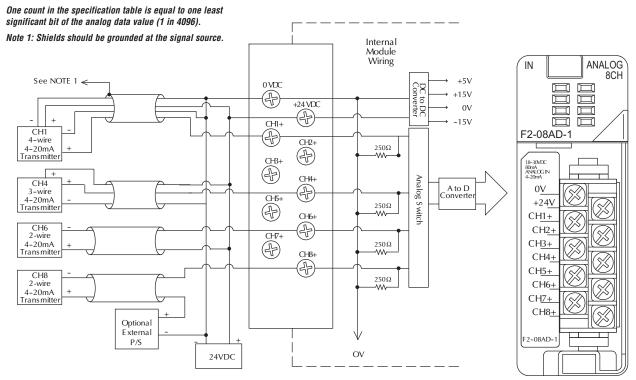
Relays/ Timers

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F2-04AD-2 4-Channel Voltage Analog In <--->

This module requires a 24 VDC user power supply for operation. See the F2-04AD-2L on the next page if you want to use a 12 VDC supply. All other specifications are the same.

Number of Channels	4, single ended (1 common)
Input Ranges	0 to 5V, 0 to 10 V, ±5V, ±10 V
Resolution	12 bit (1 in 4096)
Active Low-pass Filtering	-3 dB at 80 Hz, 2 poles (-12 dB per octave)
Input Impedance	>20 MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	1 channel per scan maximum (D2-230 CPU) 4 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
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	10 ms to 95% of F.S change

Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.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	60 mA
External Power Supply	90 mA maximum, +18 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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

Analog Voltage Input Modules

F2-04AD-2L 4-Ch. Voltage Analog In <--->

This module requires a 12 VDC user power supply for operation. See the F2-04AD-2 if you want to use a 24 VDC supply. All other specifications are the same.

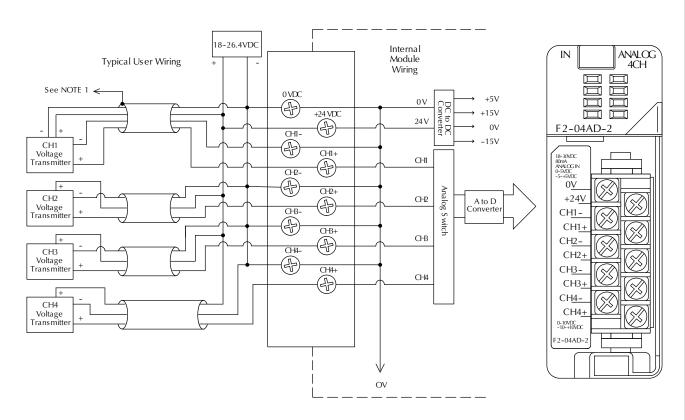|	
Number of Channels	4, single ended (1 common)
Input Ranges	0 to 5V, 0 to 10 V, ±5V, ±10 V
Resolution	12 bit (1 in 4096)
Active Low-pass Filtering	-3 dB at 80 Hz, 2 poles (-12 dB per octave)
Input Impedance	>20 MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	1 channel per scan maximum (D2-230 CPU) 4 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
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	10 ms to 95% of F.S change

Maximum Inaccuracy	±.1% @ 77ºF (25ºC) ±.3% 32º to 140ºF (0º to 60ºC)
Accuracy vs. Temperature	±50 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Digital Input Points Required	16 (X) input points (12 binary data bits, 2 channel ID bits)
Base Power Required 5VDC	60 mA
External Power Supply	90 mA maximum, +10 to +15 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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

Analog Voltage Input Modules

F2-08AD-2 8-Channel Voltage Analog In <--->

Number of Channels	8, single ended (1 common)
Input Ranges	0 to 5V, 0 to 10 V, ±5V, ±10 VDC
Resolution	12 bit (1 in 4095) uni-polar 13 bit (-4095 to 4095) bi-polar
Active Low-pass Filtering	-3dB at 200 Hz, (-6dB per octave)
Input Impedance	>20 MΩ
Absolute Maximum Ratings	-75 to +75 VDC
Converter Type	Successive approximation
Conversion Time (PLC Update Rate)	1 channel per scan maximum (D2-230 CPU) 8 channels per scan maximum (D2-240, D2-250(-1) and D2-260 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)	±3 counts maximum
Offset Calibration Error	±1 count maximum (0V input)
Step Response	4ms to 95% of F.S. change

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	60 mA
External Power Supply	80 mA maximum, +18 to +26.4 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

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096). Includes circuitry to automatically detect broken or open transmitters.
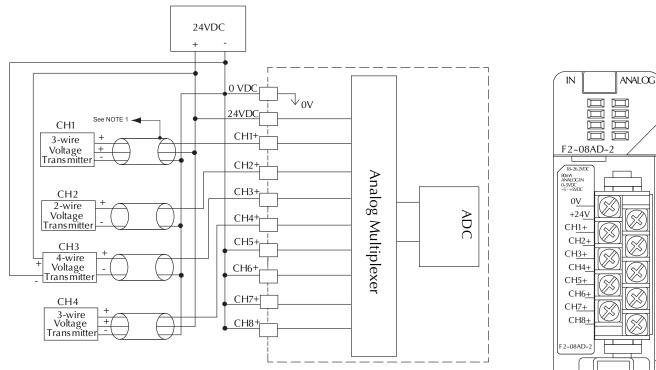
See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Note 1: Shields should be grounded at the signal source.
Note 2: 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 <--->	
Number of Channels	4
Input Ranges	Type Pt100: -200.0/850.0ºC, -328/1562ºF Type Pt1000: -200.0/595.0ºC, -328/1103ºF Type jPt100: -38.0/450.0ºC, -36/842ºF Type CU-10/25ž: -200.0/260.0ºC, -328/500ºF
Resolution	16 bit (1 in 65535)
Display Resolution	±0.1ºC, ±0.1ºF (±3276.7)
RTD Excitation Current	200 μA
Input Type	Differential
Notch Filter	>100 db notches at 50/60 Hz -3db=13.1Hz
Maximum Setting Time	100ms (full-scale step input)
Common Mode Range	0-5 VDC
Absolute Maximum Ratings	Fault protected inputs to ±50 VDC
Sampling Rate	160 ms per channel
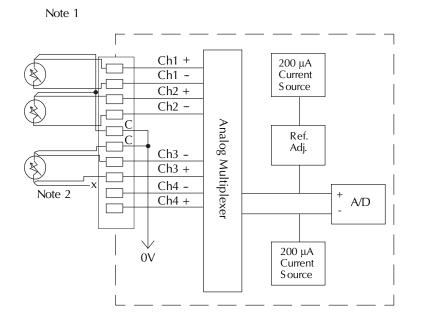
Converter Type	Charge Balancing
Linearity Error	±.05ºC maximum, ±.01ºC typical
Maximum Inaccuracy	±1ºC
PLC Update Rate	4 channel/scan max., 240/250(-1)/D2-260CPUs 1 channel per scan max., 230 CPU
Digital Input Points Required	32 input points (16 binary data bits, 2 channel ID bits, 4 fault bits)
Base Power Required 5VDC	90 mA
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4º to 158ºF (-20º to 70ºC)
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
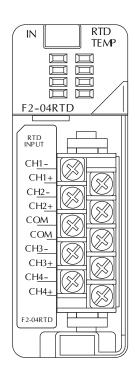
Notes:

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 <--->

General Specifications

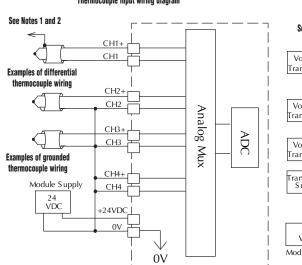|	
Number of Channels	4, differential
Common Mode Range	±5 VDC
Common Mode Rejection	90 dB min. @ DC, 150 dB min. @ 50/60 Hz.
Input Impedance	1 MΩ
Absolute Maximum Ratings	Fault-protected inputs to ±50 VDC
Accuracy vs. Temperature	±5 ppm/°C maximum full scale calibration (including maximum offset change)
PLC Update Rate	4 channels per scan max. D2-240/250(-1)/D2-260 CPU, H2-EBC(-F); 1 chan. per scan max. D2-230 CPU
Digital Input Points Required	32 (X) input points (16 binary data bits, 2 channel ID bits, 4 diagnostic bits)
External Power Supply	60 mA maximum, 18 to 26.4 VDC
Base Power Required 5VDC	110 mA
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)	Non-removable
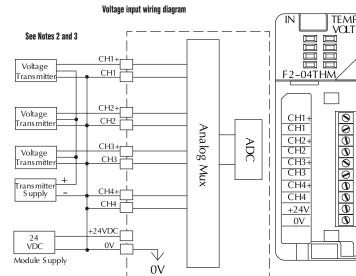
Thermocouple Specifications

Input Ranges	Type J -190 to 760°C	-310 to 1400°F
	Type E -210 to 1000°C	-346 to 1832°F
	Type K -150 to 1372°C	-238 to 2502°F
	Type R 65 to 1768°C	149 to 3214°F
	Type S 65 to 1768°C	149 to 3214°F
	Type T -230 to 400°C	-382 to 752°F
	Type B 529 to 1820°C	984 to 3308°F
	Type N -70 to 1300°C	-94 to 2372°F
	Type C 65 to 2320°C	149 to 4208°F
Display Resolution	±0.1°C or ±0.1°F	
Cold Junction Compensation	Automatic	
Conversion Time	100 ms per channel	
Warm-Up Time	30 minutes typically ± 1°C repeatability	
Linearity Error (End to End)	±.05°C maximum, ±.01°C typical	
Maximum Inaccuracy	±3°C (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% @ 25°C (77°F)

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.

Thermocouple input wiring diagram

Voltage input wiring diagram

PLCs
Company Info.
Field I/O
Software
C-more & other HMI
AC Drives
AC Motors
Power Transmiss.
Steppers/ Servos
Motor Controls
Proximity Sensors
Photo Sensors
Limit Switches
Encoders
Current Sensors
Pressure Sensors
Temp. Sensors
Pushbuttons/ Lights
Process
Relays/ Timers
Comm.
Terminal Blocks & Wiring
Power
Circuit Protection
Enclosures
Tools
Pneumatics
Appendix
Part Index

Analog Current Output Modules
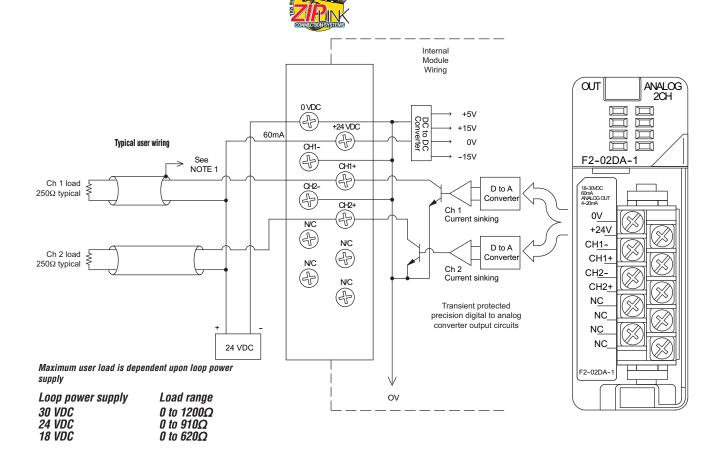
F2-02DA-1 2-Channel 4-20 mA Analog Output <--->

This module requires a 24 VDC user power supply for operation. See the F2-02DA-1L on the next page if you want to use a 12 VDC supply. All other specifications are the same.

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	30 VDC
Peak Output Voltage	40 VDC (clamped by transient voltage suppressor)
Load Impedance	0Ω minimum
Maximum Load/Power Supply	620 Ω/18 V, 910 Ω/24 V, 1200 Ω/ 30V
PLC Update Rate	1 channel per scan maximum D2-230 CPU 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
Linearity Error (end to end)	± 1 count ($\pm 0.025\%$ of full scale) maximum
Conversion Settling Time	100 µs maximum (full scale change)
Full Scale Calibration Error (offset error included)	$\pm$ 5 counts max., 20 mA @77ºF (25ºC)
Offset Calibration Error	$\pm$ 3 counts max., 4 mA @ 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	40 mA
External Power Supply	18 to 30 VDC, 60 mA. (add 20 mA 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

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Maximum user load is dependent upon loop power supply

Loop power supply	Load range
30 VDC	**0 to 1200Ω**
24 VDC	**0 to 910Ω**
18 VDC	**0 to 620Ω**

Analog Current Output Modules

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

AC Motors

Power Transmiss.

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

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Part Index

F2-02DA-1L 2-Ch 4-20 mA Analog Output <--->

This module requires a 12 VDC user power supply for operation. See the F2-02DA-1 on the previous page if you want to use a 24 VDC supply. All other specifications are the same.

Number of Channels	2
Output Ranges	4 to 20 mA
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)
Maximum Loop Supply	30 VDC
Peak Output Voltage	40 VDC (clamped by transient voltage suppressor)
Load Impedance	0Ω minimum
Maximum Load/Power Supply	620Ω/18V, 910Ω/24V, 1200Ω/30V
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
Linearity Error (end to end)	±1 count (0.025% of full scale) maximum
Conversion Settling Time	100 µs maximum (full scale change)
Full Scale Calibration Error (offset error included)	±5 counts max., 20 mA @ 77ºF (25ºC)
Offset Calibration Error	±3 counts max., 4mA @ 77ºF (25ºC)

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% @ 32 to 140°F (0 to 60°C)
Base Power Required 5VDC	40 mA
External Power Supply	10 to 15 VDC, 70 mA (add 20 mA for each current loop used)
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

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

NOTE 2: Unused current outputs should remain open (no connections) for minimum power consumption.
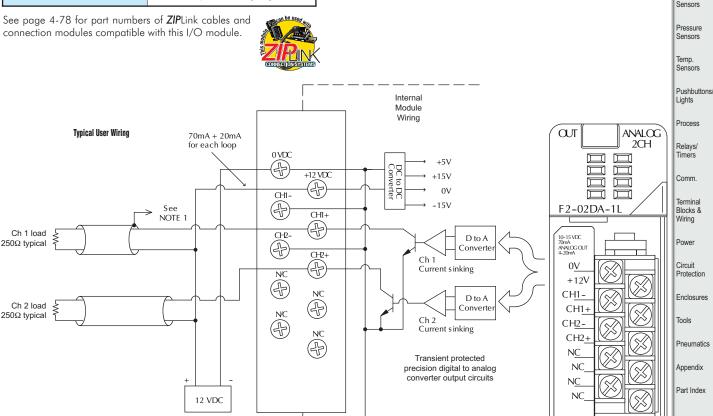
See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

Maximum user load is dependent upon loop power supply.

Loop power supply	Load range (ohm)
15 VDC	**0 to 450**
12 VDC	**0 to 300**
10 VDC	**0 to 200**

Analog Current Output Modules
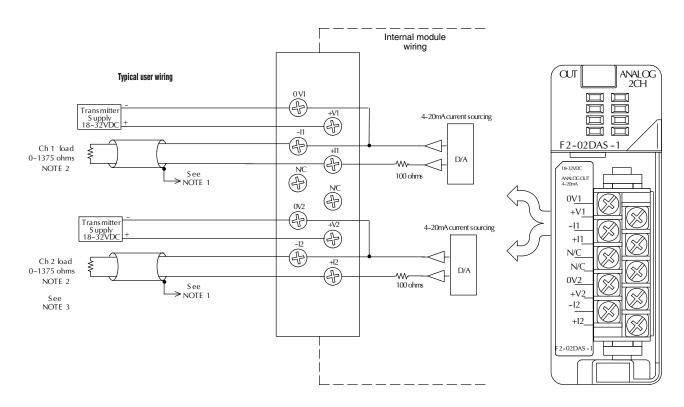
F2-02DAS-1 2-Channel Isolated 4-20 mA Analog Output
<--->

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	±750 V continuous, channel to channel, channel to logic
Base Power Required 5VDC	100 mA
Loop Supply	18-32 VDC
External Power Supply	18-32 VDC @ 50 mA per channel
Output Loop Compliance	Vin - 2.5V
Load Impedance	0-1375 Ω (@ 32 V)
Maximum Load/Power Supply	375 Ω/12 V, 975 Ω/24 V, 1375 Ω/32 V
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
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/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

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 65536).

NOTE 1: Shields should be connected to the 0V 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

Company Info.

PLCs

Field I/O

Software

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AC Drives

AC Motors

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Appendix

Part Index
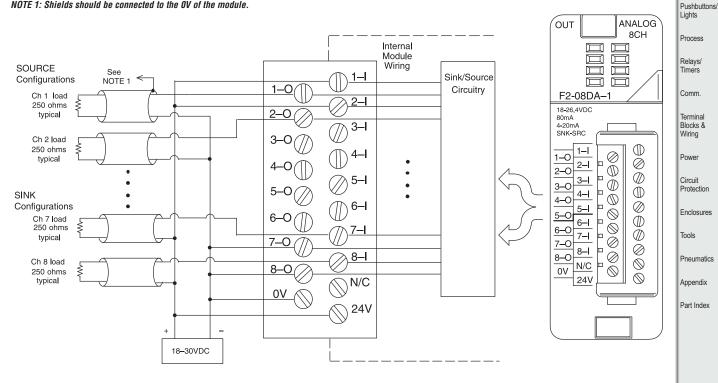
F2-08DA-1 8-Channel 4-20mA Analog Output   <--->

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	30 mA
Maximum Loop Voltage	30 VDC
External Power Supply	18 to 30 VDC, 50 mA., class 2 (add 20 mA for each current loop used)
Source Load	0-400 Ω @ 18-30 VDC
Sink Load	0-600 Ω/18V, 0-900 Ω/24 V, 0-1200 Ω/30 V
Total Load (sink + source)	600 Ω/18 V, 900 Ω/24 V, 1200 Ω/30 V
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 8 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
Conversion Settling Time	400 μs maximum (full scale change)

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 @ 125 Ω load ± 18 counts max. sourcing @ 250 Ω load ± 26 counts max. sourcing @ 400 Ω load
Offset Calibration Error	± 9 counts max. sinking @ any load ± 9 counts max. sourcing @ 125 Ω load ± 11 counts max. sourcing @ 250 Ω load ± 13 counts max. sourcing @ 400 Ω load
Maximum Full Scale Inaccuracy @ 60ºC	0.5% sinking (any load) sinking & sourcing @ 125 Ω load 0.64% sourcing @ 250 Ω load 0.83% sourcing @ 400 Ω load
Maximum Full Scale Inaccuracy @ 25ºC (Incudes all errors and temp drift)	0.3% sinking (any load) sinking & sourcing @ 125 Ω load 0.44% sourcing @ 250 Ω load 0.63% sourcing @ 400 Ω 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

See page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

This module can be used with ZIPLink CONNECTION SYSTEMS

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

Analog Voltage Output Modules

F2-02DA-2 2-Channel Voltage Analog Output <--->

This module requires a 24 VDC user power supply for operation. See the F2-02DA-2L on the next page if you want to use a 12 VDC supply. All other specifications are the same.

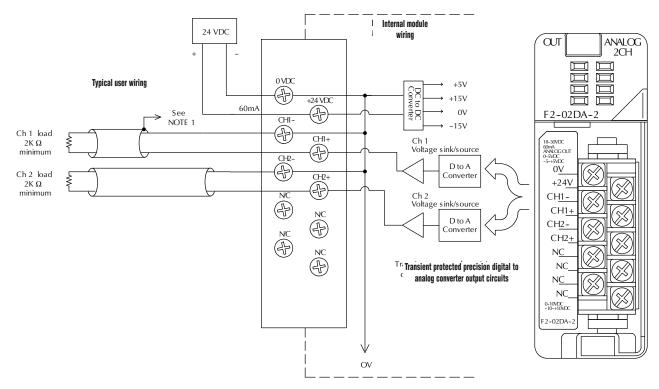|	
Number of Channels	2
Output Ranges	0 to 5V, 0 to 10 V, ±5V, ±10 V
Resolution	12 bit (1 in 4096)
Output Type	Single ended, 1 common
Digital Output Points Required	16 (Y) output points (12 binary data bits, 2 channel ID bits)
Peak Output Voltage	15 VDC (clamped by transient voltage suppressor)
Load Impedance	2000 Ω minimum
Load Capacitance	.01 µF maximum
PLC Update Rate	1 channel per scan maximum D2-230 CPU 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
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	40 mA
External Power Supply	18 to 30 VDC, 60 mA (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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

NOTE 2: Unused voltage outputs should remain open (no connections) for minimum power consumption.

Analog Voltage Output Modules

F2-02DA-2L 2-Channel Voltage Analog Output <--->

This module requires a 12 VDC user power supply for operation. See the F2-02DA-2 on the previous page if you want to use a 24 VDC supply. All other specifications are the same.

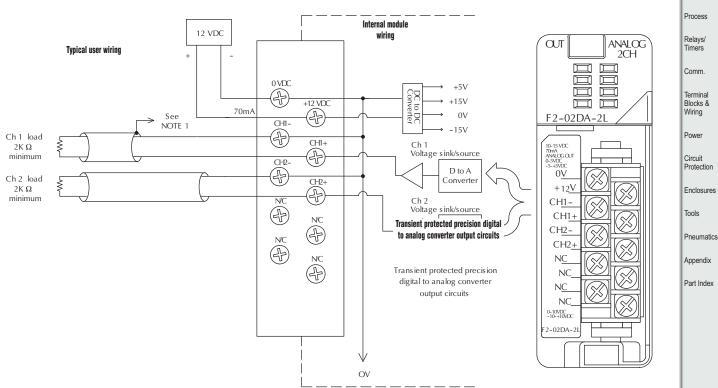|	
Number of Channels	2
Output Ranges	0 to 5V, 0 to 10 V, ±5V, ±10 V
Resolution	12 bit (1 in 4096)
Output Type	Single ended, 1 common
Digital Output Points Required	16 (Y) output points (12 binary data bits, 2 channel ID bits)
Peak Output Voltage	15 VDC (clamped by transient voltage suppressor)
Load Impedance	2000 Ω minimum
Load Capacitance	.01 µF maximum
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
Linearity Error (end to end)	±1 count (0.025% of full scale) maximum
Conversion Settling Time	5 µs 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	40 mA
External Power Supply	10 to 15 VDC, 70 mA (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 page 4-78 for part numbers of ZIPLink cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

Automation Direct

Company Info.

PLCs

Field I/O

Software

C-more & other HMI

AC Drives

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Limit Switches

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Current Sensors

Pressure Sensors
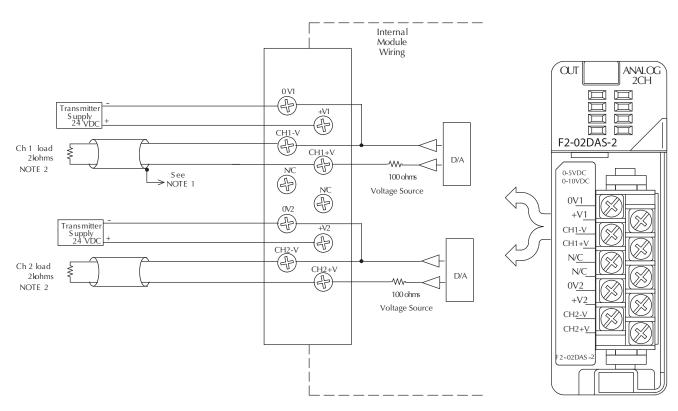
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Analog Voltage Output Modules

F2-02DAS-2 2-Channel 0-5V, 0-10V Isolated Analog Output <--->	
Number of Channels	2, isolated
Output Ranges	0-5V, 0-10V
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	±750 V continuous, channel to channel, channel to logic
Base Power Required 5VDC	60 mA
External Power Supply	21.6-26.4 VDC @ 60 mA per channel
Load Impedance	2 kΩ min
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 2 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
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/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

See page 4-78 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 0V of the P/S.

Analog Voltage Output Modules

F2-08DA-2 8-Channel Voltage Analog Output <--->

|	
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	60 mA
External Power Supply	21.6-26.4 VDC, 140 mA (outputs fully loaded)
Peak Output Voltage	15 VDC (clamped by transient voltage suppressor)
Load Impedance	1-10 kΩ
Load Capacitance	0.01 μF maximum
PLC Update Rate	1 channel per scan maximum (D2-230 CPU) 8 channels per scan maximum (D2-240, D2-250(-1) and D2-260 CPUs)
Conversion Settling Time	400 μs maximum (full scale change) 4.5 ms to 9ms for digital out to analog out
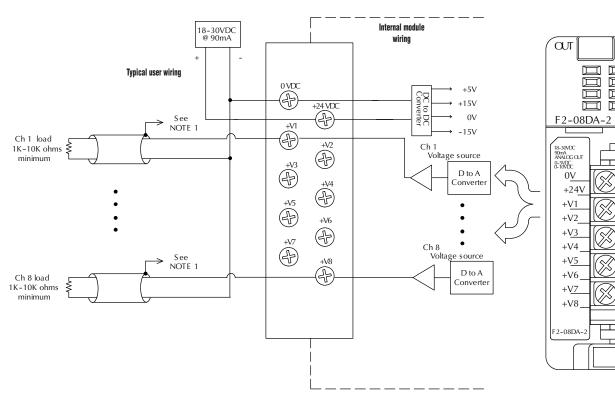
Linearity Error (end to end)	±1 count (±0.025% of full scale) maximum
Full Scale Calibration Error	±12 counts max. unipolar @ 25ºC (77ºF)
Offset Calibration Error	±3 counts max., unipolar @ 25ºC (77ºF)
Accuracy vs. Temperature	±57 ppm/ºC full scale calibration change (including maximum offset change of 2 counts)
Maximum Inaccuracy	±0.3% @ 25ºC (77ºF) ±0.45% @ 0-60ºC (32-140ºF)
Operating Temperature	0º to 60ºC (32º to 140°F)
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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).

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

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Analog In/Out Combination Module

F2-4AD2DA 4-Channel Analog Input / 2-Channel Analog Output <--->	
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	75 VDC, current outputs
Maximum Continuous Overload	-40 to +40 mA, each current output
Input Impedance	250 Ω, ±0.1%, 1/2 W, 25 ppm/°C current input resistance
External Load Resistance	0Ω minimum, current outputs
Maximum Loop Supply	30 VDC
Recommended Fuse	0.032 A, series 217 fast-acting, current inputs
Maximum Load/Power Supply	910 Ω/24 V, current outputs 620 Ω/18 V, 1200 Ω/30 V
Active Low-pass Filter	-3 dB @ 20 Hz, 2 poles (-12 dB per octave)
Linearity Error (best fit)	±1 count (±0.025% of full scale) maximum
Output Settling Time	100 µs maximum (full scale change)

Accuracy vs. Temperature	±50 ppm/°C full scale calibration change (including maximum offset change)
Maximum Inaccuracy	±0.1% @ 77°F (25°C) ±0.3% @ 32 to 140°F (0 to 60°C)
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: (D2-240, D2-250(-1) and D2-260 CPUs) 2 output channels per scan maximum: (D2-240, D2-250(-1) and D2-260 CPUs) 1 input and 1 output channel per scan maximum: (D2-230 CPU)
Base Power Required 5VDC	90 mA
External Power Supply Requirement	18-26.4 VDC @ 80 mA 20 mA per loop
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 page 4-78 for part numbers of *ZIP*Link cables and connection modules compatible with this I/O module.

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).
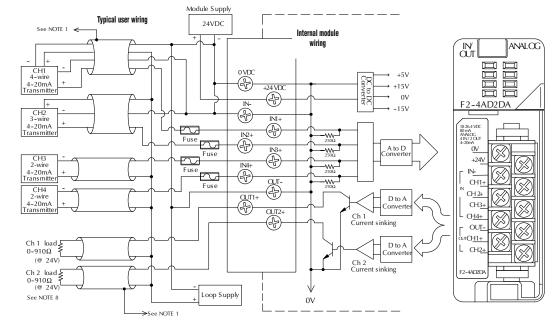
Note 1: Shields should be connected at their respective signal source.

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, 0.032A 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.
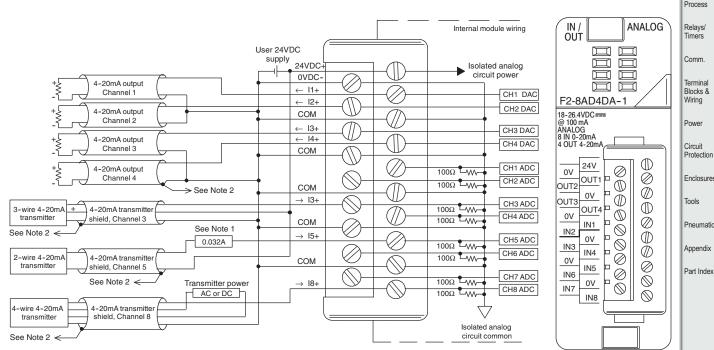
Analog In/Out Combination Module

F2-8AD4DA-1 8-Channel Analog Current Input / 4-Channel Analog Current Output <--->	
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	100 mA @ 18-26.4 VDC
Max. Continuous Overload	±45 mA
Input Impedance	100 Ω 0.1% 1/4W
Filter Characteristics	Active low pass, -3dB @ 80 Hz
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	±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)	0.032A, Littelfuse Series 217 fast-acting
Base Power Required 5VDC	35 mA

Output Channels per Module	4
Output Range	4 to 20 mA
Resolution	16-bit, 0.244 mA/bit
Output Type	Current sourcing at 20 mA 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	-70 dB, 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 min. warm-up typical
Output Ripple	0.005% of full scale
Output Settling Time	0.5 ms max., 5 µs min. (full scale change)
Max. Continuous Overload	Outputs open circuit protected
Type of Output Protection	Electronically current limited to 20 mA or less
Output Signal at Power-up and Power-down	4 mA
Terminal Type (included)	Removable; D2-16IOCON

Note 1: A Littlefuse 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.

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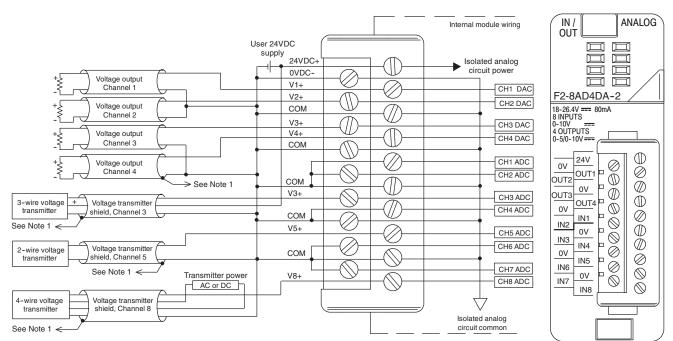Terminal Blocks & Wiring

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Analog In/Out Combination Module

F2-8AD4DA-2 8-Channel Analog Voltage Input / 4-Channel Analog Voltage Output <--->	
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	80 mA @ 18-26.4 VDC
Max. Continuous Overload	±100 V
Input Impedance	>10 MΩ
Filter Characteristics	Active low pass, -3 dB @ 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	35 mA

Output Channels per Module	4
Output Range	0 - 5V, 0 - 10V
Resolution	0 to 5V at 15-bit, 0 to10V at 16-bit, 152 µV/bit
Output Type	Voltage sourcing/sinking at 10 mA max.
Load Impedance	>1000 Ω
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	-70 dB, 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 min. 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 15 mA typical
Type of Output Protection	1 VDC 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.

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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, D2-260 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, D2-260 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, D2-260 only. Ors a normally open contact in parallel with another contact in a rung.

Or Not Bit-of-Word (ORNB)
D2-250-1, D2-260 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, D2-260 only. Ands a normally open contact in series with another contact in a rung.

And Not Bit-of-Word (ANDNB)
D2-250-1, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 only. Sets or turns on a bit in a V memory location.

Reset Bit-of-Word (RSTB)
D2-250-1, D2-260 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 Instructions

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)
D2-260 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)
D2-260 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)
D2-260 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 incrementing timer with 0.1 second resolution (0-999.9 seconds)

Fast Timer (TMRF)
Single input incrementing timer with 0.01 second resolution (0-99.99 seconds)

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

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

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

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

Up Down Counter (UDC)
Three input counter (0-99,999,999). 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)
D2-240, D2-250-1, D2-260 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)
D2-260 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)
D2-260 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, D2-260 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, D2-260 only. Logically ands the value in the accumulator and a specified range of discrete memory bits (1-32)

And with stack (ANDS)
D2-260 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, D2-260 only. Logically ors the value in the accumulator with a range of discrete bits (1-32)

Or with Stack (ORS)
D2-260 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, D2-260 only. Performs an exclusive or of the value in the accumulator and a range of discrete bits (1-32)

Exclusive Or with Stack (XORS)
D2-260 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, D2-260 only. Compares the value in the accumulator with a specified number of discrete locations (1-32)

Compare with Stack (CMPS)
D2-260 only. Compares the value in the accumulator with the first accumulator stack location

Compare Real Number (CMPR)
D2-250-1, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 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, D2-260 only. Increments a BCD value in a specified V memory location by 1 each time the instruction is executed.

Decrement (DEC)
D2-250-1, D2-260 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, D2-260 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.

Add Binary Double (ADDBD)
D2-260 only. Adds the binary value in the accumulator to a value which is either two consecutive V-memory locations or a 32-bit constant. The result resides in the accumulator

Subtract Binary (SUBB)
D2-250-1, D2-260 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.

Subtract Binary Double (SUBBD)
D2-260 only. Subtracts a 32-bit binary value, which is either two consecutive V-memory locations or a 32-bit constant, from the value in the accumulator. The result resides in the accumulator

Multiply Binary (MULB)
D2-250-1, D2-260 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, D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 only. Divides the 8-digit BCD value in the accumulator by the 4-digit BCD value in the first level of the accumulator stack. The result resides in the accumulator

Add Binary Top of Stack (ADDBS)
D2-260 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)
D2-260 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)
D2-260 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)
D2-260 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 (D2-260 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, D2-260 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, D2-260 only. Rotates the bits in the accumulator a specified number of places to the left.

Rotate Right (ROTR)
D2-250-1, D2-260 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

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, D2-260 only. Converts a table of ASCII values to a table of hexadecimal values.

HEX to ASCII (HTA)
D2-250-1, D2-260 only. Converts a table of hexadecimal values to a table of ASCII values.

Segment (SEG)
D2-250-1, D2-260 only. Converts four digit HEX value in accumulator to seven segment display format.

Gray Code to BCD (GRAY)
D2-240, D2-250-1, D2-260 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)
D2-240, D2-250-1, D2-260 only. Shuffles a maximum of 8 digits, rearranging them in a specified order. The result resides in the accumulator.

Radian Real Conversion (RADR)
D2-260 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)
D2-260 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, D2-260 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, D2-260 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)
D2-260 only. Sets a single bit (to a 0) in a V-memory location.

Reset Bit (RSTBIT)
D2-260 only. Resets a single bit (to a 0) in a V-memory location.

Extended Table Instructions (D2-260 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 / Calender Instructions

Date (DATE)
D2-250-1, D2-260 only. Use to set the date in the CPU.

Time (TIME)
D2-250-1, D2-260 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)
D2-240, D2-250-1, D2-260 only. Resets the CPU watchdog timer.

PLC Products

DL205 Instruction Set

Program Control Instructions

Goto Label (GOTO) (LBL)
D2-240, D2-250-1, D2-260 only. Skips all instructions between the Goto and corresponding LBL instructions.

For/Next (FOR/NEXT)
D2-240, D2-250-1, D2-260 only. Executes the logic between the FOR and NEXT instructions a specified number of times.

Goto Subroutine (GTS/SBR/RT/RTC)
GTS, SBR, RT: D2-240, D2-250-1, D2-260 only.
RTC: D2-250-1, D2-260 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.

Master Line Set/Master Line Reset (MLS/MLR)
Allows the program to control sections of ladder logic by forming a new power rail. The MLS marks the beginning of a power rail and the MLR marks the end of the power rail control.

Interrupt Instructions

Interrupt Routine/Interrupt Return/Interrupt Return Conditional (INT/IRT/IRTC)
INT, IRT: D2-240, D2-250-1, D2-260 only.
IRTC: D2-250-1, D2-260 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)
D2-240, D2-250-1, D2-260 only. Enables hardware and software interrupts to be acknowledged.

Disable Interrupt (DISI)
D2-240, D2-250-1, D2-260 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: D2-240, D2-250-1, D2-260 only.
DLBL: All D2 CPUs.
Displays a V memory value or a data label constant to the hand-held programmer or personal computer using DirectSOFT.

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

Print Message (PRINT)
D2-250-1, D2-260 only.
Prints the embedded text or text/data variable message to the specified communications port. Maximum message length is 255 words. appropriate bit position to 1 in the accumulator.

Network Instructions

Read from network (RX)
D2-240, D2-250-1, D2-260 only. Reads a block of data from another CPU on the network.

Write to network (WX)
D2-240, D2-250-1, D2-260 only. Writes a block of data from the master device to a slave device on the network.

Modbus Instructions (D2-260 only)

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 (D2-260 only)

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, D2-260 only)

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

(D2-240, D2-250-1, D2-260 only)

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

Company Info.

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Pressure Sensors

Temp. Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Part Index

IBox Instructions

The IBox instructions are available when using a D2-250-1 CPU with firmware version 4.60 or later, D2-260 CPU with firmware version 2.40 or later, and DirectSOFT5.

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. Every 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.