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
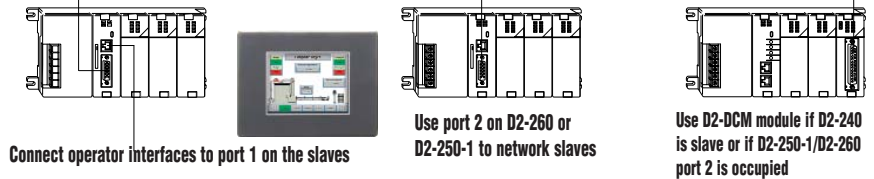
Connect operator interfaces to port 1 on the slaves

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, version 2.10 or later 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.

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

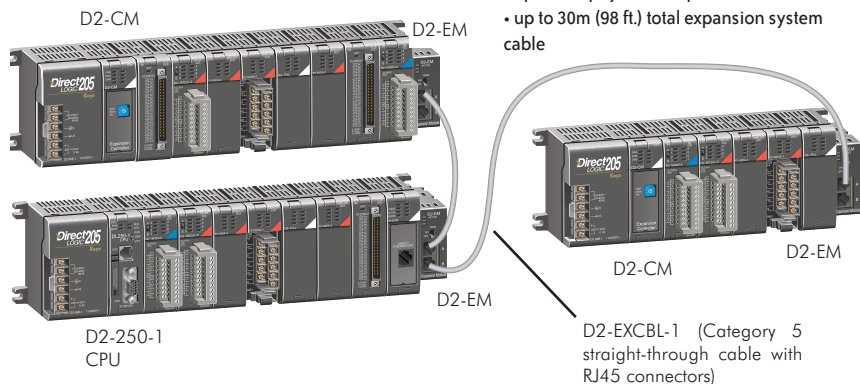D2-EXCBL-1 (Category 5 straight-through cable with RJ45 connectors)

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.

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

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Soft Starters
Motors & Gearbox
Steppers/ Servos
Motor Controls
Proximity Sensors
Photo Sensors
Limit Switches
Encoders
Current Sensors
Pressure Sensors
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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.
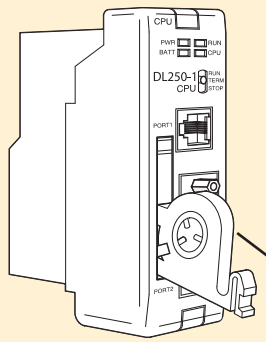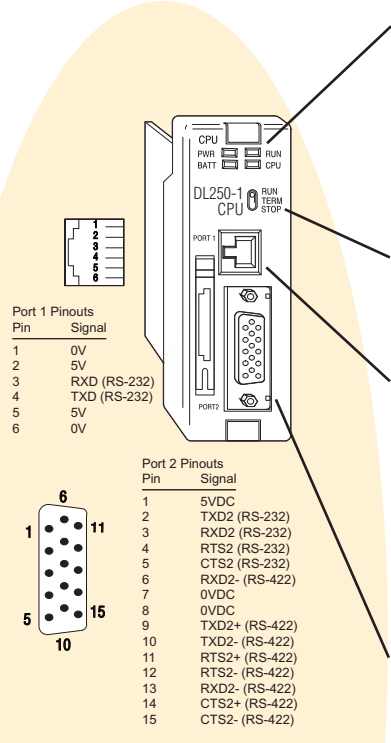
On-board memory

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.)

*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 D2-250-1 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, *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 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-232/422 300/600/1200/2400/4800 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 backup. 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
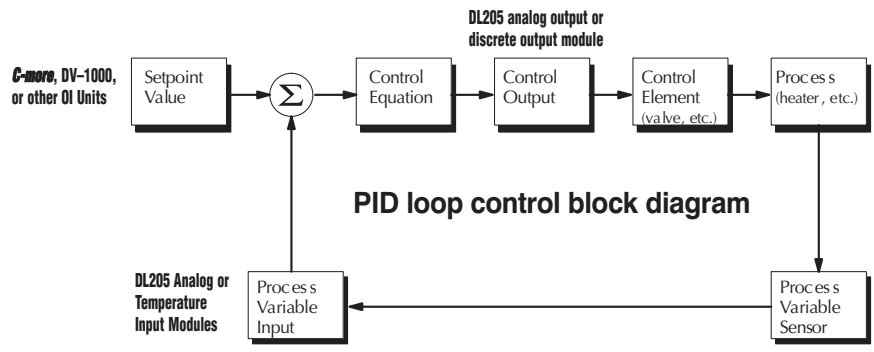
DL205 CPU Specifications

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

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