

D3-350 CPU

D3-350 Retired

A most powerful! DL305 CPU

The D3-350 combines the power, speed and ease of the D2-250-1 CPU with existing DL305 I/O modules and bases.

DirectSOFT Programming Software Release V2.3 or higher is required to program the D3-350. For existing license holders, an upgrade package is available. If you are using a handheld programmer (D2-HPP, release 1.8 or lower), a new release of handheld programmer firmware will also be required.

Four PID loops and auto-tuning

The D3-350 CPU can process up to four PID loops directly in the CPU. 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 our DirectSOFT Programming Software.

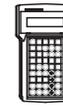
The auto-tuning feature is also easy to use and can reduce setup and maintenance time. The CPU uses the auto-tuning feature to automatically determine near optimum loop settings.



Powerful built-in CPU communications

The D3-350 offers two communication ports that provide a vast array of communication possibilities. The top RS232C port is for programming, a DV-1000 connection, a connection to our operator interface panels, or a K-sequence/DirectNET Server port. The 25-pin bottom port can use RS232C or RS422. This port offers several different protocol options, such as K-sequence protocol, DirectNET Client/-Server, Modbus Client/-Server, and even a direct connection to DL205 remote I/O. The ability to select these features is provided via software so you can choose the best combination for the application.

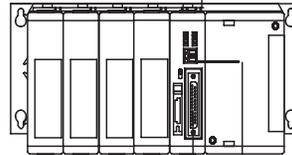
Easily connect programming devices



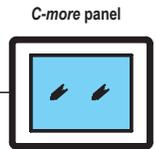
Or



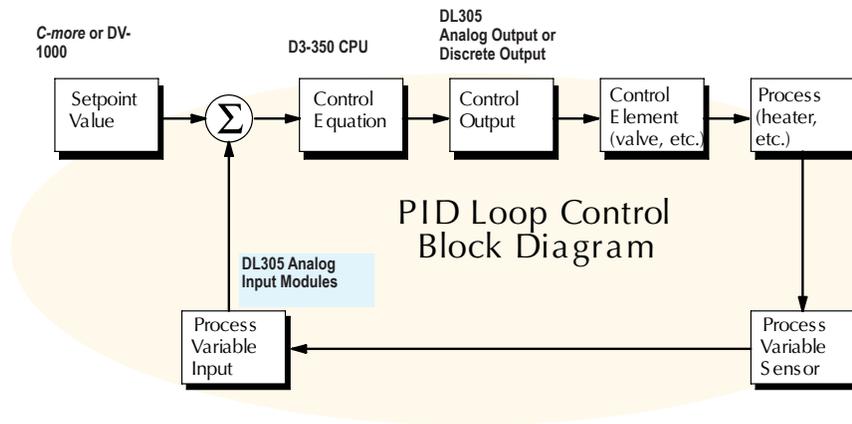
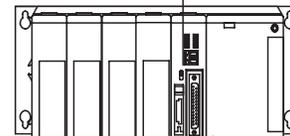
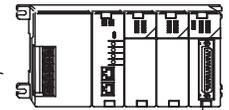
Client station issuing network request



Or connect operator interfaces



Server stations responding to network devices



D3-350 Key Features

The D3-350 supports over 130 instructions. These include:

- Four types of drum sequencers
- Leading and trailing edge triggered one-shots
- Bit of word manipulation
- Floating point conversions
- Print instruction to send ASCII data through the bottom CPU port

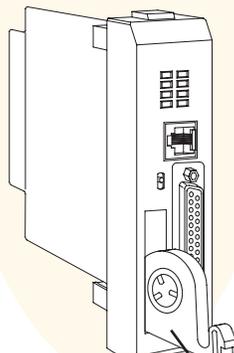
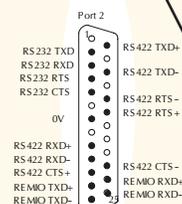
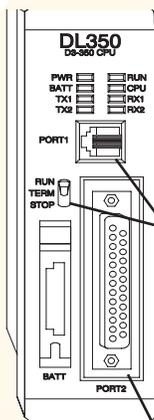
For a complete list of instructions supported by the D3-350 CPU, see the end of this section.

On-board flash memory

The D3-350 has 7.6 K of flash memory on board. 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 V-memory, like PID loops, simply purchase the optional lithium battery to maintain these parameters as well.

Built-in remote I/O connection

The bottom port on the D3-350 can also be used as a Client for a remote I/O network.



CPU Status Indicators		
RUN	ON OFF	CPU is in RUN mode CPU is in Program mode
BATT	ON OFF	Battery backup voltage is low Battery backup voltage is OK or disabled
CPU	ON OFF	CPU internal diagnostics has detected an error CPU is OK
PWR	ON OFF	CPU power good CPU power failure
Mode Switch		
RUN		Forces CPU into Run Mode
TERM		Allows peripherals (HPP, DirectSOFT and operator interface panels) to write to the CPU.
STOP		Forces CPU out of RUN mode
Port 1		
Protocols		K-sequence Server DirectNET Server
Devices		Can connect w/HPP, DirectSOFT, DV-1000, C-more Panels, or any DirectNET Client
Specs.		6P6C phone jack connector RS232C 9600 baud Odd parity Fixed station address 1 8 data bits 1 start, 1 stop bit Asynchronous, half-duplex, DTE
Port 2		
Protocols		K-sequence Server DirectNET Client/Server MODBUS RTU Client/Server Remote I/O Client
Devices		Can connect w/many devices, such as PCs running DirectSOFT, KEPServerEX* for PLCs Server, HMI packages, DV-1000, C-more panels, or any DirectNET or MODBUS RTU Client or Server
Specs.		25-pin D-shell connector RS232C/RS422 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-1 start, 1 stop bit Asynchronous, half-duplex, DTE
Batteries (optional)		
D2-BAT-1		D3-350 only, coin type 3.0V Lithium battery, 560mA battery # 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, such as PID loops.

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

D3-350 CPU Loop Specifications

D3-350 Retired PID Loop Specifications and Key Features	
Number of Loops	Selectable, four maximum
CPU V-Memory Required	32 V-memory locations per loop selected (additional 32 V-memory locations per loop required if using Ramp/Soak)
PID Algorithm	Position or velocity form of the PID equation. direct or reverse acting, square root of the error and error squared control.
Auto-Tuning	Open-loop step response method and closed-loop limit cycle method.
Sample Rate	Specify the time interval between PV samples, 0.05 to 99.99 seconds. Smallest sample rate is limited to either 0.05 seconds or (PLC scan time x number of loops).
Loop Operation Modes	Loops can be in automatic control, manual (operator) control, or cascade control. PV alarm monitoring continues when loops are in manual mode.
Ramp/Soak	Up to 16 steps (8 ramp, 8 soak) per loop, with indication of ramp/soak step.
Square Root	Specify a Square root of the PV for a flow control application.
Change of Setpoint	Specify a maximum and minimum value for allowable setpoint changes.
Output Limit	Specify a maximum and minimum value for the output range.
Gain	Specify proportional gain of 0.01 to 99.99.
Reset	Specify integral time of 0.1 to 999.8 in units of seconds or minutes.
Derivative	Specify the derivative time, 0.00 to 99.99 seconds.
Derivative Gain Limiting	Specify a derivative gain limiting coefficient to filter the PV used in calculating the derivative term (0 to 20).
Bumpless Transfer I	Bias and setpoint are initialized automatically when the module is switched from manual to automatic. This provides for a bumpless transfer, which reduces the chance of sharp changes in the output as a result of entering automatic mode.
Bumpless Transfer II	Bias is set equal to the output when the module is switched from manual to automatic. This allows switching in and out of automatic mode without having to re-enter the setpoint.
Error Deadband	Specify an incremental value above and below the setpoint in which no change in output is made.
Error Squared	Squaring the error minimizes the effect a small error has on the Loop output, however both Error Squared and Error Deadband control may be enabled.
Alarm Specifications	
Deadband	Specify 0.1% to 5% alarm deadband on all alarms except rate of change.
PV Alarm Points	Specify PV alarm settings for low-low, low, high, and high-high conditions. You can also specify a deadband to minimize the alarm cycles when the PV approaches alarm limits.
PV Deviation	Specify alarms to indicate two ranges of PV deviation from the setpoint value (yellow and red deviation).
Rate-of-Change	Specify a rate-of-change limit for the PV.

CPU Specifications

DL305 CPU Specifications	
System Capacity	
	D3-350
Total memory (K words)	14.8
Ladder memory (K words)	7.6
User data memory	7.1 K words
CMOS RAM	No
UVPROM	No
EEPROM	Flash
Total I/O points using:	
Local I/O	144
Local and Expansion I/O	368
Remote I/O(1)	512
I/O point density	8/16
Slots per base (CPU requires 1 slot)	5/8/10
Performance	
Contact execution (boolean)	0.61 μ s
Typical scan (1K boolean)(2)	5-6 ms
Programming & Diagnostics	
RLL ladder style	Yes
RLLPLUS (stage)	Yes
RunTime Editing	Yes
Supports Overrides	Yes
Variable/fixed scan	Either
Handheld programmer port	Yes
Built-in RS232C ports	2
Real-time clock/calendar	Yes
Instructions	129
Control relays(CR)	1024
Shift register bits	Use CRs
Stages (RLLPLUS only)	1024
Timers/counters	256/128
Immediate I/O	Yes
Subroutines	Yes
For/Next Loops	Yes
Timed interrupt	Yes
Integer math	Yes
Floating point math	Yes
PID	Yes
Drum sequence	Yes
Bit of word	Yes
ASCII print	Yes
Data registers	7168
Internal diagnostics	Yes
Password security	Multi-level
Battery backup	Yes
Communications	
Built-in ports	Yes
DirectNET Client	Yes
DirectNET Server	Yes
MODBUS RTU Client	Yes
MODBUS RTU Server	Yes
Data communications unit	N/A
Specialty modules	
Thermocouple	Yes
Analog Input (#channels max.)	368
Analog output (#channels max.)	48
High-speed counter (10KHz)	No



1. The D3-350 bottom port supports DL205 remote I/O.
2. 1K program includes contacts, coils, and scan overhead. If you compare to other products, make sure to include their scan overhead.

Communications

Determine your communications requirements

The choice of CPU can have a big impact on your communications capabilities in the DL305 family. If you are considering doing any communications, you should use the D3-350 CPUs.

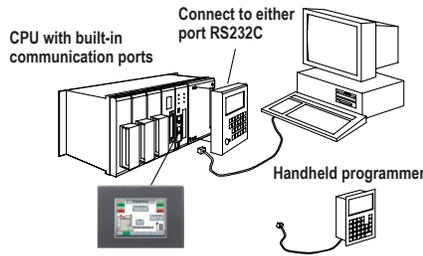
Standard communications

The D3-350 CPU offers two built-in RS232C communication ports. Operator interfaces and DirectSOFT can be connected to either port. On the D3-350 CPU, the handheld programmer is attached to Port 1. The handheld programmer can be operated simultaneously with the communication ports. Port 1 on the D3-350 is fixed. Port 2 can be configured using the handheld programmer or DirectSOFT.

DL305 as a network client

The bottom built-in communication port of the D3-350 CPU can serve as a Network Client for DirectNET. Up to 90 Server stations can be addressed. The D3-350 can also serve as a MODBUS RTU Client; up to 247 Server stations can be addressed. DL405, DL305 and DL205 controllers can be used as Server stations.

Network Addresses		
Port	Protocol	Range
1	Server	1-90
2	Server	1-90
	Client	0
	MODBUS/RTU	1-247



DL305 as a server on a network

Both ports on the D3-350 CPU can serve as server ports for DirectNET. The bottom ports offer additional flexibility in that they can serve as a Server on a Modbus RTU network. The D3-350 even supports RS422, so no RS232-to-RS422 converter is needed. No programming is required in these CPUs for them to act as Server ports.

Custom drivers

The DL305 product family supports the DirectNET protocol. However, in some applications you may have a need to connect to a device that does not support this protocol. If so, the ASCII/BASIC modules also allow you to write your own custom communication drivers (in BASIC) to connect to special devices. These high-speed modules offer communication rates up to 115.2K baud on RS232C, RS422, and RS485. With 128K of memory, there is ample program or data storage space. (These modules are not supported by the D3-350.)

