D3-350 CPU

D3-350 <--->

Our 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.

*Direct*SOFT 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.

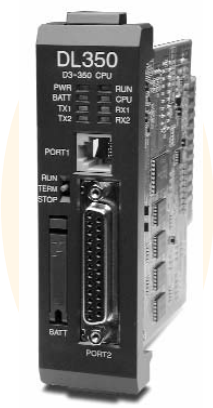
Four PID loops and auto-tuning

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 *Direct*SOFT Programming Software.

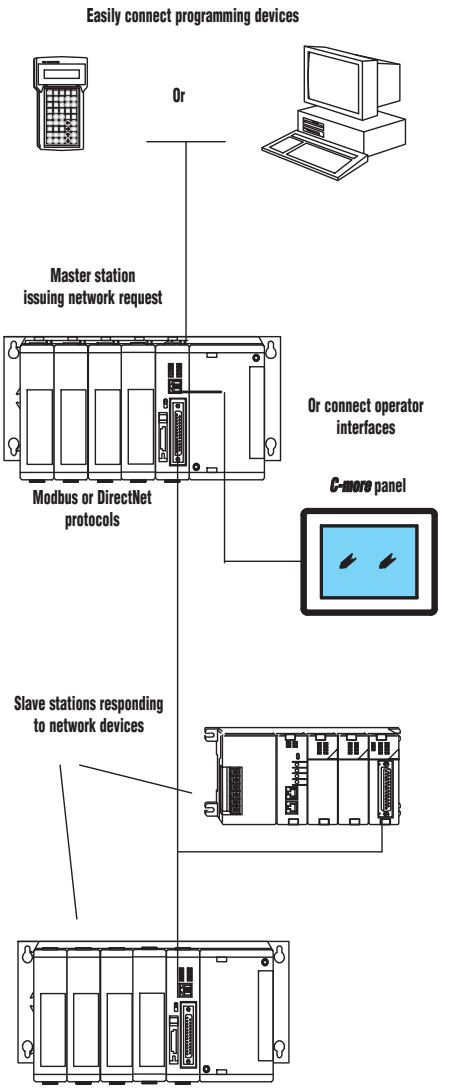
The auto-tuning feature is also easy to use and can reduce setup and maintenance time. The CPU uses the auto-tuning feature to automatically determine near optimum loop settings.

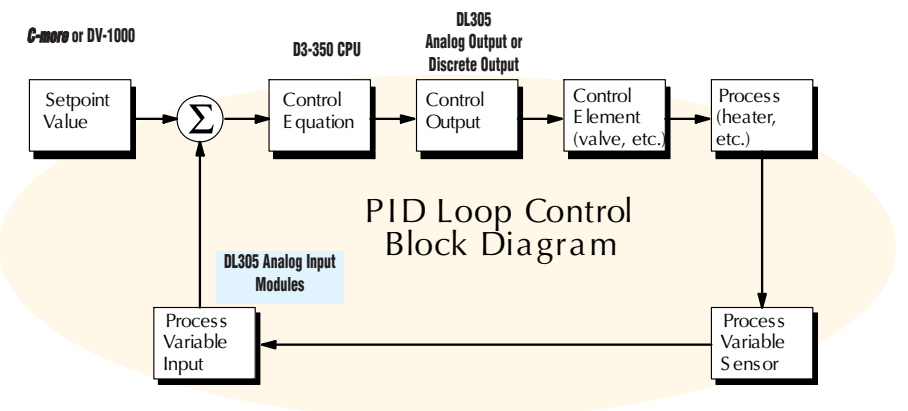
Note: D3-330 and D3-340 programs cannot be downloaded into the D3-350 CPU. The D3-350's instruction set is based on the DL205/DL405 instruction set. If an existing D3-330 or D3-340 system is upgraded to a D3-350 CPU, the RLL program must be re-written for the D3-350 CPU.



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/*Direct*NET slave port. The 25-pin bottom port can use RS232C or RS422. This port offers several different protocol options, such as K-sequence protocol, *Direct*NET Master/-Slave, Modbus Master/-Slave, 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.





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

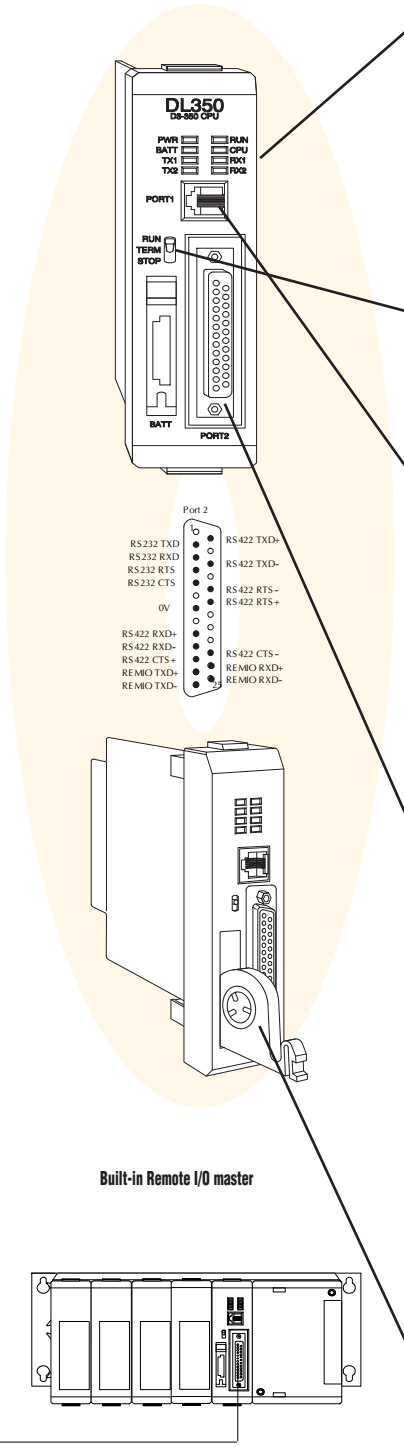
For a complete list of instructions supported by the D3-350 CPU, see the end of this section.

On-board flash memory

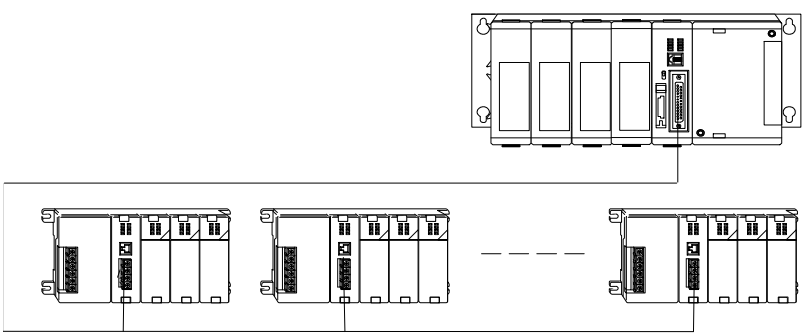
The D3-350 has 7.6 K of flash memory on board. With flash memory, you don't have to worry about losing the program due to a bad battery. If you have critical data stored in V-memory, like PID loops, simply purchase the optional lithium battery to maintain these parameters as well.

Built-in remote I/O connection

The bottom port on the D3-350 can also be used as a master for a remote I/O network. If you need extra I/O at some remote distance from the CPU, use this port to add up to seven DL205 remote slave stations. (See the DL205 section for D2-RSSS information.)



Built-in Remote I/O master



...allows you to connect up to seven DL205 remote slaves!

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, *Direct*SOFT and operator interface panels) to write to the CPU.	
STOP	Forces CPU out of RUN mode	
Port 1		
Protocols	K-sequence slave *Direct*NET slave	
Devices	Can connect w/HPP, *Direct*SOFT, DV-1000, *C-more* Panels, or any *Direct*NET Master	
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 slave *Direct*NET Master/slave MODBUS RTU Master/slave Remote I/O Master	
Devices	Can connect w/many devices, such as PCs running *Direct*SOFT, KEP*direct* for PLCs Server, HMI packages, DV-1000, *C-more* panels, or any *Direct*NET or MODBUS RTU master or slave	
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	

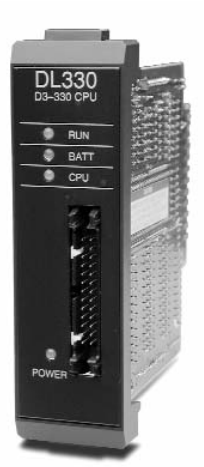
Note: Batteries are not needed for program backup. However, you should order a battery if you have parameters in V-memory that must be maintained in case of a power outage, such as PID loops.

D3-350 PID Loop Specifications

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 PV	Specify a Square root of the PV for a flow control application.
Limit SP	Specify a maximum and minimum value for allowable setpoint changes.
Limit Output	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.
Rate	Specify the derivative time, 0.00 to 99.99 seconds.
Rate Limiting	Specify a derivative gain limiting coefficient to filter the PV used in calculating the derivative term (0 to 20).
Bumpless Transfer I	Bias and setpoint are initialized automatically when the 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	***D3-330***	***D3-340***	***D3-350***
Total memory (K words)	3.91	3.98	14.8
Ladder memory (K words)	3.7	3.7	7.6
User data memory	116 bytes	172 bytes	7.1K words
CMOS RAM	Yes	Yes	No
UVPROM	Opt.	Opt.	No
EEPROM	No	Opt.	Flash
Total I/O points using:			
Local I/O	128	136	144
Local and Expansion I/O	176	184	368
Remote I/O[1]	N/A	N/A	512
I/O point density	8/16	8/16	8/16
Slots per base (CPU requires 1 slot)	5/8/10	5/8/10	5/8/10
Performance			
Contact execution (boolean)	6.6µs	.87µs	.61µs
Typical scan (1K boolean)[2]	15ms	4-5ms	5-6ms
Programming & Diagnostics			
RLL ladder style	Yes	Yes	Yes
RLL^{PLUS} (stage)	No	No	Yes
RunTime Editing	No	No	Yes
Supports Overrides	No	No	Yes
Variable/fixed scan	variable	variable	either
Handheld programmer port	Yes	Yes	Yes
Built-in RS232C ports	No[3]	2	2
Real-time clock/calendar	No	No	Yes
Instructions	61	63	129
Control relays(CR)	140	196	1024
Shift register bits	128	128	use CRs
Stages (RLL^{PLUS} only)	N/A	N/A	1024
Timers/counters	64	64	256/128
Immediate I/O	No	No	Yes
Subroutines	No	No	Yes
For/Next Loops	No	No	Yes
Timed interrupt	No	No	Yes
Integer math	Yes	Yes	Yes
Floating point math	No	No	Yes
PID	No	No	Yes
Drum sequence	No	No	Yes
Bit of word	No	No	Yes
ASCII print	No	No	Yes
Data registers	128	192	7168
Internal diagnostics	Yes	Yes	Yes
Password security	Yes	Yes	Multi-level
Battery backup	Yes	Yes	Yes
Communications			
Built-in ports[3]	No	Yes	Yes
*Direct*NET master	No	Yes	Yes
*Direct*NET slave	w/DCU	Yes	Yes
MODBUS RTU master	No	No	Yes
MODBUS RTU slave	No	Yes	Yes
Data communications unit	Yes	Yes	N/A
Specialty modules			
Thermocouple	Yes	Yes	Yes
Analog Input (#channels max.)	112	128	368
Analog output (#channels max.)	28	32	48
High-speed counter (10KHz)	Yes	Yes	No



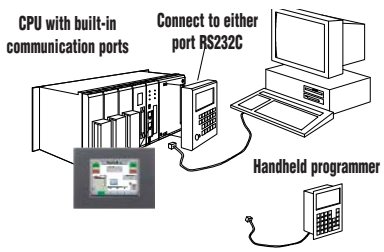
1. ***The D3-350 bottom port supports DL205 remote I/O.***
2. ***1K program includes contacts, coils, and scan overhead. If you compare to other products, make sure to include their scan overhead.***
3. ***The D3-330 requires a Data Communications Unit (DCU) for programming with Direct*SOFT *software.***

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 D3-340 or the D3-350 CPUs. You can communicate with the D3-330 CPU, but you have to add a DL305 Data Communications Unit to connect any device other than a handheld programmer. The Data Communications Unit has only one port.

D3-340 RS232C Communication Port Specifications	
Protocol	***DirectNET***
Connector	RJ11(handset connector)
Network address	01 to 90
Baud rate	38400, 19200, 9600, 4800, 2400, 1200, 600, 300
Parity-	None or odd
Transfer mode	HEX/ASCII Half-duplex Asynchronous
Data bits	8
Start bits	1
Stop bits	1
Turn around delay	0 to 1980 in 20ms intervals (preset with R777)



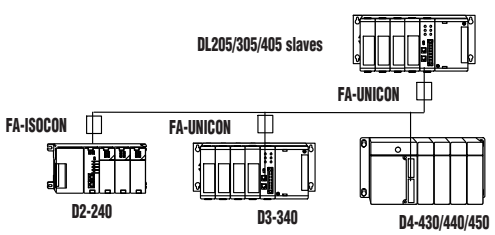
Network Addresses		
Port	***Protocol***	***Range***
1	Slave	1-90
2	Slave	1-90
	Master	0
	MODBUS/RTU	1-247

Standard communications

The D3-340 and D3-350 CPUs offer two built-in RS232C communication ports. Operator interfaces and *Direct*SOFT can be connected to either port. On the D3-340 CPU, the handheld programmer is attached directly or with a cable to the parallel port adjacent to the two serial communication ports. On the D3-350 CPU, the handheld programmer is attached to Port 1. The handheld programmer can be operated simultaneously with the communication ports. The D3-340 baud rate and network addresses are set by hardware dipswitches and rotary switches for Port 1. Port 2 uses internal registers that can be changed with a handheld programmer or *Direct*SOFT. Port 1 on the D3-350 is fixed. Port 2 can be configured using the handheld programmer or *Direct*SOFT.

DL305 as a slave on a network

Both ports on the D3-340 and the D3-350 CPUs can serve as slave ports for *Direct*NET. The bottom ports offer additional flexibility in that they can serve as a slave 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 slave ports.



DL305 as a network master

The bottom built-in communication port of the D3-340 and D3-350 CPUs can serve as a Network Master for *Direct*NET. Up to 90 slave stations can be addressed. The D3-350 can also serve as a MODBUS RTU Master; up to 247 slave stations can be addressed. DL405, DL305 and DL205 controllers can be used as slave stations. *(Please note there are certain restrictions pertaining to valid DL205 and DL405 memory types that the D3-340 master can read and write.)*

Custom drivers

The DL305 product family supports the *Direct*NET 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.)