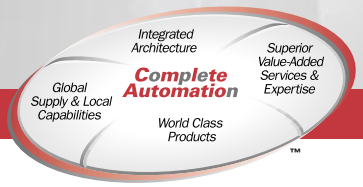


WELCOME TO THE WORLD OF COMPLETE AUTOMATION

Digital Servo Drive Power and Flexibility

Allen-Bradley

Ultra Family Servo Drives

Allen-Bradley
RELIANCE ELECTRIC
DODGE
ROCKWELL SOFTWARE
Rockwell Automation

Bringing Together Leading Brands in Industrial Automation

Ultra Family Drives – A Broad Range of Power and Flexibility

The new Ultra Family creates a comprehensive set of servo drive products that range from simple analog command control to state-of-the-art, single-axis intelligent position control. Three Ultra Family drives provide this range of features. The Ultra3000 is a high-performance, digital servo drive that provides analog command control, preset speed and torque control, as well as master/follower operation. The Ultra3000i digital servo drive with indexing adds basic position control capability to the Ultra3000 feature set. The Ultra5000 drive is a flexible, powerful, C-programmable intelligent positioning drive.

Ultra5000

The entire Ultra Family is configured and programmed using Ultraware software. Ultraware provides a rich, intuitive tool set that includes sophisticated digital storage scope capability, a comprehensive array of diagnostics, and a file management system that helps organize multiple configuration files and motion programs.

To complete your system, the entire Ultra Family will operate our wide variety of high-performance rotary servomotors. The Ultra Family also offers seamless support of high-performance linear motors for your most demanding linear motion applications.

Ultra3000

How Much Sophistication Does Your Application Require?

With the Ultra Family of drives, you can use the product that is the right fit for your application.

Ultra5000 Intelligent Positioning Drive

- When your application demands extremely high performance and flexibility, the Ultra5000 will provide you with an unprecedented level of performance at a reasonable price.
- High-speed digital signal processor technology, combined with C programmability, allows the Ultra5000 to accommodate the most demanding applications and execute motion programs extremely fast.
- High-speed applications such as labelers, smart belts, and flying cutoff systems will benefit from the Ultra5000's flexibility and performance.
- Because the Ultra5000 uses the standard ANSI C library of functions, it provides a rich set of math, string, and array commands that are not usually available on intelligent positioning drives.

Ultra3000 Digital Servo Drive

- Use the Ultra3000 with PC-based and stand-alone motion controls that generate analog torque and velocity commands. Digital velocity and current loops in the Ultra3000 provide excellent, stable performance, and the Ultraware software makes them easy to set up.
- If your application requires accurate velocity control, the 8 preset velocities available on the Ultra3000 allow several speeds to be selected using the drive's digital inputs.
- The Ultra3000's flexible master/follower mode allows 8 different master/follower ratios to be selected using the drive's digital inputs.

Ultra3000i Digital Servo Drive with Indexing

- The Ultra3000i drive provides an economical solution to applications that require simple position control. Using the Ultra3000i's digital inputs, up to 64 individual indexes can be selected. Indexes can be absolute positions, incremental distances, and even registration sensor-based motions. Also, multiple indexes can be linked together to form complex motion sequences, and blended indexes can be used to create complex profiles.

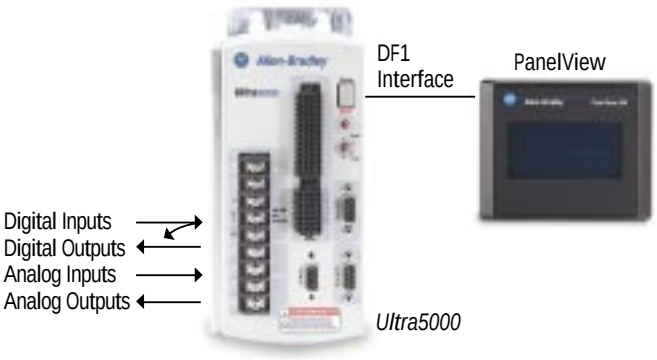
Platform Integration or Stand-Alone Flexibility

Motion control is the most important component to reducing cycle time in many applications. For higher performance and lower overall automation system costs, users now expect systems where multiple control functions, such as motion control and sequential control, integrate on single platforms for a single point of programming.

The Allen-Bradley Ultra Family is designed to provide OEM machine builders the flexibility of distributed, stand-alone component integration or broader integration into any machine architecture including Allen-Bradley's ControlLogix platform. ControlLogix technology integrates motion and sequential control functionality into a single multitasking controller platform that results in higher system performance, faster application development, easier maintenance, and lower system costs.

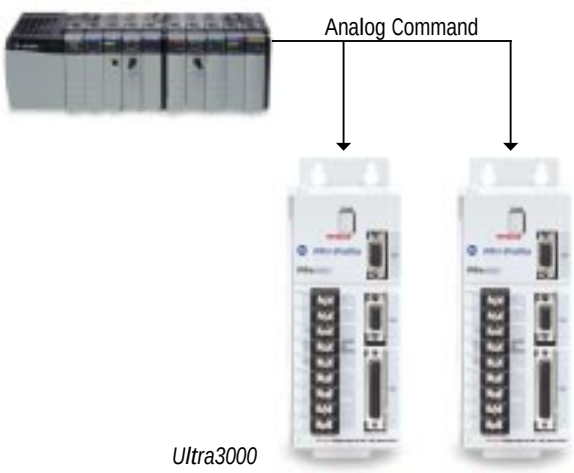
Ultra5000 Stand-Alone

The Ultra5000 is a complete stand-alone control system with 2 serial ports, 16 digital inputs, 8 digital outputs, 2 analog inputs, and 2 analog outputs. Also, using the Ultra5000's DF1 PanelView driver, you can use any PanelView product as an operator interface to the Ultra5000.



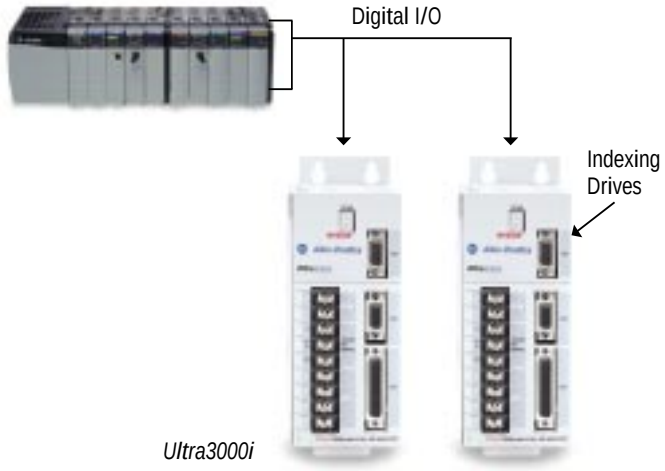
Ultra3000 and ControlLogix Integration

Using the ControlLogix I756-M02AE 2 axis analog output servo module with the Ultra3000 provides a tightly integrated motion/sequential control system.



Ultra3000i with Indexing Servo Drive and ControlLogix

Digital inputs from operator controls or a programmable logic controller can be used to initiate different motion profiles and motion sequences.



Ultraware Software – Pure Productivity

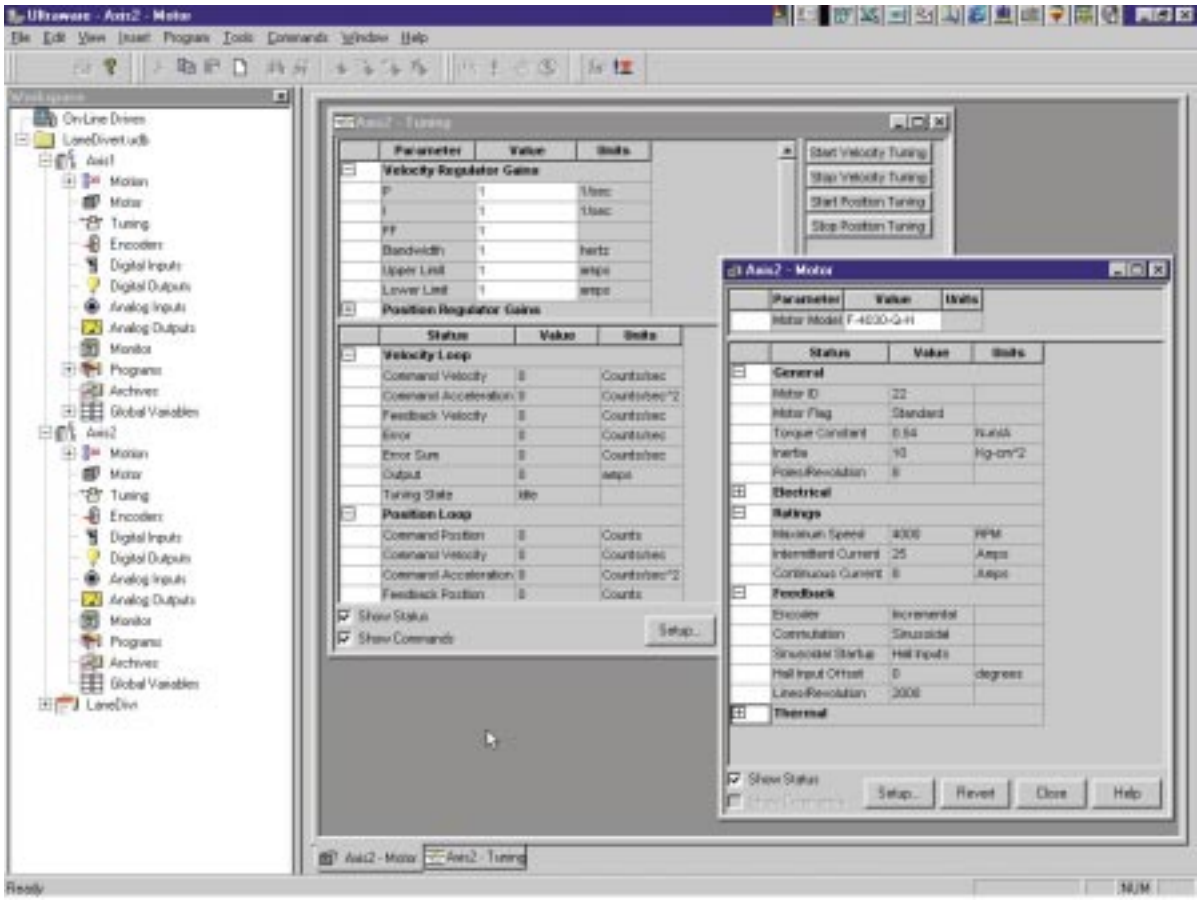
When you use the Ultra Family servo drives, you find just how easy they are to use. Ultraware is a Windows-based interface with an intuitive object-oriented tree structure. With online help and quick startup windows, setup is simple.

But Ultraware is more than just a configuration tool. It also comes with powerful, field-tested productivity tools such as:

- On-screen digital oscilloscope for fast tuning and diagnosis (October 2000)
- A full array of on-screen meters and other software tools for rapid debugging and measurement
- Instant access to critical information with complete online help
- Diagnostic and setup tools to make system integration a snap

Ultra Family drives keep error messages in nonvolatile message buffers, so tracking down problems is easier.

Ultraware software helps you save time, reduce your learning curve, and simplify the integration and debugging of your system because the same software is used for the entire Ultra Family. That means fewer maintenance headaches, less downtime, and a lower life cycle cost for all your drives.



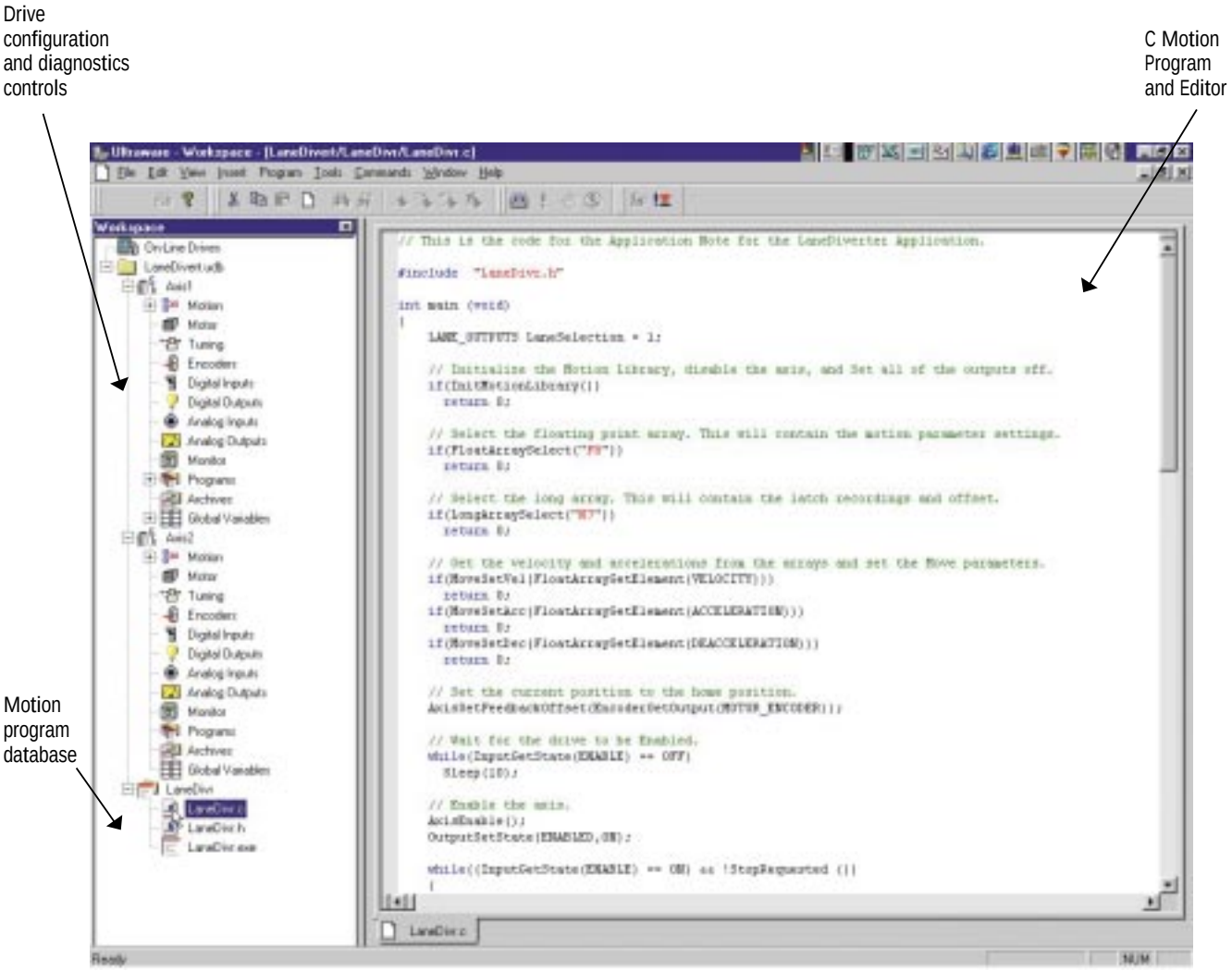
Ultraware Software

Ultraware C Programming Environment

Ultra5000 Intelligent Positioning Drive motion programs are created using motion commands within an ANSI C format. The Ultra5000 is the first intelligent positioning drive to leverage the power and flexibility of the standard ANSI C language. Furthermore, adopting ANSI C as the programming language for the Ultra5000 provides the following benefits:

- Excellent capability to handle arrays, strings, numeric conversions, and math operations
- A rich set of iteration and selection structures such as If-Then, While, Do-While, For, and Switch operations
- Well-known syntax
- Greater speed and code compactness
- Convenient methods to add custom functions like rotary-knife, smart-belt, etc.

The Ultraware software used to configure the Ultra5000 includes a full-featured, color-syntax editor that provides access to the C programming environment.



Ultraware Software with C Editor

Ultra5000 Intelligent Positioning Drive Features

- 100 to 240 VAC single-phase input
- 60 MHz TMS320C32 floating point DSP
- Field-Programmable Gate Array (FPGA) technology
- Field-programmable flash memory storage of firmware and user programs
- Nonvolatile storage for system parameters and user variables
- Digital rotating reference frame current regulator
- Software selection of digital I/O to be sinking or sourcing
- Discrete termination of all user I/O connections
- 16 general-purpose digital inputs, 2 of which are high-speed
- 7 general-purpose digital transistor outputs
- 1 general-purpose, normally open, relay output
- 2 general-purpose analog inputs with 12-bit resolution
- 2 general-purpose analog outputs with 12-bit resolution
- 2 RS-232/RS-422/RS-485 serial ports
- Integrated diagnostics and power-up self-test
- Surface-mount technology
- CE compliance and UL rating

Ultra5000 Family

0.5 kW Drive

1.0 kW Drive

2.0 kW Drive

Ultra3000 Module Features

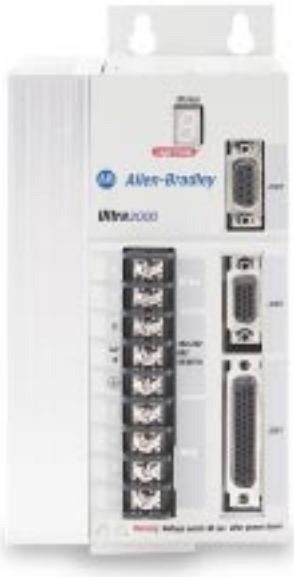
- 100 to 240 VAC single-phase input
- 8 general-purpose digital inputs, assignable to multiple functions
- 4 digital outputs and 1 relay output, all general-purpose
- Serial port for RS-232/RS-485 communications
- Standard D-shell connectors
- Optional 5V external logic supply power
- Choice of multiple operating modes:
  - +/- 10V analog input for torque or velocity control
  - Step/direction input (also step up/step down) for electronic gearing with an indexer
  - Auxiliary encoder input for electronic gearing
  - 8 preset speeds, torques, or gearing ratios selectable via digital inputs or serially
- Dual-loop feedback with auxiliary encoder input
- Seven-segment status LED
- Field-programmable flash memory storage of firmware
- CE compliance and UL rating

Ultra3000i Module Features

- 64 configurable index profiles for absolute, incremental, and registration-type positioning
- Ability to blend indexes with a nonzero velocity
- Built-in homing routines
- 8 preset positions for control of an index's progress via a digital input

Ultra3000 Family

0.5 kW Drive



1.0 kW Drive

2.0 kW Drive

Indexing – Cost-Reduce and Simplify Your Solution

Indexing functionality allows the drive to execute up to 64 different trapezoidal position moves initiated by the use of the digital I/O, MMI, or an unlimited number of indexes through the use of the host command language.

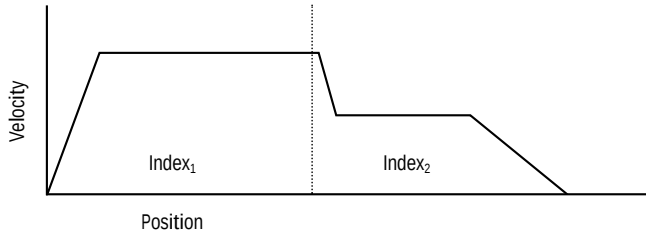
The benefit of indexing is the ability to obtain the position-control performance and flexibility in applications where electronic motion control systems were not cost-effective in the past. And the indexing drives simplify, as well as cost-reduce, many existing motion control systems by eliminating the need for the command source typically provided by motion controllers, stepper controllers, and PLC servo and stepper cards.

The indexing drives support three different types of index moves:

- Incremental – distance move that executes relative to current position
- Absolute – position move executed in reference to the home position
- Registration – distance move that executes relative to the registration sensor digital input

Blended Moves

Blended moves extend the positioning capability of the Ultra3000i by allowing it to finish an index move at a nonzero velocity and immediately begin the next specified move. As the picture illustrates, one index can immediately lead to a second without stopping.



One of the many ways this feature can be useful includes making the high-velocity move of $Index_1$ to a defined point, then immediately blending it with $Index_2$ to the desired position, using a lower velocity. This allows product to be gently positioned without sacrificing cycle times.

Alternatively, an application may require the use of a registration mark to define position. An index move to the zone where the registration mark is anticipated, immediately blended to a second index move that uses the mark for positioning, will result in accurate position registration.

Blended indexes are easily set up in Ultraware.

MP-Series – New Low-Inertia Brushless Servomotors

MP-Series features a newly engineered construction that reduces motor size while delivering significantly higher torque. A segmented core stator design, improved thermal management, along with multiple electronic configurations available create a motor with optimal performance characteristics. Easily reversible motor connectors and several feedback options including absolute and high resolution add to the versatility and capability of the MP-Series motor. Available in three frame sizes, the MP-Series motors range in continuous torque capability from 7 to 90 lb-in (0.79 to 10.20 Nm) and speeds up to 5000 rpm. Feedback options for the MP-Series motor include a 2000-line, high-performance encoder that delivers 8,000 counts per revolution for precise position feedback.

H-Series – Low-Inertia Brushless Servomotors

H-Series motors provide low inertia and high acceleration. Available in five frame sizes, the H-Series motors range in continuous torque capability from 5 to 450 lb-in (0.5 to 50 Nm) and speeds to 6000 rpm. The H-Series motors use an optical 2000-line incremental encoder with the 5000-line option for superior low-speed performance with the Ultra Family.

F-Series – Medium-Inertia Brushless Servomotors

F-Series motors, mechanically interchangeable with the H-Series, use a ferrite magnet that provides nearly four times greater inertia than the H-Series family for matching larger-load inertias. Available in two frame sizes, the F-Series motors range in continuous torque capability from 31 to 245 lb-in (3.5 to 28 Nm) and speeds to 4000 rpm. The F-Series motors use an optical 2000-line incremental encoder with a 5000-line option for superior low-speed performance with the Ultra Family.

Y-Series – Small, Low-Inertia Brushless Servomotors

Y-Series motors, available in either 115V or 230V windings, use a high-energy neodymium magnet that provides low inertias for fast acceleration. Available in three popular metric frame sizes, the Y-Series motors range in continuous torque capability from 1.5 to 22 lb-in (.17 to 2.5 Nm) and speeds up to 4500 rpm. Their outstanding torque-to-size ratios make the Y-Series a powerful combination with the Ultra Family drives.

N-Series – NEMA-Style Brushless Servomotors

N-Series motors use a high-energy ring magnet rotor construction for outstanding torque-to-size ratio. Available in four common NEMA-style frame sizes, N-Series motors matched with an Ultra Family drive create a high-performance alternative to stepper systems. They range in continuous torque capability from 1.6 to 47 lb-in (.18 to 5.3 Nm) and speeds up to 7000 rpm.

Cables and Accessories

When it comes to motion control systems, efficient commissioning and superior uptime are a direct result of simple, easy-to-understand interconnects and integrity in every component. You'll find that using the standardized cables and accessories designed specifically for the Ultra Family means fewer problems, more efficient operation, less downtime, and quicker troubleshooting. We've taken great care to ensure that Ultra Family accessories provide unquestionably sound connections, long life, and superior performance.

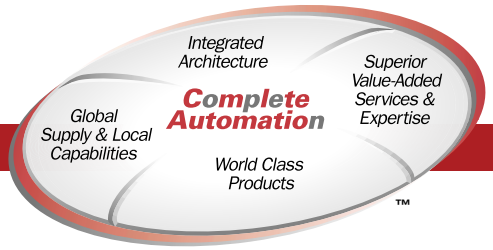
Ultra5000 Intelligent Positioning Drive Specifications

GENERAL	2098-IPD-005	2098-IPD-010	2098-IPD-020
Peak Output Current (Amps)	7.5	15	30
Continuous Output Current (Amps)	2.5	5	10
Continuous Output Power (kW)	0.5	1	2
Continuous Shunt Power Internal	N/A	N/A	N/A
Peak Shunt Power Internal	N/A	N/A	N/A
Continuous Shunt Power External (ASM-300 Kit)	300 Watts	300 Watts	300 Watts
Peak Shunt Power External (ASM-300 Kit)	4 kW	4 kW	4 kW
INPUT			
Continuous Input Current	5	9	18
Input Voltage		100-240 volts AC Single-Phase	
Input Frequency		47-63 Hz	
USER PROGRAMMING			
Language	Compiled ANSI C with Library of Motion Commands		
Programming Environment	Full-featured Color Syntax Editor and "C" Compiler Integrated with Ultraware Software		
Operating System	Real-time multitasking, Flash-upgradeable		
User Program Memory Capacity	512 Kbytes		
User Program Memory Storage Medium	Flash Memory, 100,000 Write Cycles		
Nonvolatile Memory Capacity	32 Kbytes (approximately 8000 nonvolatile user variables)		
Nonvolatile Memory Storage Medium	nvSRAM (high-speed SRAM/EEPROM)		
CONTROLLER			
Processor	Texas Instruments IMS320C32 32-Bit Floating Point Digital Signal Processor		
Clock Speed	60 MHz		
Commutation	3-Phase Sinusoidal Space Vector Modulated PWM		
Current Loop	SVM-125 µsec update rate		
Velocity Loop	Digital PI - 250 µsec update rate		
Position Loop	Digital PI - 500 µsec update rate		
Position Range	32-bit signed		
Velocity Range	32-bit floating point		
Acceleration Range	32-bit floating point		
Electronic Gearing	64-bit signed		
INPUTS/OUTPUTS			
General-Purpose Digital Inputs	16 Optically Isolated 12-24 volt inputs		
Inputs/Outputs - Sinking/Sourcing Selection	Software Selectable as a Group to be Active High, Current Sinking or Active Low, Current Sourcing		
General-Purpose Digital Outputs	7 Optically Isolated 12-24 Volt Outputs – 50 Miliamperes Maximum		
General-Purpose Relay Output	1 Normally Open Relay – 30 Volts DC Maximum Voltage, 1 Ampere Maximum Current		
General-Purpose I/O Response	100 µsec		
High-Speed Input Response	<1 µsec (Inputs 1 and 2)		
Position Capture Response	<1 µsec (Input 1, Input 2, Motor Encoder Index, and Auxiliary Encoder Index)		
General-Purpose Analog Inputs	2 12-bit Analog-to-Digital Converters (+/- 10v, single-ended)		
General-Purpose Analog Outputs	2 12-bit Digital-to-Analog Converters (+/- 10v, +/- 2ma, single-ended)		
COMMUNICATIONS			
Serial	2 Independent RS-232/RS-422/RS-485 Ports, 1200-38,400 Baud		
Networking	DeviceNet (available November 2000)		
MOTOR FEEDBACK			
Input Modes	Incremental with Index		
Maximum Input Frequency	2.5 MHz (Encoder Lines)		
Commutation Startup	Hall Sensor		
AUXILIARY FEEDBACK			
Operation	Auxiliary Feedback Input		
Input Modes	A quad B		
Input Type	Line Receiver		
Maximum Input Frequency	2.5 MHz (Encoder Lines)		
MOTION			
Acceleration Types	Linear, S-Curve, Parabolic		
Auxiliary Encoder Follower Modes	Bidirection, Single-Direction, Buffered (Ratchet Mode)		
Electronic Cam	User-Generated Point Pair Table (Available October 2000)		
Programmable Limit Switch	(Available October 2000)		
CONNECTORS			
Digital I/O Connector CN1A	28-Position Pluggable Spring-Clamp Terminal Block		
Auxiliary Feedback/Analog I/O Connector CN1B	14-Position Pluggable Spring-Clamp Terminal Block		
Motor Feedback Connector CN2	15-Position High-Density Female D-Sub Connector		
Serial Port Connectors CN3A and CN3B	9-Position Female D-Sub Connector		
Main AC, Motor Power, and DC Bus Connector	9-Position Screw Terminal Block		
ENVIRONMENTAL			
Storage Temperature	-40°C to 70°C (-40°F to 158°F)		
Operating Temperature	0°C to 55°C (32°F to 131°F)		
Humidity	5% to 90% noncondensing		
Altitude	1500m/5000ft (derate 3% per 300m above 1500m)		
Vibration	10 to 2000 Hz at 2g		
Shock	15 g 11 msec half sine		
Weight	2098-IPD-005	2098-IPD-010	2098-IPD-020
	3.9 lbs (1.77 kg)	4.55 lbs (2.07 kg)	4.51 lbs (2.05 kg)

Ultra3000 & Ultra3000i Digital Servo Drive Specifications

ELECTRICAL CHARACTERISTICS	2098-DSD-005 2098-DSD-005X	2098-DSD-010 2098-DSD-010X	2098-DSD-020 2098-DSD-020X
Peak Output Current (Amps)	7.5	15	30
Continuous Output Current (Amps)	2.5	5	10
Continuous Output Power (kW)	0.5	1	2
Continuous Shunt Power Internal	N/A	N/A	N/A
Peak Shunt Power Internal	N/A	N/A	N/A
Continuous Shunt Power External (ASM-300 Kit)	300 Watts	300 Watts	300 Watts
Peak Shunt Power External (ASM-300 Kit)	4 kW	4 kW	4 kW
INPUT			
Continuous Input Current (Amps RMS)	5	9	18
Input Voltage	100-240 Volt AC Single-Phase	12-24 VDC required for Digital I/O Optional 5 VDC external logic power	
Input Frequency	47-63 Hz		
OPERATING MODES AND COMMAND SOURCES	**Ultra3000**		
Analog Velocity/Current Mode	+/- 10 Volt input		
Preset Velocity, Current, and Follower Ratios	8 presets, binary selection by digital inputs or serial commands		
Step and Direction, Step Up/Step Down	2.5 MHz maximum frequency, Differential or single-ended input		
Master Encoder Following	2.5 MHz maximum line frequency, Differential or single-ended input		
Digital Serial Commands	Via serial port and 7-bit ASCII protocol		
	Ultra3000i		
Indexing	64 configurable indexes, selectable by digital inputs or serial commands Blended moves at a nonzero velocity, Jogging, Stop Index via digital input or serial command		
Positioning Types	Absolute, Incremental, Registration		
Home Routines	Home-to-sensor, home-to-marker, or home-to-sensor/marker		
INPUTS/OUTPUTS			
General-Purpose Digital Inputs	8 Optically Isolated 12-24 Volt, Active High Inputs - Assignable to one or more selections		
General-Purpose Input Selections	Drive Enable, Disable Serial Communications, Pause Index, Stop Index, Pause Homing, Stop Homing, Preset Select, Set Preset Position, Integrator Inhibit, Follower Enable, Forward Enable, Reverse Enable, Operation Mode Override, Position Strobe, Home Sensor, Start Index, Define Home, Registration Sensor, Remove Command Offsets, Start Homing, Fault Reset		
General-Purpose Digital Outputs	4 Optically Isolated 12-24 volt Outputs, 50 Milliamperes Maximum		
General-Purpose Output Selections	In-Position, Within Position Window, Zero Speed, Within Speed Window, Up to Speed Drive Enabled, DC Bus Charged, Ready, In Motion, In Dwell, Tracking, End of Sequence, Current Limiting, Registered, At Home, Axis Homed, Start Up Commutation Done, Brake Fault Disable, Fault Decel/Disable, Fault Ignore, Fault Indicate, Overtravel Exceeded		
General-Purpose Relay Output	1 Normally Open Relay, 30 volts DC Maximum Voltage, 1 Ampere Maximum Current		
Registration Input Capture Response	<100 µseconds		
Analog Command Input	1 14-Bit Analog-to-Digital Converter (+/- 10v, Differential)		
General-Purpose Analog Output	1 8-Bit Digital-to-Analog Converter (+/- 10v, +/- 2ma, single-ended)		
COMMUNICATIONS			
Serial	1 port with RS-232/RS-422/RS-485 at 1200-57,600 baud		
Networking	DeviceNet (Available March 2001), SERCOS (Available March 2001)		
CONTROL LOOPS			
Modes	Current, Velocity, Position control		
Types	All loops digital		
PWM	8 kHz, Space Vector Modulation		
Velocity Loop Bandwidth	300 Hz		
MOTOR FEEDBACK			
Input Modes	Incremental with Index		
Maximum Input Frequency	2.5 MHz (Encoder Lines)		
Commutation Startup	Hall Sensor or Self-Sensing		
AUXILIARY FEEDBACK			
Operation	Auxiliary Position Loop Feedback Input		
Input Modes	A quad B		
Input Type	Line Receiver		
Maximum Input Frequency	2.5 MHz (Encoder Lines)		
CONNECTORS			
Control Connector CN1	44-Position High-Density Female D-Shell Connector		
Motor Feedback Connector CN2	15-Position High-Density Female D-Shell Connector		
Serial Port Connector CN3	9-Position Female D-Shell Connector		
Main AC, Motor Power, and DC Bus Connector	9-Position Screw Terminal Block		
ENVIRONMENTAL			
Storage Temperature	-40°C to 70°C (-40°F to 158°F)		
Operating Temperature	0°C to 55°C (32°F to 131°F)		
Humidity	5% to 90% noncondensing		
Altitude	1500m/5000ft (derate 3% per 300m above 1500m)		
Vibration	10 to 2000 Hz at 2g		
Shock	15g 11 msec half sine		
Weight	2098-DSD-005 2098-DSD-005X 3.7 lbs (1.68 kg)	2098-DSD-010 2098-DSD-010X 4.47 lbs (2.03 kg)	2098-DSD-020 2098-DSD-020X 4.41 lbs (2.0 kg)

Rockwell Automation is an automation leader who not only develops innovative technology, but has the expertise and global supply network to be your complete automation solution provider. Rockwell Automation offers worldwide customer support capabilities. And, through a network of partnerships, Rockwell Automation brings together reliable, knowledgeable people from all corners of the automation world to meet your needs. As a part of Complete Automation,™ the Ultra Family of world-class motion control products was designed with built-in reliability for long life and superior performance.
In addition to stand-alone control, the Ultra Family offers the flexibility of platform integration with ControlLogix. This flexibility provides you with the most efficient flow of information to meet your needs from the simplest device to the highest-level information system. You can depend on Complete Automation to help you achieve increased productivity and lower total cost of ownership.



World-Class Motion Control with Worldwide Support

To put the Ultra Family – along with any other Allen-Bradley motion control equipment – to work for you, Rockwell Automation has a worldwide network of sales and service engineers and authorized system integrators. Together, they offer the industry's broadest range of support services to help you implement your motion control solution.

Our Motion Control Area Managers are specialists in motion control, CNC, and servo drive technology. They have the expertise to evaluate your application requirements and help you achieve the optimum solution.

Rockwell Automation Global Technical Services offers application engineering services, system startup, training, field service, and ongoing product support. They also offer an emergency HELP line – a 24-hour, toll-free evaluation and service connection.

Our network of authorized motion control system integrators can provide complete integration services for new, retrofit, or rebuild requirements worldwide.

For more information on the Ultra Family or any of our support services, contact your nearest Rockwell Automation sales office or motion control distributor, or refer to our Web site: **www.ab.com/motion**

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors, and system integrators around the world.

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