

# Power · Performance · Flexibility

## Integrated Servo and Control Solutions



*ULTRA Plus*  
*Positioning Servo Drives*



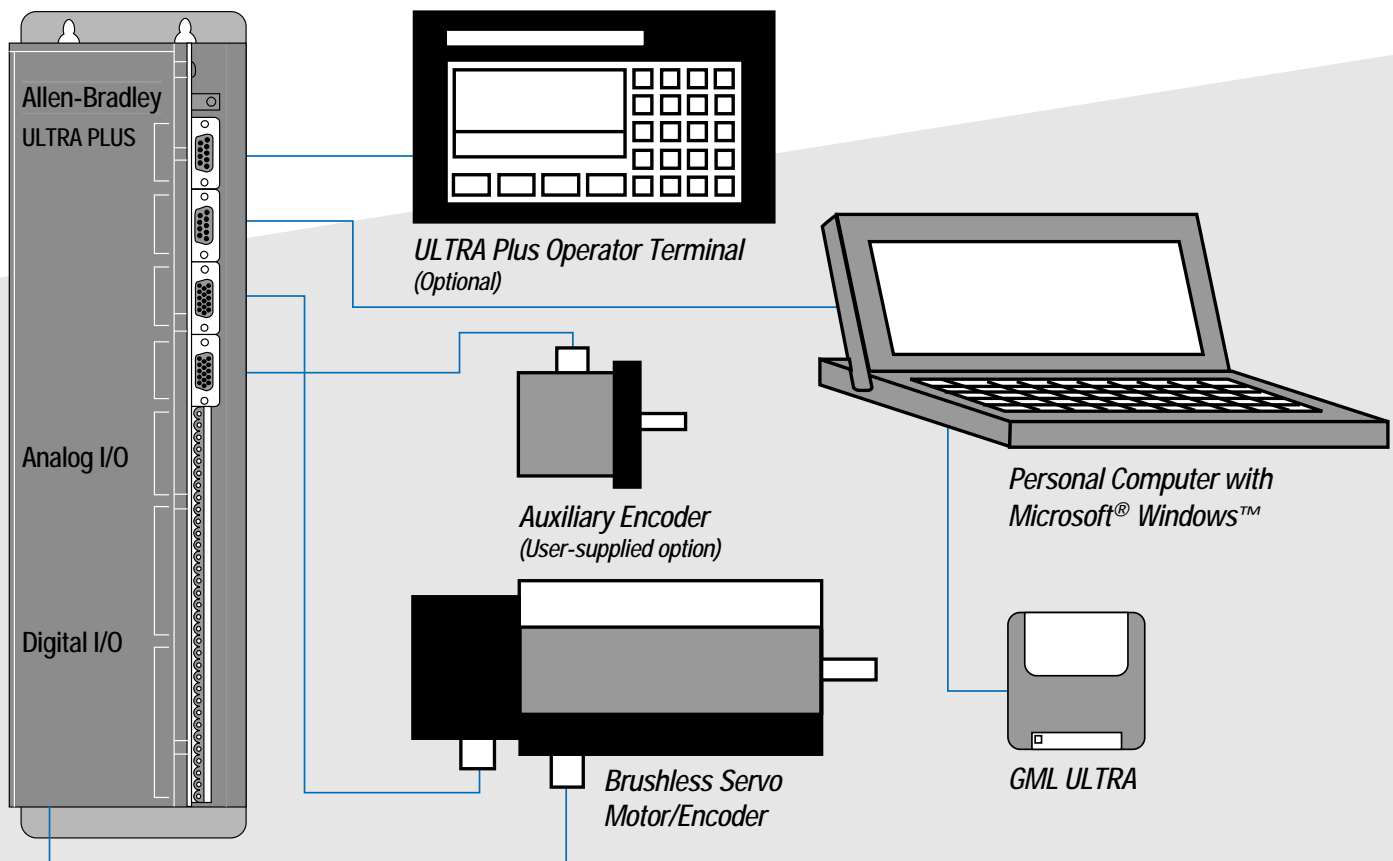
# AB Drives

 **Rockwell** Automation  
**Allen-Bradley**

# ULTRA Plus Positioning Servo Drives

The ULTRA Series is a family of single axis, digital servo and positioning servo drives designed to offer flexibility and performance for a wide range of applications. The ULTRA 100 and 200 Digital Servo Drives offer drive users new versatility and ease of use. Drive setup, commissioning, and troubleshooting are quickly accomplished using the Windows™-based ULTRA Master software. The ULTRA Plus Positioning Servo Drives combine control and drive to create a powerful, single axis motion controller. Application programming, commissioning, and troubleshooting are done with graphical, Windows™-based GML™ ULTRA Software.

The Allen-Bradley ULTRA Plus offers a family of innovative control solutions. The ULTRA Plus offers highly integrated packages of high performance positioner and brushless drives all in one module. With GML ULTRA, the Microsoft® Windows™ interface provides users with a common programming environment for any size positioning drive.



# An Easy-to-Use Platform for High Performance Motion Control

## **High Performance**

- Brushless sinusoidal commutation
- Innovative on-the-fly motion profile generator
- High performance master/follower operation
- Analog and digital I/O with scan functions
- Four-function math and logic functions
- Hardware latched high speed input

## **Simple to Install**

- Modular packaging
- 115/220/230/240V offline operation
- No external transformer required (USA)\*
- Built-in shunt regulator
- Integral 24V DC opto-isolated I/O
- Fits in a 12-inch (30cm) deep NEMA enclosure

## **Quick and Easy Start-Up**

- Friendly GML ULTRA programming language
- Intuitive Microsoft® Windows™ user interface
- Automatic velocity and position loop tuning
- No potentiometer adjustments
- Menu-driven user configuration stored in transferable personality module
- Offline editing and compiling of programs

\* Isolation transformers may be required in Europe for some models of the ULTRA Plus.

## **Built-In Flexibility**

- Volatile and non-volatile variables for speed, distance, time and loop counters.
- S-curve, trapezoidal and complex motion profiles
- True feed rate override
- Electronic gearing-follower capability
- Step and direction inputs

## **Comprehensive Protection and Diagnostics**

- Comprehensive diagnostics
- Fault history
- Built-in solid state soft start
- Motor and drive system thermally protected
- Loss-of-phase indication
- Phase-to-phase short circuit protection
- UL listed

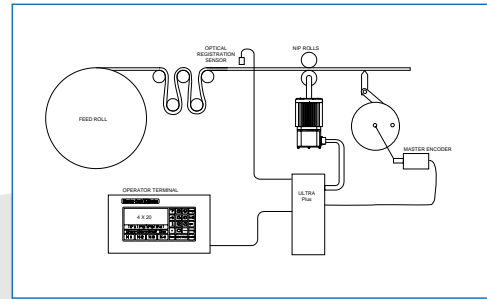
## **Superior Operator Terminal**

- Bright, easy-to-read 4 x 20 vacuum fluorescent display
- Easy user set up for customizing applications
- Smart display of user messages and variable entry
- Real time axis status monitoring

# ULTRA Plus: The Right Solution

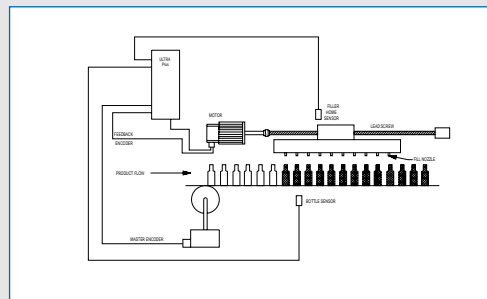
## Press Feeds

- **APPLICATION:** A motion controller with flexible operator interface capability is required to control the feed of sheet material to a knife or shear. The system must allow operator control of the move length, speed, and hit rate. Registration capability is also required for some materials. A high dynamic response servo is necessary for high hit rates and stiffness.
- **SOLUTION:** The ULTRA Plus with the optional Operator Terminal allows a customized operator interface for a press feed machine. The user program can prompt the operator for the necessary data or use a menu-driven input format. The program variables make changes easy even during a run. Non-volatile variables maintain the operator data without power. The ULTRA Plus position latch and interrupt inputs provide fast, accurate registration, and the optically isolated I/O makes interfacing simple.



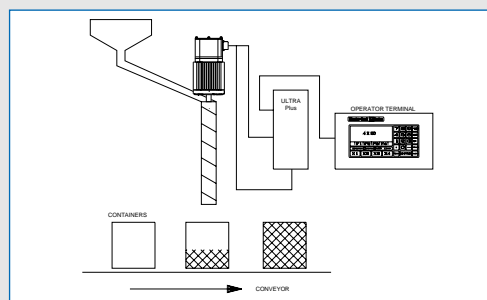
## In-Line Bottle Filling

- **APPLICATION:** A conveyor feeds bottles through a filling station that consists of fill nozzles mounted on a carriage driven by a leadscrew. The filler carriage must track the speed of the bottles in a timing screw during the fill operation, and then return and be in position in time to track and fill the next batch of bottles.
- **SOLUTION:** The filler carriage leadscrew is driven by an ULTRA Plus Positioning Drive Module and brushless servo motor. A reference encoder coupled to the conveyor or timing screw is the input the ULTRA Plus uses to track the bottle speed. An external sensor determines the carriage home position. When the ULTRA Plus detects a set of empty bottles beneath the filler the carriage begins tracking the bottle conveyor speed. After synchronizing the speed of the carriage and the bottles, the ULTRA Plus calculates and executes a correction move to align the bottles and filler head, and begins the fill operation by turning on an output. The carriage returns to the home position after the fill is complete and waits to repeat the process.



## Precision Auger Fillers

- **APPLICATION:** A motion control system is required for an auger filler system. The motion of the auger precisely controls the fill level. The operator must be able to program the level and also adjust the fill during a run.
- **SOLUTION:** The ULTRA Plus with an optional Operator Terminal implements the auger filler controls. The power of the Operator Terminal allows a customized interface for the machine, and the flexibility of the ULTRA Plus program makes it simple to change fill, speed, and make adjustments on the fly. The I/O capability of the ULTRA Plus interfaces to the indexing conveyor and senses when the hopper is low on material.



## And Many Other Applications Such As:

- Rotary Tables
- Vertical-Form-Fill-Seal Machines
- Horizontal-Form-Fill-Seal Machines
- Bag Making Machines
- Case Erectors
- Case Packers
- Flying Cut-Offs
- Cut to Length
- Mail Sorting
- Cartesian Robots
- Web and Film Handling
- Reciprocating Grinders
- Boring
- Drilling
- Tapping
- Coil Winding
- Wrapping
- Transfer Lines
- Textiles
- Thermoformers
- Rotary Knives
- Label Applications
- Random Timing Infeeds

# Programmability: GML Development System Software

## Distinguishing Features

- Object-oriented graphical environment, which reduces application development time.
- Icons are intuitive and easy to use.
- “Fill-in-the-Form” approach eliminates complexity.
- Easier to learn, and once learned, easier to use than traditional programming languages.
- Graphical debug allows quick and easy simulation and test of program.
- Application diagrams are self-documenting.
- Comprehensive context-sensitive help screens.
- Graphical motion controller setup and drive tuning interface
- Standard graphical programming method for all Allen-Bradley motion controllers.

## Graphical Consistency

Allen-Bradley uses the same GML (Graphical Motion Language) programming methodology across its ULTRA Plus and S Class families of motion controllers. GML software is easy to learn and, with language standardization, offers a single application development environment for Allen-Bradley motion controllers.

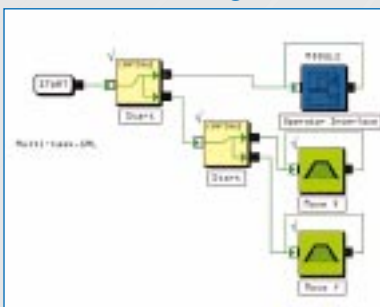
## The GML Development System

GML offers a departure from traditional programming. It provides a natural object-oriented environment. Icons – or picture blocks – represent motion functions. You can create a motion program simply by drawing a diagram. Motion and process details are filled in later. The result is a well documented, easy-to-read, easy-to-troubleshoot program.

The icons are placed on the screen in the order required by the application and connected by using a “soldering iron.” A “wire cutter” is used to break connections and modify the diagram.

Once the diagram of the basic logic of the application has been drawn, details about each icon are entered using a “fill-in-the-form” approach. Each icon has its associated form, which is called up by pointing and clicking the computer mouse on the icon. The “move axis” icon, for example, has choices for the type of move to perform, plus places to enter position, speed, acceleration and deceleration. All of these can be entered and modified at any time, minimizing the need to consult a manual or understand any specialized syntax. Online context-sensitive help is also available to immediately aid in understanding how each icon can be used.

## Visual Program



## Easy Definition

MOVE AXIS: Axis: X001B Move: Minimize

Position: [ ] units per sec?

Speed: 10 units per sec?

Accel: 100 units per sec?

Decel: 100 units per sec?

Override profile: Trapezoidal

Merge from Jog, GMI or Grot: All Control Speed

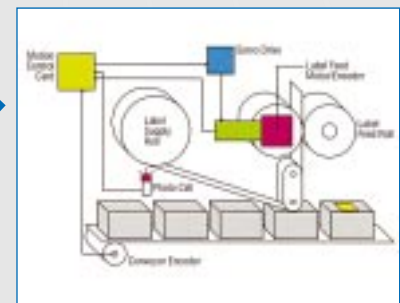
Wait for Completion:  Synchronize with next move

Move is physical or imaginary axis at a speed that accelerates a specified acceleration and deceleration.

Click on the desired Axis and Motion type from the pop-up menu and enter values or expressions for

Save Cancel

## Meets Your Needs



## ULTRA Plus Specifications

Catalog number (1398-PDM-XXX) PDM-10 PDM-20 PDM-30 PDM-75 PDM-25 PDM-50 PDM-100 PDM-150

Peak Output Current/Phase - (amps)	10	20	30	75	25	50	100	150
Continuous Output Current/Phase - (amps)	5	10	15	35	20	40	50	65
Continuous Output Power - (kW)	1	2	3	7	4	8	10	12

### Electrical Characteristics

RMS Line Voltage Input (50/60 Hz - Single Phase) <sup>(1)(3)</sup>	115 - 240V AC (Nominal)
Continuous Shunt Power Dissipation	50W (200W external option)
Peak Shunt Power	4.5 kW (6.0 kW external option)
Output Bus Voltage (nominal) - (VDC)	
Output Bus Current (continuous) - (amps)	

### Power Supply Module<sup>(2)</sup> PSM-50 PSM-125

	115 - 240V AC
	325 325
	50 100
	600 1200
	20 40

### Physical Characteristics of Drive

Operating Temperature	32° to 122° F (0° to 50° C)
Storage/Shipping Temperature	-40° to 176° F (-40° to 80° C)
Relative Humidity	5 to 95% noncondensing
Weight (Drive Module)	11 lbs (5 kg)
Weight (Power Supply Module)	26.2 lbs (11.9 kg)

(1) Speed-Torque Curves represent 230V AC input. Reduced voltage will reduce speed (2) Used with PDM-25, -50, -100, -150, and -150X (3) PDM-75 is 3-phase input

### Control Hardware

Microprocessor	80C196KC
Clock	20MHz
Hardware Watchdog	.016 Seconds
Firmware Memory	96K with 8K Text EPROM
Program Memory	32K (Personality Module)
Motor Feedback	Incremental Encoder
Encoder Input Frequency	750 kHz
Pulse and Direction Input	800 kHz Maximum Pulse Input Frequency
Analog I/O	1-12 Bit DAC Output 1-8 Bit DAC Programmable monitor Output 1-10 Bit ADC Input 4-12 Bit ADC Inputs with Optional Memory and I/O Expansion Card
Digital I/O	16 General Purpose Inputs (User Definable) Inputs May Be Used As: FWD Limit Jog FWD Enable Pause REV Limit Jog REV Star Ereturn Home Switch Home Command 8 General Purpose Outputs (User Definable) Outputs May Be Used As: In Position Home Sequence Complete At Home Error Program Running 2 Dedicated Normally Open Relays: PDM Ready PDM Enabled

### Resolutions, Ranges, Accuracy and Speeds

Range	32 Bits (+/-2,147,483,648) Encoder Counts
Resolution	2.7 Minutes (2000 Line Encoder)
Accuracy	2.7 Minutes (2000 Line Encoder)
Repeatability	2.7 Minutes (2000 Line Encoder)
Velocity Command:	
Range	4,294,967,296:1
Resolution	0.000229 RPM (2000 Line Encoder)
Acceleration:	
Range	4,294,967,296:1
Resolution	0.00381 revs/sec/sec (2000 Line Encoder)
Type	Linear S-Curve
Electronic Gearing	32767:1 to 1:32767 (+/-)
Registration Input	2 (35 $\mu$ S +/- 15 $\mu$ S)
Latched Input	1.5 $\mu$ S max (Encoder 1 or Encoder 2)

### Serial I/O

Serial Ports	2 (or 1 with Daisy Chain)
Type	RS232C/RS422
Baud rate	1200-19,200
Multi-drop	Up to 63 Addresses

### Tuning and Compensation

Position Loop	
KP	Proportional Gain
KPZ	Proportional Gain When Within PZONE
PZONE	KPZ Active Zone
KFF	Velocity Feed Forward Gain
KI	Integral Gain
IZONE	KI Active Zone
Velocity Loop	
PGain	Proportional Gain
IGain	Integral Gain
FGain	Acceleration Feed Forward Gain
Filter	Filters Undesirable High Frequency
Auto Tune Application	Adjustable 6 Levels
Manual Tuning	
Command Generator	Real Time Adjustments

GML is a trademark of Allen-Bradley Co., Inc.

Microsoft and Windows are trademarks of Microsoft Corporation.



Allen-Bradley, a Rockwell Automation Business, has been helping its customers improve productivity and quality for more than 90 years. We design, manufacture and support a broad range of automation products worldwide. They include logic processors, power and motion control devices, operator interfaces, and a variety of software. Rockwell is one of the world's leading technology companies.



### Worldwide representation.

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