

Unimation[®]

A Westinghouse Company 

Unimation Incorporated
Shelter Rock Lane
Danbury, CT 06810

Descriptive Bulletin
22-523
Page 1

November 1984
Supersedes DB-22-523
Dated May 1984
Mailed to: E.C.D/22-505A,
B.C.E.J

A compact, computer-controlled
robot for medium-to-lightweight
assembly, welding, materials
handling, packaging and
inspection applications.

UNIMATE[®] PUMA[®]
Series 500
Industrial Robot



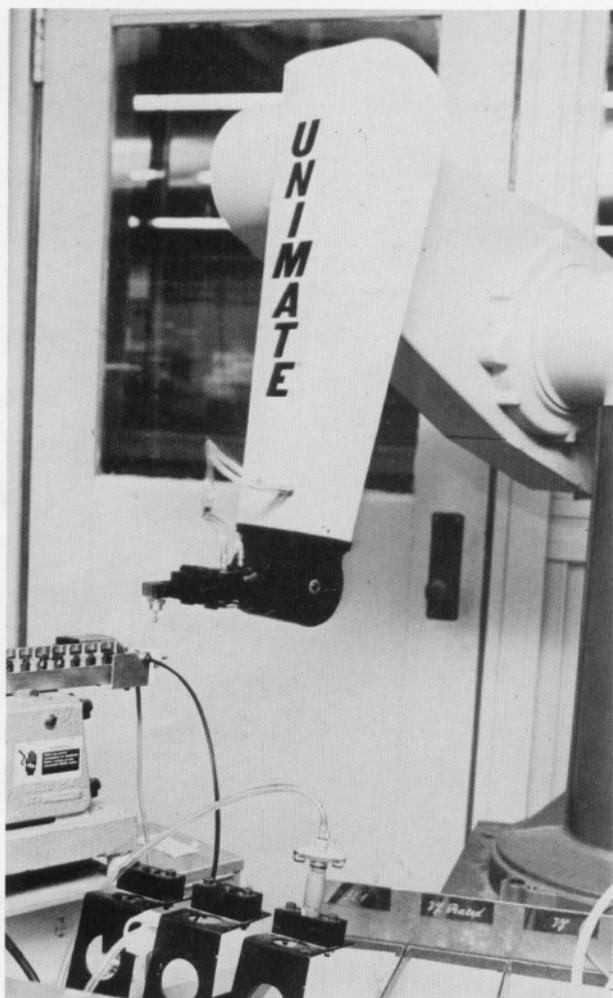
FEATURES

The Series 500 is the most widely used model in the UNIMATE PUMA line of electrically driven industrial robots. With a 36 inch reach and 5-pound payload capacity, the PUMA Series 500 robot is designed for assembly and applications requiring high degrees of flexibility and reliability.

With over 1,000 units in the field, its capabilities are particularly suited to the requirements of the electronics and other industries where light-to-medium-weight parts handling or processed functions are carried out.

EASE OF USE

VAL™, a revolutionary advance in robot control systems, is used to control and program PUMA robots. The system uses an LSI-11 as a central processing unit and communicates with individual joint processors for servo control of robot arm motions. The results are



ease in set up, high-tolerance repeatability, and greater application versatility.

VAL combines a sophisticated, easy-to-use robot programming capability with advanced servo control methods. Intuitive English-language instruction provides fast, efficient program generation and editing capabilities. All servo path computations are performed in real time, which makes it possible to interface with sensory based systems.

EASE OF INSTALLATION

PUMA 500 robots are easily integrated into existing production lines because of the ease with which they are programmed. In addition, the robot can be easily and quickly reprogrammed for changes in the product or production process.

Programs can be written either on- or off-line using a CRT or teletype terminal, or they can be generated manually by guiding the robot arm through program paths using a microprocessor-based teach pendant. With either method, position data can be added or changed by key input, manual control or floppy-disk input, without affecting the overall task program.

VAL reduces memory requirements and permits complex programs, such as palletizing, to be easily written with a minimum number of taught positions.

Significant time savings can also be realized by integrating predefined subroutines and tasks into complex operations. These tasks can also be stored on floppy disks to build a library of routines, and even whole programs, that can be loaded into the memory of any PUMA controller so that specific tasks and repetitive routines need to be written only once.

With VAL, the Series 500 can also respond to fluctuations in the rate or other parameters of on-going production processes. Since all servo-path computations are performed in real time, changes in the arm path, or even task sequencing, can be initiated by feedback from various sensors and vision systems. As a result, the 500 can interact flexibly and efficiently as part of a large and complex manufacturing system.

APPLICATIONS

With its high speed, repeatability and flexibility the PUMA 500 robot is suited to a wide range of small parts-handling applications, and VAL control makes it easy to design application programs to carry out the most difficult robotic tasks.

Current assembly applications include automotive instrument panels, small electric motors, printed circuit boards, subassemblies for radios, television sets, appliances and more. Other applications include packaging functions in the pharmaceutical, personal care, and food industries. Palletizing of small parts, inspection, and electronic parts handling in the computer, aerospace and defense industries round out the present installed base.

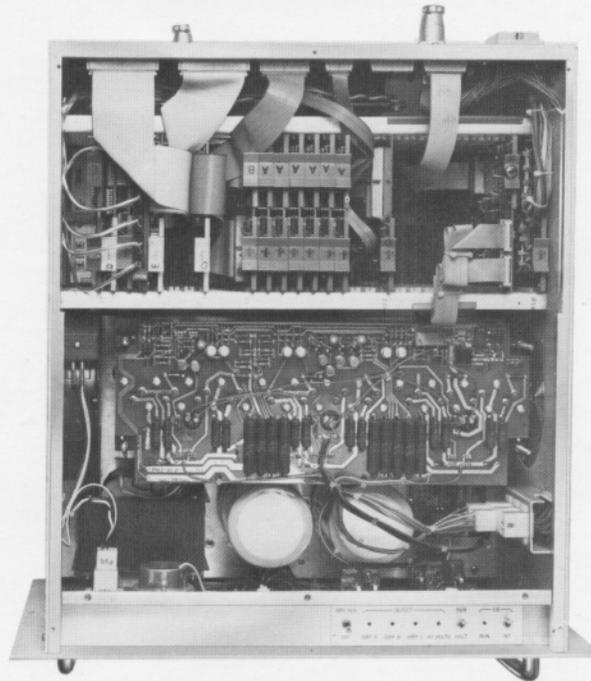
ADVANCED ENGINEERING

Modular, straightforward layout facilitating easy board replacement and plug-in expansion.

High-volume ventilation system.

10 bit digital converter offering highly reliable repeatability of arm positions to ± 0.004 inch.

Digital servo components designed for high-temperature operation and state-of-art dc motor control.



Compact packaging (19 in. rack mountable.).

Power amplifiers designed for high energy output with sensors for high temperature.

Auto-start button for automatic operation.

Easy-access panel location for self-diagnostic indicators and troubleshooting switches.

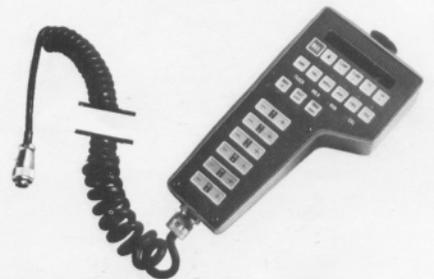


High-density, double-sided floppy-disk drive unit for program storage at 9,600 baud with 10,000-hour MTBF componentry.

External lubrication fittings for ease of maintenance.



Durable, industrially hardened design utilizing monocoque construction for stiff, accurate motions.



Industrial-grade, membrane-type teach pendant and CRT.



High-precision gearing designed for ultra-low backlash and specially hardened for long life.

Servo motors incorporating square wave encoders and high precision, laser-trimmed potentiometers offer the most proven and sophisticated drive systems.



GENERAL

Configuration Up to 6 degrees of motion
 Drive Electric DC Servos
 Controller System computer (LSI-11)
 Teaching Method By teach control and/or computer terminal
 Program Language VAL PLUS or VAL II
 Program Capacity 8K CMOS user memory in VAL PLUS
 24K CMOS user memory in VAL II
 Options for add'l. user memory

External Program Storage Floppy-disk
 Gripper Control 4-way pneumatic solenoid
 Power Requirement 110-130 VAC, 50-60 Hz, 1500 Watts

Optional Accessories CRT or TTY terminals, I/O module (8 input/8 output signals isolated AC/DC levels) up to 32, I/O capacity, pneumatic grippers without fingers, software packages

PERFORMANCE

Repeatability ±0.004 in. (0.1 mm)

Maximum Payload

Static Load 5.5 lbs. (2.5 kg)
 Dynamic Load 137.5 lb-in² (403.2 kg-cm²)
 Around Joint 5 (5.5 lb (2.5 kg) concentrated load at 5 inches (12.7cm) from Joint 5
 Dynamic Load 12.4 lb-in² (35.3 kg-cm²) (a
 Around Joint 6 5.5 lb (2.5 kg) concentrated load at 1.55 inches (3.76cm) from Joint 6

Straight Line Velocity 20 in/sec. max. (0.5m/sec.)

ENVIRONMENTAL

OPERATING RANGE

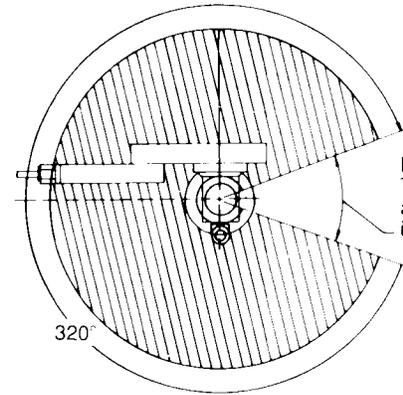
50°-120°F (10°-50°C)
 10-80% relative humidity (non-condensing)
 Shielded against industrial line fluctuations and human electrostatic discharge

PHYSICAL

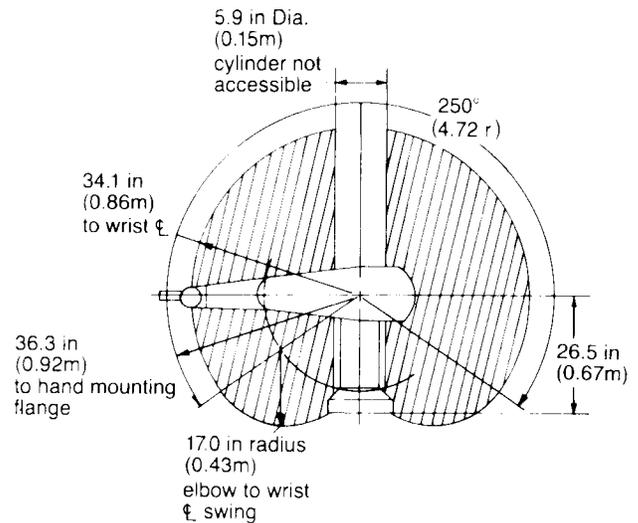
CHARACTERISTICS

Arm Weight 120 lbs. (54.5 kg)
 Controller Size 12.5" H × 17.5" W × 19.6" D.
 (317.5 mm H × 444.5 mm W × 500.0 mm D)
 (19 in. rack mountable)
 Controller Weight 80 lbs. (36.4 kg)
 Controller Cable Length 15 ft. (4.57m) std
 50 ft. (15.24m) max.

Specifications subject to change without prior notification.



NOTE: This region is attainable by robot in lefty configurator



For technical installation information, request UNIMATION Dwg. No. 560-0050

UNIMATION TOTAL CAPABILITY

UNIMATION offers a full line of computer controlled programmable robots that provide manufacturers with the cost savings and productivity increases needed in today's economic environment. The company is dedicated to a sustained program of product improvement, taking advantage of the latest proven developments in technology, together with production quality-control procedures and field performance surveillance reports.

In addition to on-going development engineering, UNIMATION's System Engineering Division consists of a staff of knowledgeable applications engineers with experience in virtually all manufacturing disciplines. Activities range from design and manufacture of end-of-arm tooling and simple, single-robot installations up through multi-robot systems. A large applications laboratory allows customer demonstrations on all robot models, and system run-offs prior to installation.

A staff of skilled field service and installation engineers and a customer training and technical publications department round out the organization.

The breadth and depth of UNIMATION's total organization is its assurance to customers of full support and dependable products.

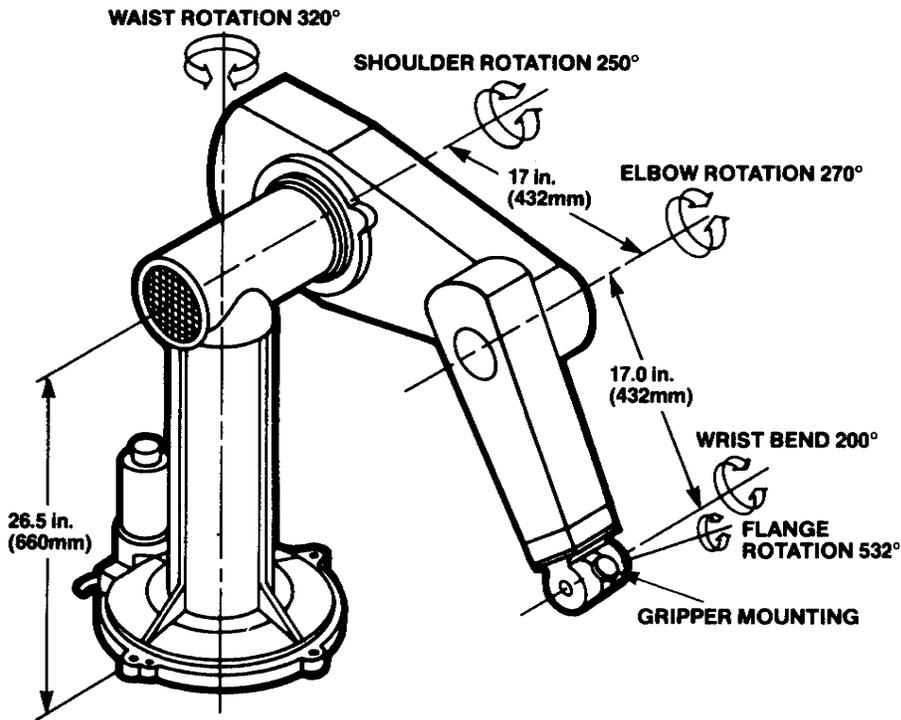
For more information, call or write:

Unimation[®]

A Westinghouse Company 

UNIMATION Incorporated
 Shelter Rock Lane
 Danbury, Connecticut 06810
 (203) 744-1800

UNIMATE PUMA 500 Series



Performance

REPEATABILITY	±0.004 in. (±0.1 mm)
LOAD CAPACITY	5.5 lbs. (2.5 Kg)
STRAIGHT LINE VELOCITY	20 in/s max. (0.5 m/s max.)
ENVIRONMENTAL REQUIREMENTS	50-120° F (10-50° C) 80% humidity (non-condensing). Shielded against industrial line fluctuations and human electro-static discharge

Physical Characteristics

ARM WEIGHT	120 lbs. (54.5 Kg)
CONTROLLER SIZE	19" x 12.5" x 23.6" (475 mm x 312.5 mm x 590 mm)
CONTROLLER WEIGHT	80 lbs. (176 Kg)
CABLE LENGTH	15 ft. (4.5 m) Standard 50 ft. (15 m) Optional

General Specification

CONFIGURATION	5 revolute axes or 6 revolute axes
DRIVE	Electric DC Servo
CONTROLLER	System Computer (LSI-11/2 or 11/23)
Teaching Method	By manual control and/or computer terminal
Program Language	VAL or VAL II
Program Capacity	16K CMOS user memory std. (32K for VAL II)
External Program Storage	Floppy-disk (optional)
GRIPPER CONTROL	4-way pneumatic solenoid
POWER REQUIREMENT	110-130 V AC 50-60 Hz, 1500 W
OPTIONAL ACCESSORIES	CRT or TTY terminals, floppy-disk memory storage, I/O module, 8 input/8 output signals (max. 32)—isolated AC/DC levels. Pneumatic gripper w/o fingers

SPECIFICATIONS

PUMA 200, 500, 700

Series Robots

Individual Specifications

	Configuration	Repeatability	Load Capacity	Straight Line Velocity	Arm Weight/Mounting
200	6 Revolute Axes	0.002 in. (±0.05 mm)	Not to exceed: At Flange Rotation, 0.5 in-oz-sec ² At Wrist Bend and Rotation, 1.8 in-oz-sec ²	49.0 in/s max. (1.25 m/s max.)	15 lbs. Designed for floor or overhead mounting only.
500	5 or 6 Revolute Axes	0.004 in. (±0.1 mm)	Not to exceed: At Flange Rotation, 0.5 in-oz-sec ² At Wrist Bend and Rotation, 5.7 in-oz-sec ²	20 in/s max. (0.5 m/s max.)	120 lbs. Designed for floor or overhead mounting only.
700	6 Revolute Axes	0.008 in. (±0.2 mm)	Not to exceed: At Flange Rotation, 14.1 in-oz-sec ² At Wrist Bend and Rotation, 56.7 in-oz-sec ²	40 in/s max. (1.0 m/s max.)	660 lbs. Designed for floor or overhead mounting only.

General Specifications

Drive	Electric D.C. Servo
Controller	System Computer (LSI-11/2 or 11/23)
Size	200 & 500: 19" x 12.5" x 23.6" (475 mm x 312 mm x 590 mm) 700: 72" x 25.5" x 32" (1830.3 mm x 636.5 mm x 801.6 mm)
Weight	200 & 500: 80 lbs.—700: 600 lbs.
Teaching Method	By manual control and/or computer terminal
Program Language	VAL or VAL II
Program Capacity	16K CMOS user memory std. (32K for VAL II)
External Program Storage	Floppy Disk (Optional)
Cable Length (arm-controller)	15 ft. (4.5 in) of standard 50 ft. (15.24 m) optional
Mounting (arm)	Designed for floor or overhead mounting only.
Power Requirements	200: 110-130 VAC, 50-60 Hz, 500 W 500: 110-130 VAC, 50-60 Hz, 1500 W 700: 220 or 440 VAC, 50-60 Hz, 3 Phase, 6300 W
Options	CRT or TTY terminals, floppy disk memory storage, pneumatic grippers w/o fingers (parallel or toggle action), UNIVISION™, 200 & 500: I/O module (8 input/8 output signals-isolated AC/DC levels) up to 32 I/O capability (4 modules) 700: I/O modules (16 input/16 output, up to 32 I/O capability (2 modules)
Environmental Operating Range	50-120° F (10-50° C) 10-80% relative humidity (non-condensing) Shielded against industrial line fluctuations and human electrostatic discharge.