# ARMDROID 1000 ROBOT
# MODEL 5100



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## GENERAL DESCRIPTION

The Lab-Volt Automation Armdroid 1000 Robot provides complete and affordable training in the programming and operation of industrial style robots. Through the curriculum and hands-on experience gained in working with the Armdroid 1000, students learn to create automated work cells ideal for flexible manufacturing systems (FMS) and computer integrated manufacturing (CIM).

A precision-built, joined arm (articulated) micro robot, the Armdroid 1000 represents an important step forward in automation and handling. A stepper motor located in the base of the unit provides horizontal rotation while five additional stepper motors located in the shoulder provide precision movements of specialized components. The continuous path robot has five axes of rotation plus a gripper and is able to use several joints simultaneously to perform a programmed move sequence. Movement of the elbow joint, wrist, and gripper mechanisms is accomplished by cables and belts through a series of gears and belt-driven pulleys.

The base of the unit includes one connector for an external stepper motor which can be used for further experimentation, such as operating the Rotary Carousel 1000. The robot has four external device control connections, one of which is mounted on the shoulder and three of which are mounted in the base. Accessory devices, which operate at the same supply voltage as the Armdroid 1000, include a Magnetic Gripper and Vacuum Gripper. A feedback line is included among the unit's output lines to enable the robot to operate in a wait state via an external sensor. The included File Transfer software allows point programs to be stored and retrieved from a PC through a standard serial port.

## STRUCTURAL FEATURES

### Base

The base supports the arm mechanism and houses the printed circuit control boards and motor that provides the rotation of the shoulder. A mechanical stop on the base prevents over-rotation of the shoulder. The robot base also houses four TTL outputs and three 12 V relay switch ports for control of external devices.

### Shoulder

Rotating on the base, the shoulder houses the five motors associated with the gears and belts that move the other parts of the arm. The shoulder movement spans 170 degrees. A mechanical stop prevents the shoulder from over-travel.

### Upper Arm

Attached to the shoulder, the lower end of the upper arm carries the gears and pulleys that drive the elbow, wrist, and gripper. Driven by its own stepper motor and pivoting from the shoulder joint, the upper arm contains gears that mesh with the reduction gears of the shoulder to provide up and down movement at a maximum of 190 degrees.

### Forearm

The forearm attaches from the elbow joint and extends to the wrist, moving a maximum of 200 degrees up or down. The structure of the forearm allows the gripper pulley block, housed in the forearms center, to move back and forth, which opens or closes the gripper.

### Wrist and Gripper

The wrist and gripper work together to pick up items and move them to a programmed location. The wrist moves up or down to control the two-fingered gripper that can rotate in a 360 degree clockwise or counterclockwise direction. The fingers of the gripper, which are fitted with rubber tips that enable it to grab onto items with smooth surfaces, move in an "open" or "close" motion. The wrist gears are moved by drive belts attached to gear and toothed belt assemblies using two dedicated wrist stepper motors. The gear assemblies of the stepper motor can be moved in opposite directions from one another to cause the gripper to roll or twist, or they can be moved in the same direction to pitch the gripper in an up or down direction.

### Stepper Motors

The Armdroid 1000 stepper motors take 200 steps per revolution at 1.8 degrees per step motion.

## TEACH PENDANT 1001

The Teach Pendant 1001 provides the control for the Armdroid 1000. It has a four-line, 20-character LCD display for feedback to the operator. The Teach Pendant has a serial port for uploading and downloading a point program to a computer. The interface box has standard tip jacks for 6TTL inputs, and 2 interrupt lines on the interface box (one for the system and one for safety.)

## TEACH PENDANT FEATURES

- Four-line, 20-character command and message display
- One 9-pin serial port to upload and download point programs from a PC
- Standard tip jacks for six TTL compatible inputs and two interrupt lines on the interface box.

## ROBOT COURSEWARE

Basic instruction in Lab-Volt Automation robotics involves step-by-step directions in the setup and operation of the Armdroid 1000. These directions are provided in manuals that enable students to get started immediately and include the following topics:

### User Manual

- Introduction to Robotics
- Mechanical and Electrical Components
- Connecting the Armdroid 1000
- Teach Pendant 1001
- Teach Pendant 1001 File Transfer Software
- End Effector
- Parts Feeders
- Rotary Carousel 1000
- Conveyor Belt 1000

### Student Manual

- Robotics Pretest
- Using the Armdroid 1000

- Creating a Program
- Obstacles
- Robot Speeds
- Efficiency
- Simulating an Industrial Activity
- Simulating a Welding Operation
- Using a Wait Point
- Combining Common Commands
- Simulating a Washing Operation
- Creating a Shell Game
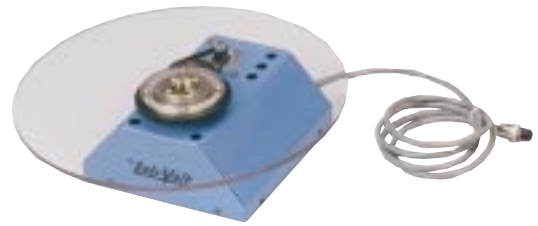- Using a Feeder
- Using the Rotary Carousel

## OPTIONAL ACCESSORIES

### ROTARY CAROUSEL 1000
### 5113-00

The Rotary Carousel 1000 has a 12″ platter mounted on a 4″ x 7″ x 7″ base. It is controlled by stepper motor open loop control via the external stepper motor connector in the base of the Armdroid 1000.



ROTARY CAROUSEL 1000
5113-00

### BELT CONVEYOR  1000
### MODEL 5118-00

Used in material handling experiments with the Armdroid 1000 and Armdroid 2001, the conveyor has a self-contained power supply and electronic interface. The control panel has three input connectors for interfacing the conveyor with the Armdroid robots, or as a stand- alone unit. The inputs enable the motor power, stepper motor clock signal, and the direction of the belt movement to be remotely controlled. Overall dimensions are 38″ x 4.5″ x 5.5″.



BELT CONVEYOR  1000
MODEL 5118-00

### Gravity Feeder (Flat)
### MODEL 5119-00

The Gravity Feeder (Flat) is used in exercises that require flat stock. It has a sensor switch and feedback cables for connection to the Armdroid 1000 through the Teach Pendant 1001. Movable magnetic guideways allow for a wide range of stock sizes.



GRAVITY FEEDER (FLAT)
MODEL 5119-00

### Gravity Feeder (Cylinder)
### MODEL 5121-00

The Gravity Feeder (Cylinder) is used in exercises that require cylindrical stock. It as a sensor switch and feedback cables for connection to the Armdroid 1000 through the Teach Pendant 1001.



GRAVITY FEEDER (CYLINDER)
MODEL 5121-00

## LAB-VOLT AUTOMATION®
## ARMDROID 1000 ROBOT MODEL 5100

### REQUIRED EQUIPMENT

| Description | Model # |
|---|---|
| Armdroid 1000 (120V) | 5100-10 |
| Includes robot, Teach Pendant 1001, power supply, File Transfer software, User Guide, Student Manual, and Instructor Guide | |
| Armdroid 1000 (220V) | 5100-15 |
| Includes robot, Teach Pendant 1001, power supply, File Transfer software, User Guide, Student Manual, and Instructor Guide | |

### OPTIONAL CURRICULUM ACCESSORIES

| Description | Model # |
|---|---|
| Armdroid 1000 User Guide | TM-5152-00 |
| Armdroid 1000 Student Manual | TM-5166-00 |
| Armdroid 1000 Instructor Guide | TM-5166-10 |
| Conveyor Belt 1000 (120V) | 5118-00 |
| Conveyor Belt 1000 (220V) | 5118-05 |
| Gravity Feeder Flat | 5119-00 |
| Gravity Feeder Cylinder | 5121-00 |
| Pneumatic Stock Feeder (2″ x 2″ x 1/2″) | 5122-00 |
| Magnetic Gripper | 5111-00 |
| Two-Finger Gripper (For replacement only) | 5112-00 |
| Pneumatic Feeder, Round | 5142-00 |
| Rotary Carousel, 1000 | 5113-00 |
| Vacuum Gripper | 5115-00 |
| Relay Kit #1 – 1 solenoid | 5125-00 |
| Includes box and connecting cables to control 1 external device | |
| Pneumatic Supply System for Flexible Manufacturing Systems (120V) | AX-5169-00 |
| Armdroid 1000 Grid Sheet | TE-95089-00 |

### MECHANICAL SPECIFICATIONS*

#### Mechanical Arm

| | |
|---|---|
| Construction | Articulated arm |
| Number of axes | 5 plus gripper |
| Load capacity | 16 oz |
| Reach | 17″ |
| Repeatability | 0.125 in |
| Maximum speed | 6 in /sec |
| Actuators | 6 DC stepper motors |

#### Working Envelope

| | |
|---|---|
| Base | 320° |
| Shoulder joint | 170° |
| Elbow joint | 190° |
| Pitch joint | 200° |
| Roll joint | 360° |
| Transmission | Gears and timing belts |
| Weight | 10.5 lb |

\* Specifications are subject to change without notice.