

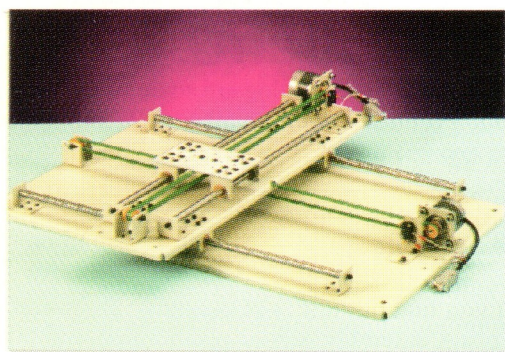
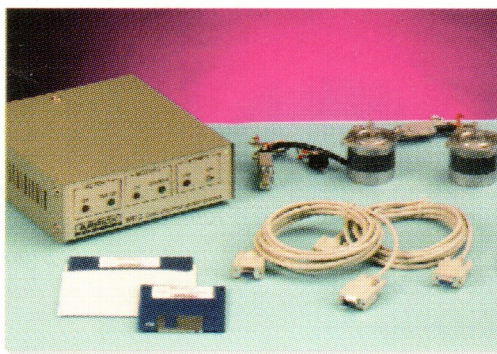
PC-Based

Motion Control

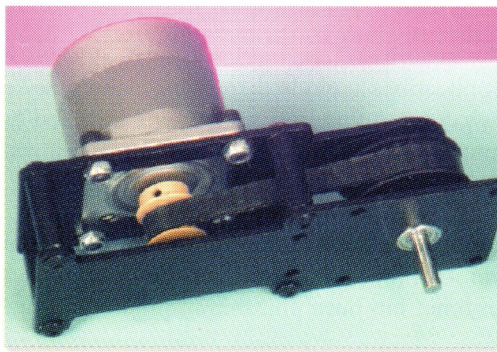
Made Simple and Affordable

For Laboratory & Factory Automation, Machine Control, Research, Instrumentation

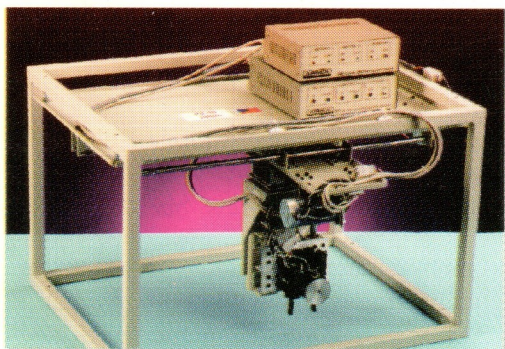
Stepper Motor Systems



Positioning Tables

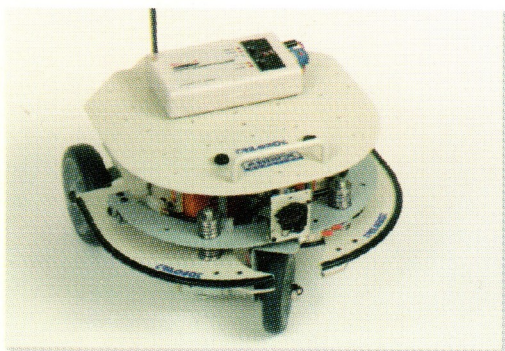


Grippers, Pulley Reducers



Robotic Workcells

Computer Enclosures



Mobile Robots



A letter from the President

Welcome to our 1996 catalog of easy-to-use motion control systems. In case you haven't heard about Arrick Robotics or seen our ads in major trade journals, we've been building PC-based stepper motor systems and positioning tables since 1987. Our small size makes us easy to deal with, responsive to your needs, and keeps the price/performance ratio of our products the best in the industry. Best of all, our staff really enjoys their work and it shows in the quality of the products we produce.



We know your time is important, so we've designed this condensed catalog to deliver the facts. Instead of a lengthy sales pitch, you'll find color pictures of each product along with descriptions, features, and specifications. However, if you need additional details, use the fax form on the back of this catalog to request a detailed data sheet. You can also use this form to stay on our mailing list. We've gone to great lengths to make ordering easy. Check out the details on the next page to see for yourself.

The types of products you'll find in this catalog are some of the most useful, cost-effective motion control systems available. We've spent a lot of time making our products plug-and-go so you don't have to become a control expert just to make your project work. Connecting one of our systems is as easy as attaching a printer to your computer. Systems are complete - even the tools are included! But don't let the price and simplicity fool you, these products are designed with the valuable, high-end features you need, and to have a long life span.

The benefits of our motion control systems become obvious when you find out just how easy they are to use. Applications include dispensing, laboratory automation, pick and place, assembly, sensor positioning, satellite dish control, winding, computer controlled exhibits, and general-purpose machine control. Users include large companies, small companies, contractors, and individuals who want their project completed on time and within budget with minimal hassle.

Let me also introduce you to our Internet web site that went on-line in February of 1995. With a lot of work and with feedback from users, we now have a truly useful way to provide information about our products. The response has been phenomenal and our customers love it. You can find details on the next page.

We've introduced a new product this year that I'm really excited about - The Trilobot Mobile Robot. It's designed mainly for educators looking for the latest teaching tools to keep pace with the ever-expanding area of robotics and artificial intelligence. You'll find it on page 14.

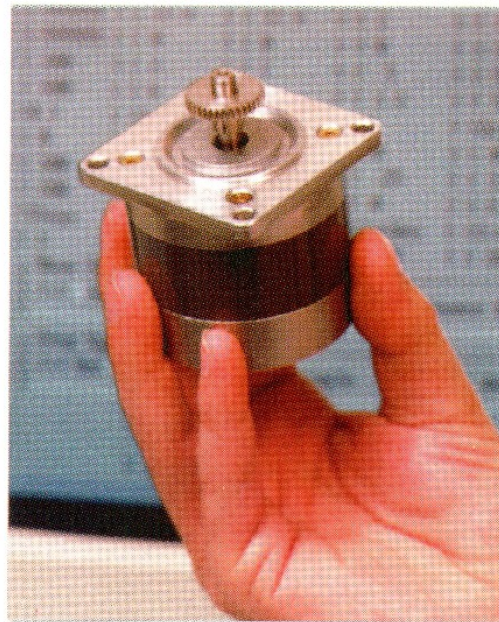
One last note, we're always developing new products, so don't be shy about asking for something you don't see. Almost all of our products were designed because a customer asked for them.

I'm committed to making Arrick Robotics work for you. I don't get paid if you're not pleased with our products and service. If you have any comments or suggestions, I would greatly appreciate them.

Best Regards,

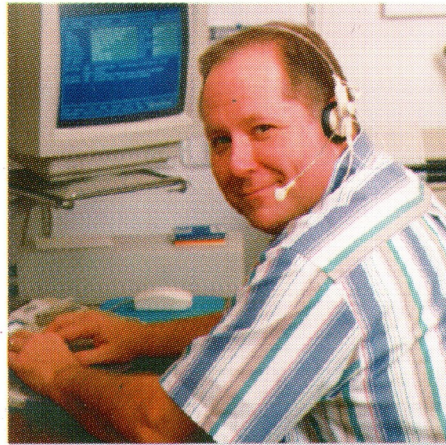


Roger Arrick, President
roger@robotics.com

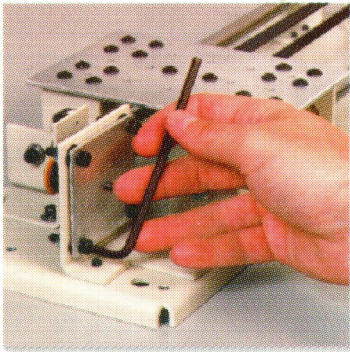


Placing Orders is Easy

We know your time is important, so we've gone to great effort to make dealing with us quick and easy. In many cases our computer will already have your address on file. We can accept your order via phone, fax, or mail. Payment methods include check, money order, and major credit cards such as Visa, Mastercard, and American Express. We ship most orders from our stock in Texas the very same day. Select from a variety of shipping methods including ground and air service. We can also bill your company freight account if needed.



Unsurpassed Technical Support



We offer technical support for our products both before and after the sale. We'll be happy to offer advice and guidance about using one of our products with your application. And we'll be the first to tell you if they don't fit your needs. We're also happy to recommend products from other companies when needed. The vast majority of our users don't require help due to the simplicity of our designs, but if the need ever arises, we're there. Each of our products carry a 1-year warranty covering both parts and labor. Our support services can be accessed via phone, fax, or by e-mail at info@robotics.com.

View Our Internet Web Site

We've created a vast information resource on the Internet's World Wide Web to serve our current and future customers.

At our site, you'll find most of the information needed to make decisions about the use of our products including applications, specifications, and prices.

Fill out our on-line Information Request Form to request additional product information or to ask technical questions. The form will be automatically e-mailed to us for prompt response.

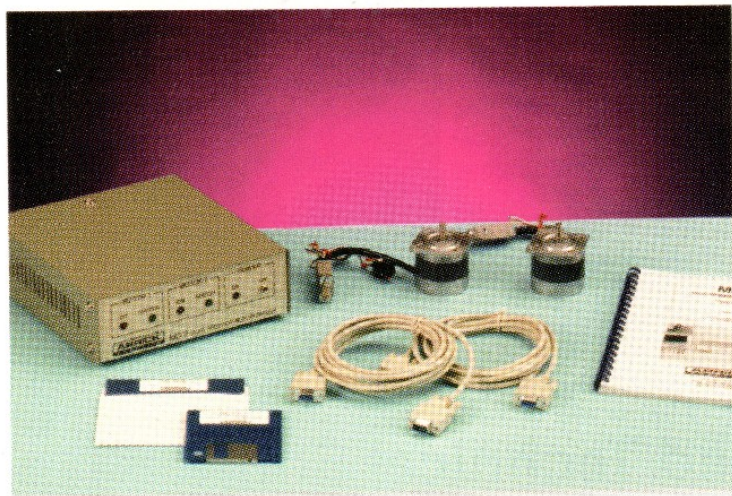
We also provide information that may be useful to automation builders such as sources for mechanical parts including gears and pulleys along with links to other related information that can be found on the Internet. These include products and services that could help you with your application.

You can contact us via e-mail at info@robotics.com. To view our Web site, you'll need Internet access and a Web browser program such as Netscape, Mosaic, or NetCruizer. The address or URL (Universal Resource Locator) for our site is:



MD-2 PC-Based Dual Stepper Motor Control System

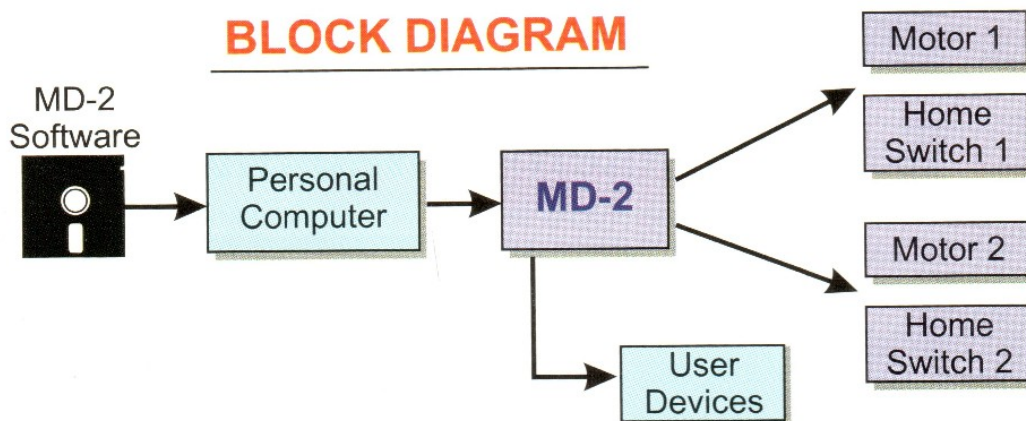
The Complete Motion Control System



Would you like to automate a task but don't know how? Have you looked through some motion control catalogs and been shocked by the complexity? Most vendors expect you to select and match motors, drivers, power supplies, and cables, then write your own software. We've cut through the confusion and created the complete motion control solution for those who don't want to design their own. The MD-2 Dual Stepper Motor System contains everything you need to accomplish motion control with an IBM style personal computer. No cards to install, no cables to build and no components to match. Simply connect to the parallel

port on your computer just like a printer, load the software, and *GO!* *Within minutes* you'll have complete control over the direction, position, and speed of each motor. Up to 6 motors (3 MD-2 systems) can be connected to your computer for those multi-axis projects. Programming is simple with our interactive motion control programs and DOS command-line interpreter. Custom programs are easy to create using our subroutine libraries. There are 3 MD-2 models to choose from to fill a variety of torque and resolution requirements. Each MD-2 system includes 2 stepper motors, 2 10' motor cables, printer port cable, 2 home switches, drive/power supply box, software and extensive documentation. The MD-2 system can be operated from an AC outlet or from a battery. You must have an IBM compatible personal computer with a parallel printer port. Need assistance? - give us a call, we'll be glad to help. Detailed data sheets are available upon request.

BLOCK DIAGRAM



Stepper Motor Basics

A stepper motor is a special kind of motor that moves in individual steps which are usually .9 degrees each. Each step is controlled by energizing one or more of the coils inside the motor which then interacts with the permanent magnets attached to the shaft. Turning these coils on and off in sequence will cause the motor to rotate forward or reverse. The time delay between each step determines the motor's speed. Steppers can be moved to any desired position reliably by sending them the proper number of step pulses. Unlike servo motors, steppers can be used open-loop without expensive encoders. Stepper motors are much more cost-effective than servo systems due to their simplified control and drive circuitry. There are no brushes to replace in a stepper motor, eliminating the need for maintenance. Even though a stepper motor system can not achieve the speed of a servo motor system, their ease of use allows them to be the preferred solution for many of today's computerized motion control systems.

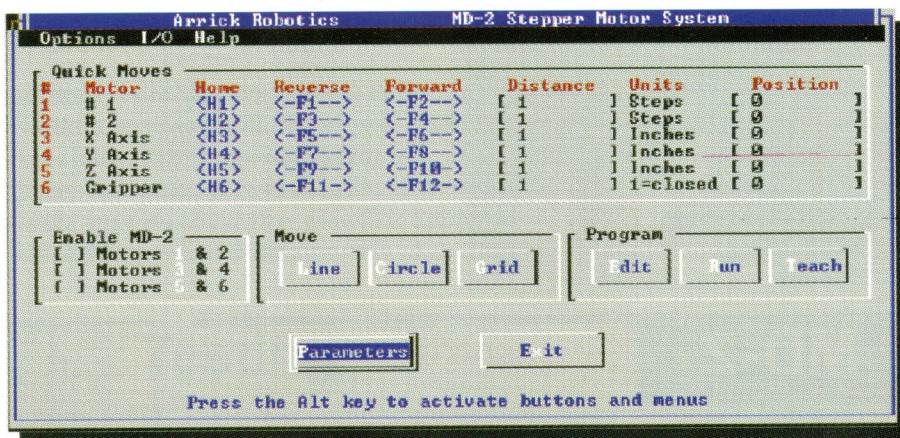
P.O. Box 1574 Hurst, TX 76053 USA
Ph: (817) 571-4528 Fax: (817) 571-2317
Web: <http://www.robotics.com>
E-mail: info@robotics.com



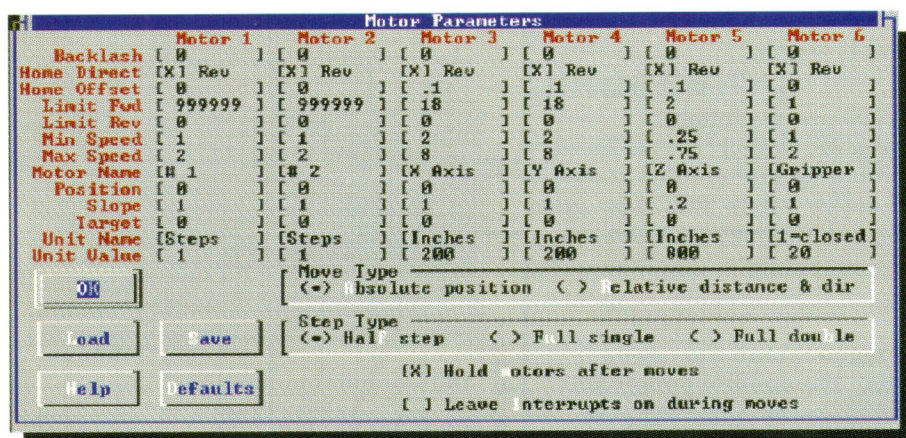
*Software Features***Powerful software features to solve simple and complex automation tasks**

- Control of up to 6 motors
- On-line help
- Keyboard/joystick control
- Teach mode
- Absolute/relative moves
- Linear interpolation
- Circular interpolation
- User-definable units
- Adjustable accel/decel
- Backlash compensation
- Programmable soft limits
- Half and full step modes
- Use from DOS batch files
- Program editor

And much more . . .



Each MD-2 system comes complete with our DOS-based motion control program, which gives you complete control of up to 6 motors from a single computer. Motor speed, travel distance, limits, units, and other parameters can be edited easily and saved to disk. Single and dual-motor moves, including linear and circular interpolation, are also possible. The powerful teach mode feature creates programs automatically as you control motors via the keyboard or joystick. These BASIC-like programs can be maintained with the editor, saved to disk, and recalled whenever needed. On-Line help guides your usage and gives explanations for each motor parameter. The software can be run from floppy or hard disk (1.5MB free required) and will operate on low-end XT-class as well as high-speed systems. A 386 or faster processor, mouse, and hard disk are recommended for best performance.

Adjust motor speed, acceleration, limits, units, and other parameters

- Parameters for each motor are easy to edit.
- On-Line help guides your selection and suggests optimum settings.
- Fine-tune values to maximize performance.
- Save and load parameter files from disk for different projects.

Subroutine Libraries for Custom Programs

The MD-2 system also includes a complete set of subroutine libraries written in all popular languages. This allows the creation of custom motion control programs, which provide the features and user interface you desire. The subroutine libraries can be used in conjunction with libraries from data acquisition products to solve complex control and automation tasks. Programming languages supported are GW-Basic, Q-Basic, Quick-Basic, Visual Basic for Windows, Visual Basic for DOS, Pascal, and C. Source code for each of these libraries are supplied along with documentation and example programs.

MD-2 PC-Based Dual Stepper Motor Control System

3 Models to Choose From

Three different MD-2 models are available to meet a wide variety of torque requirements. Each MD-2 system contains drive electronics, 2-stepper motors, 2-home switches, 2-10' motor cables, a printer port cable, MD-2 software, subroutine libraries, and extensive technical documentation. An input/output port is included on each unit. This gives the user 3 digital inputs and 2 digital outputs to attach to external devices such as cutting motors, lamps, lasers, limit switches, or level sensors.

The torque curve charts below can be used to determine the available torque for any speed. As you can see, torque decreases as motor speed increases. Torque can be increased on the MD-2a and b models by using our PR23 pulley reducer found on page 10. The maximum speed that your application can operate at depends on many factors including payload, friction, acceleration, and computer speed. It's best to have 30-50% more torque than required. Although the MD-2 software will work on very slow computers, we recommend a 386 for best performance. Feel free to call us to discuss your torque requirements.

MD-2_a

\$699.95

Description: The MD-2a is our smallest system and is capable of driving all of our linear and rotary positioning tables with moderate payloads and speed.

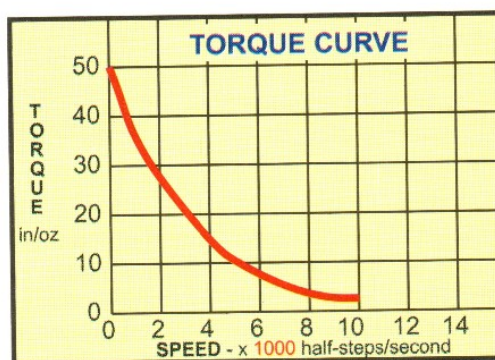
Motors: Size #23, 2.25" diameter, 2.25" length.

Shafts: .25" diameter, .75" length.

Resolution: .9 degree half-steps (400 per revolution).

Maximum Speed: 10,000 half-steps per second.

Holding Torque: 50 in/oz.



MD-2_b

\$999.95

Description: Having 3 times the torque of the MD-2a system, the MD-2b can be used with our X and XY positioning tables to move larger payloads faster. Not compatible with our RT-12 rotary positioning table or Z-2 due to motor length.

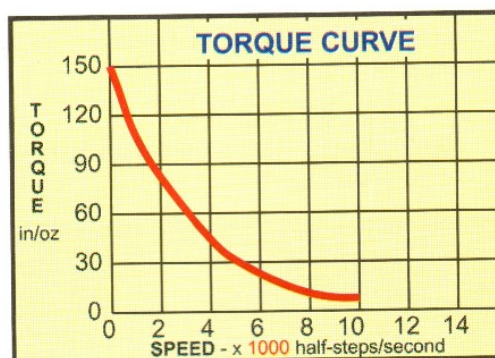
Motors: Size #23, 2.25" diameter, 4" length.

Shafts: .25" diameter, .75" length.

Resolution: .9 degree half-steps (400 per revolution).

Maximum Speed: 10,000 half-steps per second.

Holding Torque: 150 in/oz.



MD-2_c

\$1,399.95

Description: The MD-2c is our biggest system and can be used to position very large payloads. The size #34 motors are not compatible with our positioning tables or pulley reducers.

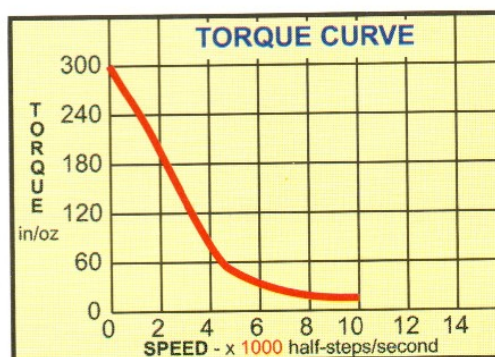
Motors: Size #34, 3.4" diameter, 3.75" length.

Shafts: .375" diameter, 1.25" length.

Resolution: .9 degree half-steps (400 per revolution).

Maximum Speed: 10,000 half-steps per second.

Holding Torque: 300 in/oz.

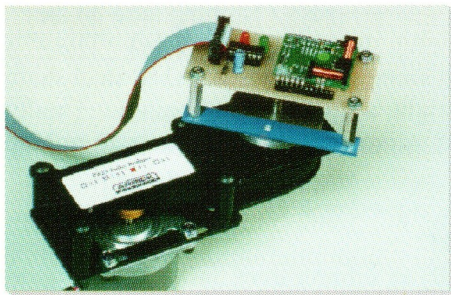


Applications and Possibilities

Shown here are just a few of the possible uses for the MD-2 motion control system and our positioning tables. Other applications include satellite dish positioning, vent control, museum exhibits, camera positioning, laser engraving, full-scale automation prototyping, and even car steering. Call us today to discuss your application.

Pick and Place

Our Robotic Workcells (page 11) can be used to automate repetitive tasks in a laboratory, factory, or workshop. Use our GR-2 gripper to grasp items such as test tubes, crucibles, trays, or electronic parts. Use our PR23 pulley reducer to enhance resolution, torque, and speed for more demanding projects.

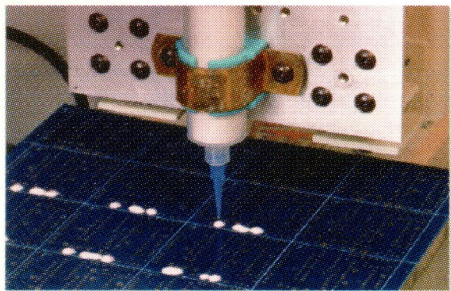
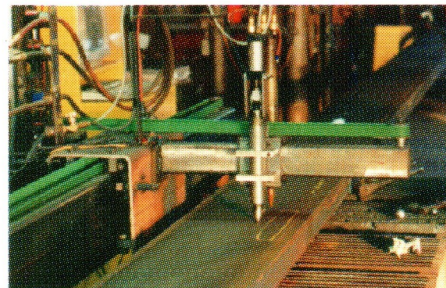


Testing

PC-based test fixtures are commonplace in today's factories. Our motion control products are designed to work with standard office-style personal computers which are cost-effective and easy to maintain. Systems can be designed and built quickly because Engineers and Programmers are familiar with its architecture.

Computer Controlled Cutting

A variety of cutting, engraving, etching, and marking operations can be performed with our MD-2 motion control systems. Laser, plasma, and other types of tooling can be used to work with almost any material. Large machines can be automated using our MD-2c system with its powerful size 34 motors. Lead-screws, rack-and-pinion, and belt-driven mechanical systems can be utilized.

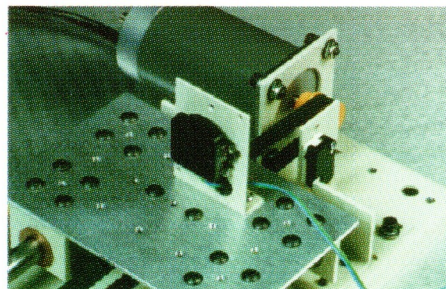


Dispensing

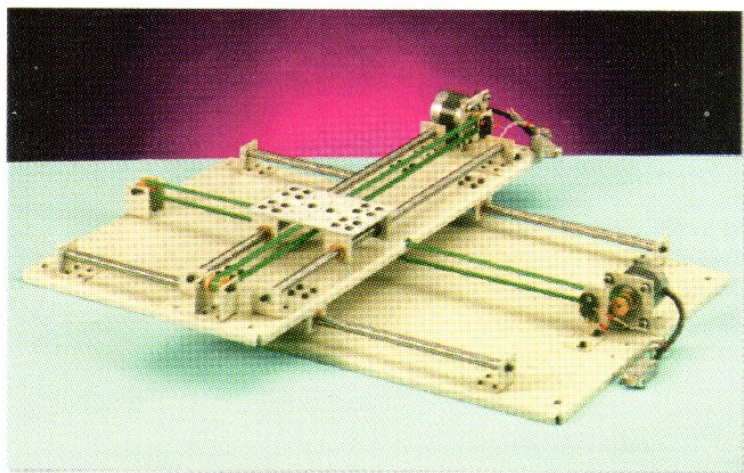
Dispensing can be performed automatically using the MD-2 system to control a positioning table which guides either the dispensing tool or the part. The digital output signals on the MD-2 system can be used to activate the dispensing pump. Possible materials include adhesive, fluids, or gasket compound.

Sensor Positioning

Our motion control systems are perfect for positioning sensors, cameras, and probes. The MD-2 software can be integrated with data acquisition products such as A/D and digital I/O boards using our subroutine libraries. Motion sequences can be created using the teach mode in our MD-2 program. A Basic-style program is automatically created which can then be edited and saved to disk.



Affordable Linear Positioning Systems



Now it's easy to position sensors, automate pick-and-place operations or perform light-duty machining. Our X and XY series belt-driven positioning tables are the perfect alternative to traditional lead-screw driven tables. The low-stretch timing belt provides an incredible 1/100" accuracy (twice the thickness of a sheet of paper) at speeds rivaling lead-screw models. All positioning tables can be controlled easily with our MD-2 stepper motor systems - just attach the motor, connect the home switch, and you're ready! Nothing else to buy - even the tools are included. The 4" x

6" top plate has 15 mounting holes to attach your instrument or tool. An aluminum frame, polished steel shafts and bronze bearings make the X and XY series positioning tables lightweight, accurate, and affordable. Finally, an easy way to implement those automation tasks. Have any questions? Give us a call, we'll be glad to help. Detailed data sheets are available for all models.

Increase Performance with a PR23 Pulley Reducer

Use these positioning tables with our PR23-2.5 pulley reducer (page 10) to achieve even faster speeds, more torque, and a resolution of .002" per step. Select the MD-2b motor control system (page 6) for maximum performance.

Specifications

When used with the MD-2b stepper motor system and a 2 pound payload -

Accuracy: +/- .010" per foot

Resolution: .005" per .9 degree step

Repeatability: .005"

Maximum X speed: 6" per second

Maximum Y speed: 8" per second

Note: Payloads up to 15 pounds can be used with decreased speed and accuracy.

Applications

- Sensor Positioning
- Laboratory Automation
- Pick and Place Operations
- Dispensing
- Training
- Automated Testing
- Light-duty Machining
- Automated Test Probe
- Engraving
- Camera Positioning

Package Includes

- Linear Positioning Table
- All Necessary Hardware
- Home Switch
- Tools for Setup
- Documentation

Pricing

X-9	Single axis positioning table, 9" total linear travel.	\$399.95
X-18	Single axis positioning table, 18" total linear travel.	\$449.95
X-30	Single axis positioning table, 30" total linear travel.	\$749.95
<hr/>		
XY-9	Dual axis positioning table, 9" of travel on each axis.	\$749.95
XY-18	Dual axis positioning table, 18" of travel on each axis.	\$849.95
XY-30	Dual axis positioning table, 30" of travel on each axis.	\$1,499.95

Accurate, Lightweight, Easy-to-use

We've designed a rotary positioning table using our unique, cost-effective design philosophy. The RT-12 can be used to position a variety of payloads such as cameras or lasers. The 12" diameter aluminum top plate has 24 tapped holes to attach your application. An endless variety of configurations can be created by attaching a linear positioning table such as our Z-2 or X-9 to the RT-12. The RT-12 can be driven with the MD-2a motor system and can also be used with a PR23-3 pulley reducer for greater performance. A detailed data sheet is available.

Specifications

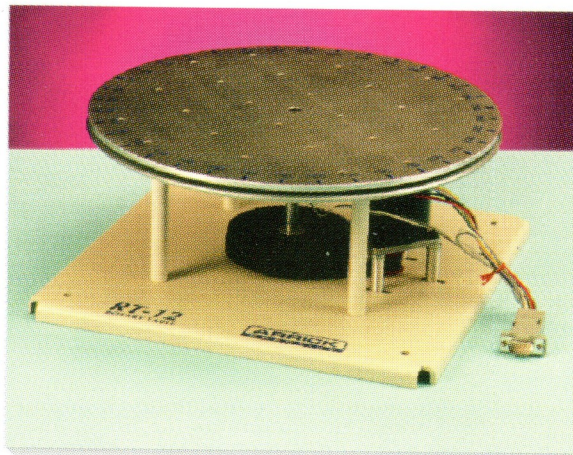
When used with the MD-2a stepper motor system and a 2 pound payload -

Accuracy: .1 degree

Resolution: .15 degrees per .9 degree step

Repeatability: .1 degree

Maximum speed: 45 degrees per second

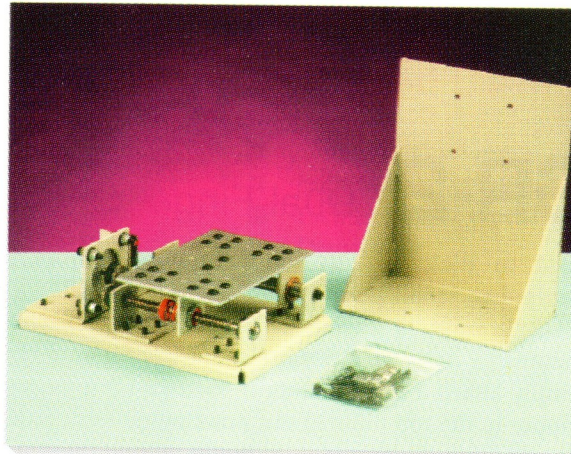
**Pricing**

RT-12 12" Rotary positioning table \$299.95

Lead-Screw Positioning Table

Z-2

Need the precision of a lead-screw? Need short travel against gravity? Our Z-2 table can solve the problem. Constructed with an aluminum frame, precision ground lead-screw, and an anti-backlash nut, the Z-2 is perfect for short X, XY and XYZ applications. The Z-2 is easily attached to our X and XY tables using the SK-4 spacer kit (horizontal mounting) or the BR-2 bracket kit (vertical mounting). Connect the Z-2 to an X-9 to make an XY table with 9 inches of travel in one direction and 2 inches in the other. Connect 3 Z-2 tables together and create a 3-axis workcell. The possibilities are unlimited! The Z-2 is easily controlled using our MD-2a motor system. A detailed data sheet is available - we'll be glad to fax it to you today.

**Pricing**

Z-2 Single axis positioning table, lead-screw, 2" total travel. \$399.95

BR-2 Right angle bracket w/hardware, for vertical mounting of Z-2. \$74.95

SK-4 Spacer kit, for horizontal mounting of Z-2. \$24.95

Specifications

When used with the MD-2a stepper motor system and a 2 pound payload -

Accuracy: +/- .005" per foot

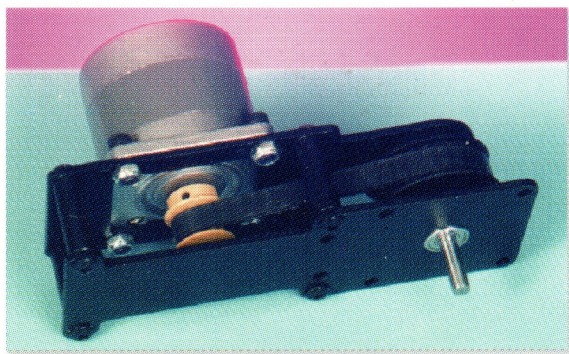
Resolution: .00125" per .9 degree step

Repeatability: .002"

Maximum speed: 2" per second

PR-23 Pulley Reducer

Increase Motion Performance



Pricing

PR23-2	Pulley Reducer, 2:1	\$149.95
PR23-2.5	Pulley Reducer, 2.5:1	\$149.95
PR23-3	Pulley Reducer, 3:1	\$149.95
PR23-4	Pulley Reducer, 4:1	\$149.95
PR23	Pulley Reducer, all ratios	\$199.95

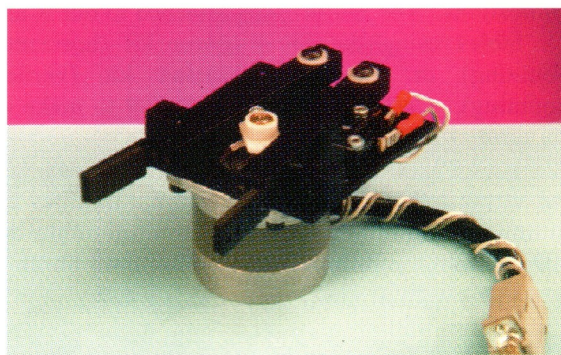
Specifications

Maximum output torque:	200 oz/in
Maximum output speed:	1000 RPM
Efficiency:	95%
Backlash:	10 arc minutes

The PR23 series of pulley reducers provide a cost-effective alternative to gear reducers often costing \$400 or more. Use the PR23 with any NEMA size 23 stepper or servo motor to provide an increase in resolution and torque. Vibration reduction and load matching benefits can also be achieved to enhance the performance of many mechanical systems. Perfect for belt-driven and lead screw-driven XY positioning tables. Even though the output speed is reduced by the reduction ratio, some systems will actually have their overall speed performance increased due to better matching of the motor with the load. This is particularly true on our X and XY belt-driven positioning tables where speeds can be increased by as much as 4 times by simply adding a 2.5:1 reduction. The PR23 face plate appears as a size 23 motor with a 1/4" shaft. This allows the user to simply remove the motor from the mechanical system, mount it to the reducer, then mount the reducer on to the system. Timing belt tension is easily adjustable. Pulleys can even be swapped within the housing to provide an 'increase' function if needed. Five models are available providing ratios of 2:1, 2.5:1, 3:1, 4:1, and one model capable of all ratios.. The simple yet rugged design incorporates precision ball bearings and requires no maintenance. Everything you need is included - pulleys, belts, hardware, and wrenches. A data sheet is available.

GR-2 Dual-Finger Gripper

Need to pick up test tubes in a laboratory or manipulate small parts on an assembly line? The GR-2 gripper is easier to use than conventional pneumatic units and doesn't require an air supply. Simply attach a size 23 stepper motor and mount the gripper to the top plate of our positioning table using the supplied hardware. A home switch provides open status to the computer. The cam & spring design provides individual finger compliance and is capable of gripping the inside or outside of an object. Finger extensions are reversible for small or large payloads and can be replaced with customized ones for special applications. Add the GR-2 to our positioning tables to create a complete robotic workcell.



Specifications

Specifications when used with the MD-2a stepper motor system and the supplied finger extensions.

Grip Range:	.5" Closed, .88" Open
Grip Force:	4 ounces..
Resolution:	.019" per .9 degree step.
Repeatability:	.02"

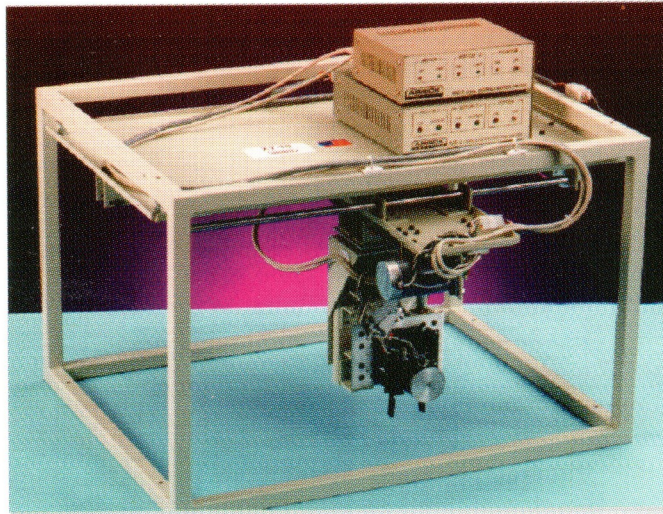
Maximum open speed: .1 second.

Pricing

GR-2	Dual-Finger Gripper	\$249.95
-------------	---------------------	----------

Affordable Automation

Now's the time to automate those tasks currently being performed manually. By combining our MD-2 stepper motor systems with our XY positioning table and a gantry stand, a complete robotic workcell can be created. Our Z stage can be added to create 3-axis motion. In many cases, an XYZ workcell can replace a very elaborate robotic system at a fraction of the cost. Just connect to your personal computer, attach a tool and your system is complete. Add our GR-2 Gripper for even more capability. Robotic workcell packages come complete with motor control systems, positioning tables, hardware and an accessory kit which includes a parallel printer port, cables, cable mounting hardware, and a T-handle hex wrench.



RW-9b	9"x9"x2" Robotic Workcell, XY-9, MD-2a, MD-2b, ST-9, Z-2, BR-2, Accessory kit.	\$3,199.95
RW-18b	18"x18"x2" Robotic Workcell, XY-18, MD-2a, MD-2b, ST-18, Z-2, BR-2, Accy kit.	\$3,299.95

Accessories Improve Capabilities

Improve speed, resolution, and torque by adding 2 PR23-2.5 pulley reducers (page 10) to your Workcell. Add our GR-2 Gripper (page 10) to allow your workcell to grasp objects such as test tubes and other parts.



Laser etching example using an MD-2b and an XY-18 positioning table

Unlimited Uses

- Sensor Positioning
- Laboratory Automation
- Pick and Place Operations
- Dispensing
- Training
- Automated Testing
- Light-duty Machining
- Automated Test Probe
- Engraving
- Camera Positioning

Stands

Each Robotic Workcell includes a stand for gantry (upside down) operation of the positioning table. These stands can be purchased separately when our Z-2 and other accessories are not required. Constructed to minimize vibration and flex. Detailed data sheets available.

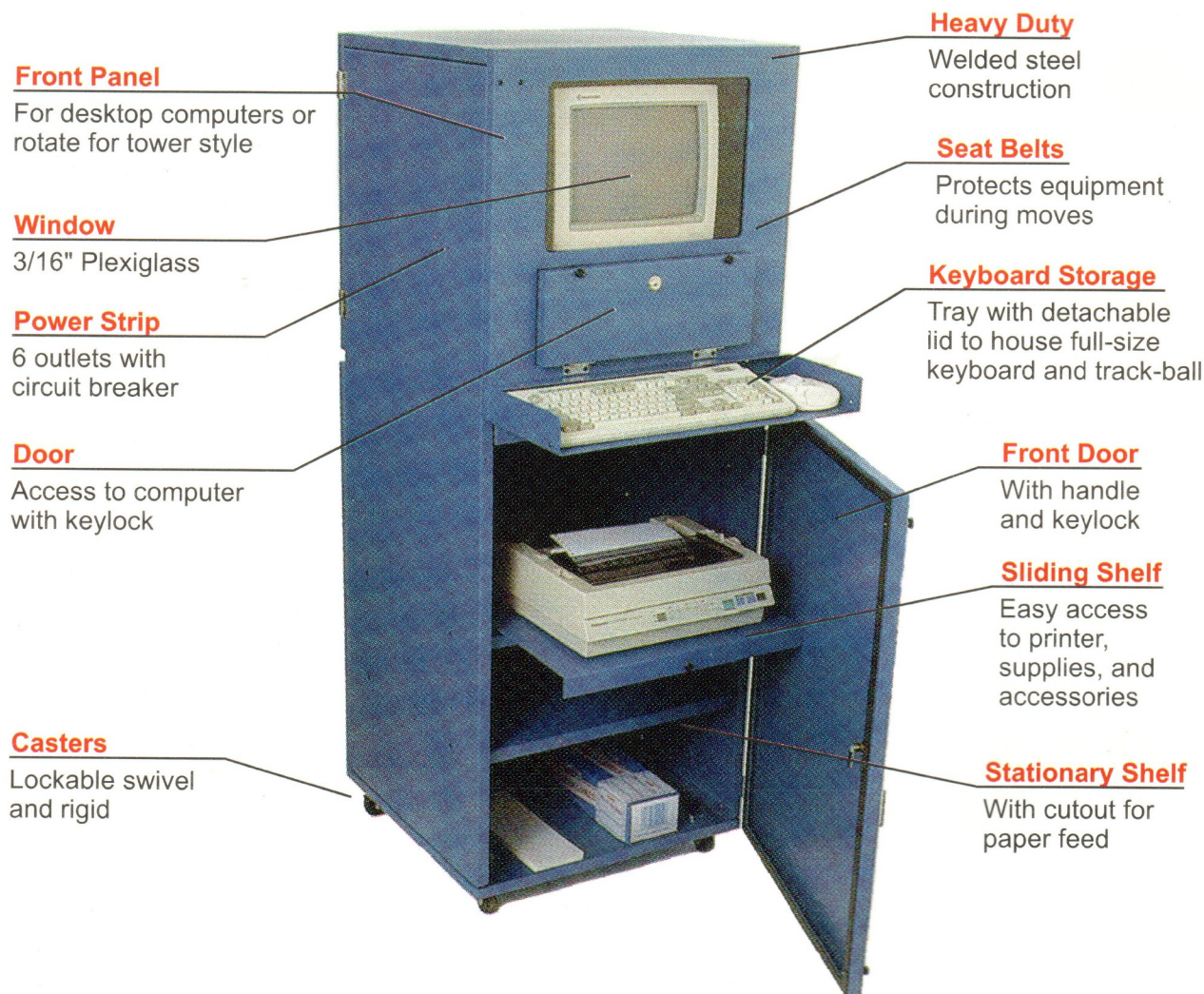
ST-9	Gantry stand for use with XY-9	\$349.95
ST-18	Gantry stand for use with XY-18	\$349.95

EnviroCase

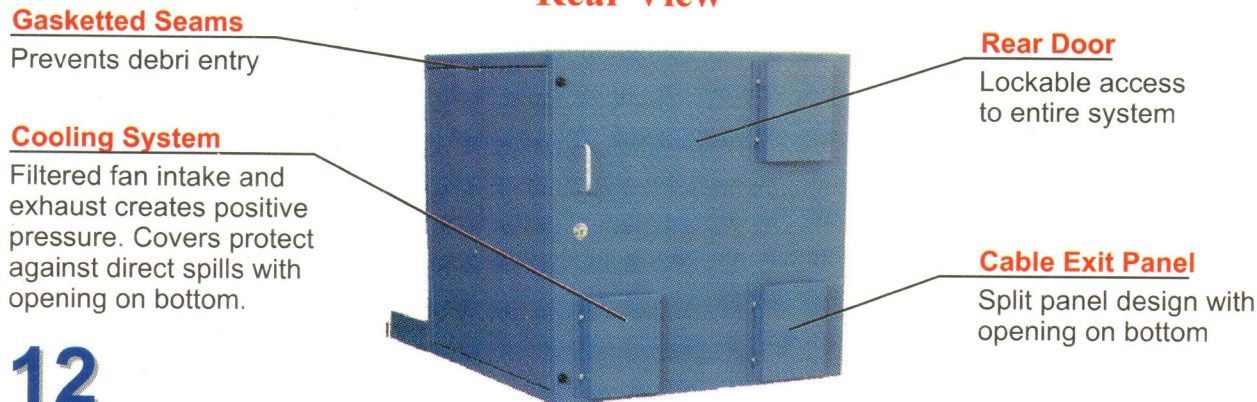
Protection for Personal Computers

Everyone knows that a dusty or dirty environment can cause damage to your personal computer. Don't wait until a catastrophe occurs, protect your data and your investment with an EnviroCase. The EnviroCase is perfect for garages, factories,

laboratories, and workshops. Just place your computer inside the rugged, steel enclosure and guard it against spills, dust, and other contaminants. The keyboard tray has a removable lid and is large enough to house a trackball and a full-size keyboard. The unique front-panel design can be oriented for desktop or tower-style computers. The cooling system includes an intake filter, an exhaust filter, and a powerful fan which creates a positive pressure environment to prevent dust from getting in your system. Unlike expensive alternatives, the EnviroCase **comes complete** with keyboard tray, filtered-fan cooling system, power strip, and equipment seat belts. Stand-up and Sit-down models include printer shelves and lockable casters.



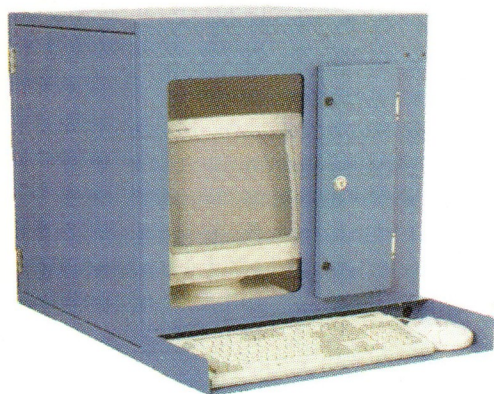
Rear View



Three Models to Choose From

EnviroCase

Protection for Personal Computers



Shown with front panel rotated for use with tower-style computers.

Desktop

Model 100

Only

\$999.00

When your computer must sit on top of a desk or table, the model 100 can do the job. Complete with rubber feet to protect surfaces or bolt the unit down using the 4 holes provided. An adjustable floor-standing pedestal is also available for \$299.00. Case dimensions are W-24" x H-24" x D-25", Keyboard tray is W-24" x H-2.5" x D-9".



Sit-Down

Model 200

Only

\$1699.00

The model 200 sit-down EnviroCase is made for applications requiring operation from a chair. Complete with casters and printer shelves. Case dimensions are W-24", H-48", D-25", Keyboard tray is W-24" x H-2.5" x D-9".



Stand-Up

Model 300

Only

\$1799.00

The model 300 EnviroCase is constructed like the model 200 but with extra height for standing operators. Lower cabinet has plenty of room for multiple printers or other computer equipment. Case dimensions are W-24", H-60", D-25", Keyboard tray is W-24" x H-2.5" x D-9".

Visit our Internet Web site at: <http://www.maketeck.com/enviro.html>

MAKETECK

INCORPORATED

P.O. Box 1626 Hurst, TX 76053 USA
Ph: (817) 571-0649 Fax: (817) 571-2317
E-mail: info@maketeck.com

State-of-the-art



The Trilobot mobile robot combines the latest in microcontroller and sensor technology with a strong, lightweight frame to create an affordable, rugged platform. Perfect for research in artificial intelligence, autonomous navigation, robotics technology, and maze competition.

High-level commands can be sent to the on-board controller from a PC using a serial (RS-232) interface. The user can place a laptop computer on the upper deck of the robot or communicate via radio modems. The user can then control the Trilobot using any terminal program or by using popular programming languages such as C, BASIC, or Pascal. Controllers can be daisy chained together for unlimited expansion capability. The simple two-letter command structure makes programming quick and efficient.

The Trilobot frame is made entirely from lightweight aluminum. The front drive wheel and the two rear idler wheels each have independent suspension to reduce vibration. The front wheel is driven by a strong DC motor at speeds up to 15 inches per second. Steering is performed by a stepper motor which can rotate the front wheel up to 90 degrees left or right from center. The upper deck has an array of mounting holes for accessories and is hinged to allow access to the battery, controller, and other components. Multiple decks can be added for additional expansion.

TRILOBOT

Mobile Research Robot

\$1,900.00

Specifications

Mechanical: 1/8 inch aluminum, CNC-punched frame components. Vibration resistant fasteners. Three-wheel independent suspension. Front wheel drive and steering with encoder. Two rear idler wheels. 14" wide, 14" long, 10" tall. 18 lbs. 20 lb. payload capacity. Hinged upper deck for access to electronics.

Power: 12 volt, 7 amp hour sealed lead-acid. 4 to 24 hour run time depending on activity. Accessory jack to power a laptop computer or radio modem. Wall mount charger included. Manual on/off/charge switch.

Drive motor control: 12 volt reversible DC motor. PWM speed control, 0-100% voltage in 10% increments. Maximum speed is 15"/sec. Desired travel distance from 1 to 9,999 inches in 1 inch increments.

Steering control: 4-phase stepper motor with gear reducer and home switch. Positions 90 degrees left and right from straight in 1 degree increments.

Ultrasonic ranging: Measures the distance to the nearest object for collision avoidance and to aid navigation. Detects objects from .5 to 21 feet away in 1 inch increments.

Electronic compass: Detects heading using solid-state magnetic sensor - N, S, E, W, NE, NW, SE, SW.

Temperature sensor: Reads ambient temperatures from 32 to 120 degrees Fahrenheit.

Light level sensor: Senses light level. 0-255, 0=dark, 255=bright.

Tilt sensor: Detects tilting of the robot to aid navigation. Senses flat, front, back, left, and right.

Battery status: Detects voltage of battery.

Bumper switches: Front and rear, low-force, mechanical lever switches for collision detection.

Wheel travel encoder: Measures drive wheel travel from 0 to 9,999 inches in 1 inch increments.

Beeper: Used to send audio signals.

User output signals: Control accessories such as headlights or a vacuum cleaner. 12 volt, 1 amp capacity. Also able to control one RC/PWM aircraft servo for sensor positioning.

User input signals: Four digital and 2 analog user signals can be used to read devices such as moisture sensors, smoke alarm, sound level, joystick, etc. Expansion of existing sensor system is also possible with custom circuitry.

Communications: Serial, RS-232 port. Female 9-pin D-sub connector. 1200 baud, 8 data bits, no parity.

Commands: Each command consists of a 2-letter ID prefix and a 2-letter command followed by parameters.

Networking: Controllers can be daisy-chained together with the serial port to create a master/slave network.

Flexible, Programmable, Expandable

Programming the Trilobot

The Trilobot is programmed by sending simple commands through the serial port. Each command consists of a 2-letter controller ID and a 2-letter command followed by parameters. The controller ID allows multiple controllers to be daisy-chained together using the same serial cable. The Trilobot controller ID is !1. Each command will either return an 'A' indicating 'accomplished' or will return the desired information. Commands are grouped together using the first letter - A=action, S=set, G=get, P=put.

Example:

!1AS090

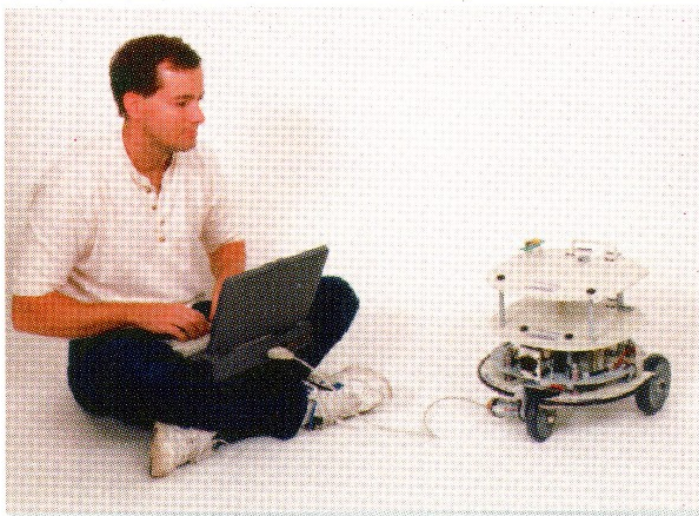
Controller ID ——— Desired position 0-180 degrees
Steering motor command (Act Steering)

Commands can be sent using a common terminal program or any programming language which allows access to the serial port. Example programs are supplied in QBasic. Here is a partial list of commands.

- AB** - Control the beeper.
- AS** - Control the steering.
- AD** - Control the drive motor.
- AR** - Reset the controller.
- AT** - Initiate test sequence.

- SA** - Set Autopilot.
- SC** - Set current steering position.
- ST** - Set steering motor torque.

- GC** - Gets controller information.
- GD** - Get distance traveled.
- GI** - Get input port data.
- GS** - Get all sensor information.
- GU** - Get sonar reading.



The AI CD-ROM

From Network Cybernetics Corporation

- Fuzzy logic
- Neural networks
- Artificial life
- Genetic algorithms
- Expert systems
- Robotics
- Machine vision
- Machine reasoning
- Natural language
- Cellular automata
- Chaos
- Fractals

The AI CD-ROM is a collection of thousands of up-to-date files on topics related to artificial intelligence and robotics. This ISO-9660 CD-ROM can be used on IBM-style personal computers running DOS, OS/2, and Windows; Apple Macintosh systems; and Unix-based systems. Demo programs, research papers, FAQs, program source code, and project drawings are organized in easy-to-access subdirectories. The AI CD-ROM is revised annually to include files on the latest developments in the field of AI. This is the original AI CD-ROM that you've read about in magazine reviews and on the Internet.

AICDR3

AI CDROM Revision 3

\$89.95

P.O. Box 1574 Hurst, TX 76053 USA
 Ph: (817) 571-4528 Fax: (817) 571-2317
 Web: <http://www.robotics.com>
 E-mail: info@robotics.com





P.O. Box 1574 Hurst, TX 76053 USA
Ph: (817) 571-4528 Fax: (817) 571-2317
Web: <http://www.robtics.com>
E-mail: info@robotics.com

Send to:

Fax Back Form

Fill out this form and fax it to us for prompt response
(817) 571-2317

- ☐ Keep me on your mailing list.
- ☐ Remove me from your mailing list.
- ☐ Send another catalog.

- ☐ Send data sheet on _____
- ☐ Call to discuss my application.
- ☐ My new address is below.

Address: _____

Phone: _____

Fax: _____

E-Mail: _____