

SECOND EDITION

Industrial Robots

**ROBOTS
ACCESSORIES
COMPONENTS
SENSORS
CONTROL SYSTEMS
CONSULTANTS
MOTION CONTROL
DRIVES
TOOLING**

PRODUCTIVITY EQUIPMENT SERIES



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Industrial Robots

Productivity Equipment Series

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INDUSTRIAL ROBOTS

Productivity Equipment Series

This volume of the Productivity Equipment Series is designed to aid engineers, managers, and technicians in the purchasing of industrial robots and related accessories and services. This book will prove to be an important time-saver, placing current product information in the hands of the reader.

More than 500 suppliers of robots and accessories as well as consultants were contacted in the development of this volume. Each contribution was carefully analyzed as to its industrial usefulness and timeliness.

In the first section, dozens of robot models are supplied by 39 companies. In the book's second section, "Accessories and Components," encoders, actuators, positioners, systems, parts, digital components, and modular components from more than 35 companies are included.

Section Three, "Sensors" represents three companies. The section entitled "Control Systems" explores products from 17 companies.

Section Five includes data on six consulting firms and systems houses. "Motion Control" covers information from eight companies. Section Seven, "Drives" provides the reader with product sheets from more than 10 companies. The final section, "Tooling" represents 11 companies.

Within each section, product sheets are grouped by manufacturer. As a special addition to aid in the ordering process, supplier names, addresses, and telephone numbers are featured on every page.

Manufacturers within each section are listed in alphabetical order.

Product data in this volume does not constitute a product endorsement by SME or its affiliated associations. The number of products listed for each manufacturer in this volume does not imply or indicate the manufacturer's share of the market, product quality, or any other differentiation among manufacturers.

Special thanks are extended to the many companies who participated in the development of this unique publication.

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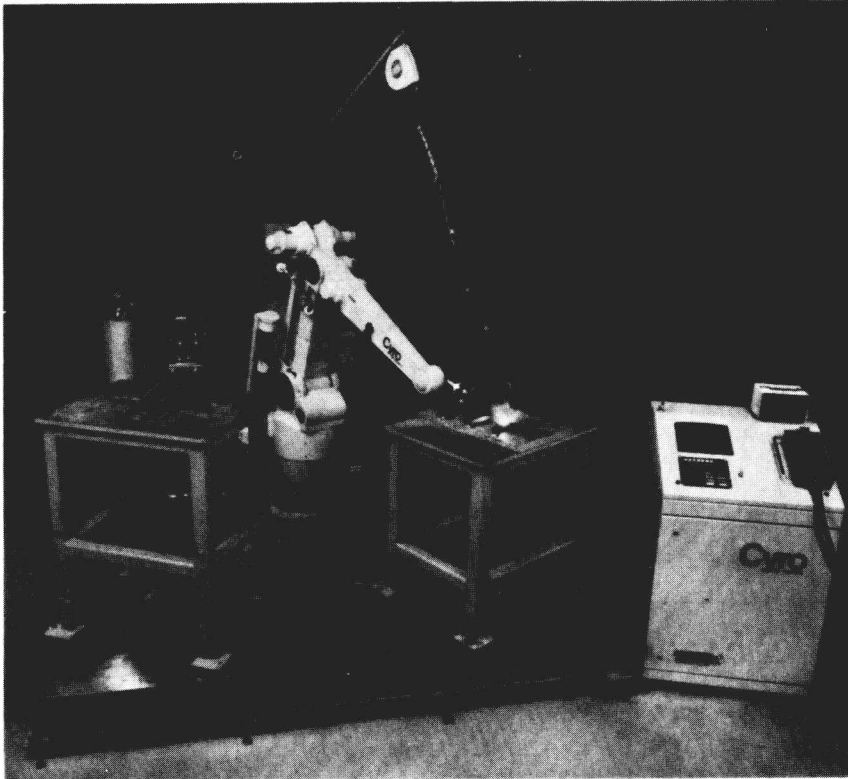
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SECTION 1

ROBOTS

Cyro[®] 1000

WORK CELL WITH C-30 CONTROLLER



A fully integrated Cyro 1000 work cell includes a Cyro 1000 robot, a C-30 controller, a GMAW or GTAW process package, and associated positioning equipment. Its jointed arm configuration and compact size reduce floor space requirements and provide maximum part accessibility, making it an ideal addition for virtually any production line, small parts fabricator, or job shop.

The C-30 controller provides real-time control of weld process variables. Programming is user friendly and easy to learn. The CRT displays cycle time, arc time, number of cycles and total work time to assist the operator in monitoring work cell efficiency.

CYRO 1000 FEATURES AND BENEFITS *1000 mm reach with ± 0.008 "*

repeatability. Reduces part tolerance requirements and the need for accurate fixturing.

Five or six axes of articulated motion. Provides dexterity for reaching hard to access joints, and reduces cycle time for welding (and for transfers between welds).

Expandable x-axis. Provides additional work cell length to permit multi-station operation or to accommodate larger parts.

Mounted on floor, ceiling or wall. Allows greater flexibility in designing the work cell configuration.

Modular construction. Simplifies service and reduces spare parts inventory.

Highly reliable. Delivers 99% uptime with 3500 hours mean-time between failure.

All-electric drives. Offer better servo response and clean, quiet operation that's easier to maintain and less expensive than hydraulics.

Lightweight aluminum structural components. Reduces inertial loading and allows better control of acceleration and deceleration.

Welding package integration. Accommodates GMAW, GTAW and FCAW processes.

C-30 CONTROLLER FEATURES AND BENEFITS

Real-time control of weld process and path variables. Allows setting of process parameters with accurate process control while the robot is actually welding.

Joint, linear and circular interpolation. Simplifies programming task by enabling the controller to calculate the complete weld path based on a very limited number of data points.

Program shift and transformation features. Allows repositioning of part with minimal reprogramming.

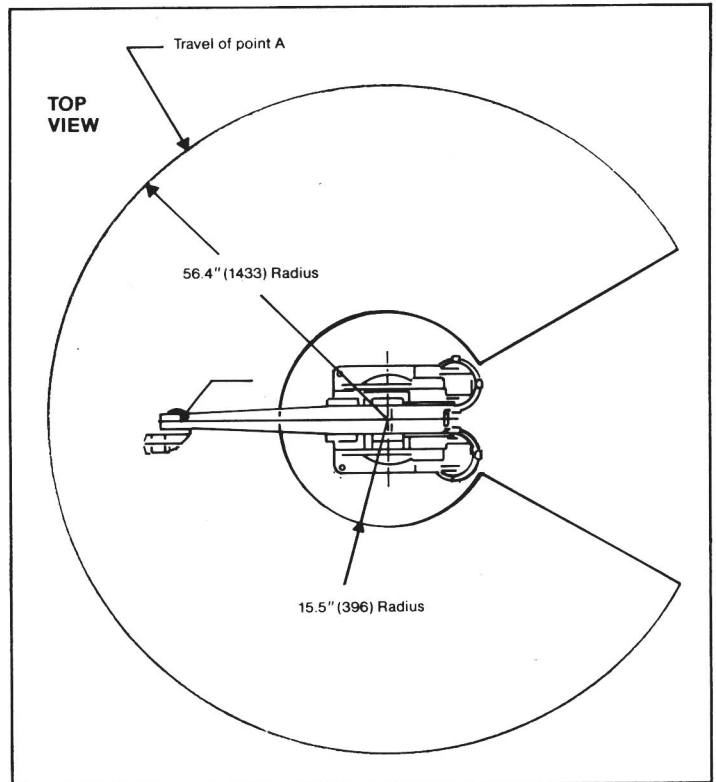
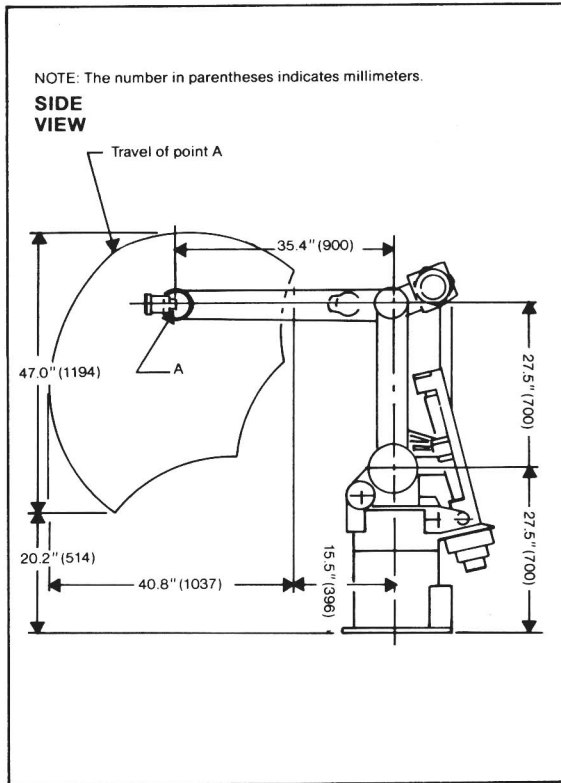
Large, non-volatile memory. Permits simultaneous storage of multiple programs in active memory, minimizing set-up costs.

Comprehensive, on-board diagnostics through built-in CRT.

Uses 121 English error codes to facilitate troubleshooting and minimize downtime.

Specifically designed for arc welding. Software commands and algorithms are written for the control of welding process and path variables.

Cyro® 1000 Robot Manipulator



Expandable I/O. Standard I/O allows 14 inputs and 15 outputs for peripheral devices. Expandable per work cell requirements.

Two RS 232 C serial ports for host computer or printer. Allows use of both units at operator's discretion. Includes down loading of user programs.

All programming functions controlled through teach pendant. Simplifies programming task. LED display identifies robot location at any moment.

SPECIFICATIONS

Repeatability.....	±0.008 in. (0.2 mm)
Reach	
Vertical	47 in (1194 mm)
Horizontal	41 in (1037 mm)
Maximum Speed (Motion)	
Swing Axis	105°/sec (±150°)
Horizontal Axis	92°/sec (+50°, -40°)
Vertical Axis	92°/sec (+20°, -45°)
Wrist Rotate Axis	320°/sec± (190°)
Wrist Bend Axis	200°/sec± (110°)
Floor Space	
Robot base	17.71 sq. in. (450 mm ²)
Control Cabinet	28.74 in. by 27.55 in. (730 mm x 700 mm)
Power Required	480V, 3-phase, 60 Hz, 3kVA
Environment	32° to 113° F (0 to 45° C)
Wrist Carrying Capacity	22 lb (10 kg)
Robot Weight	617 lb (280 kg)
X-axis extension	Available as option

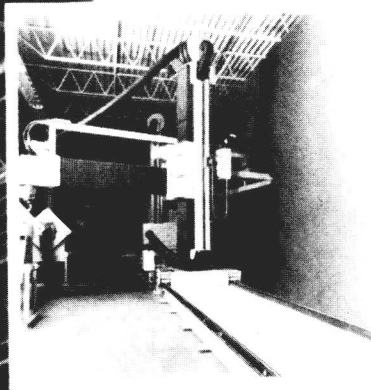
**ADVANCED
ROBOTICS**

Advanced Robotics Corporation
 777 Manor Park Drive
 Columbus, Ohio 43228
 Telephone: 614-870-7778



ADVANCED ROBOTICS

Large Working Volume:
 $2M \times 2M \times 2M$



Cyro 2000 industrial robots are rectilinear robots with a 2 meter by 2 meter by 2 meter reach. Additional expansion of the horizontal axis enables Cyro 2000 to handle even longer parts or accommodate multiple work stations.



All Cyro robots are easily programmed. The advanced control of the Cyro 2000 robots enables on-site programming with the portable hand-held pendant, remote editing and other advanced techniques.

Cyro's repeatability and smoothness are unusual in a machine this size. It is truly THE Advanced Generation robot... capable of performing many tasks... increasing industrial productivity.

Cyro® is a registered trademark of Advanced Robotics Corporation

Advanced Robotics Corporation

777 Manor Park Drive
Columbus, OH 43228
Telephone 614 870-7778

**ADVANCED
ROBOTICS**

Cyro® 2000 Robot Specifications

Motions

5 axes—powered by electric Servo Motors

Travel:

- X axis—80 in expandable
- Y axis—80 in
- Z axis—80 in
- A axis—110 deg
- C axis—720 deg

Repeatability

Repeatable to ± 0.016 in

Maximum Speed

- X, Y axis —300 in/min
- Z axis —150 in/min
- A, C axis —90 deg/sec

Floor Space

Robot Base: 54 ft²

Control Cabinet: 6-8 ft²

Power Requirements

480 Volts, 3 phase, 60 Hz, 10 KVA

Environments

50°F to 120°F (10°C to 50°C)

Weight

Robot —12,000 lb

Control—800 lb

Programming Methods

- Teaching with a pendant
- Numerical programming via terminal
- Off-line programming

Programmable Features

- Linear interpolation
- Circular interpolation (3 types)
- Joint coordinates
- Programmable acceleration/deceleration
- Analog function (2 outputs)
- Dwell
- Inch/Metric units
- Absolute/Incremental dimension
- Program shift
- Programmable tooling point
- Oscillation (Weave)
- Position override
- Feedrate override

Hardware Features

- Memory 64K Bytes
- Permanent program storage on tape cassette
- 8 I/O expandable to 32 I/O
- Automatic origin seek
- 180 deg Manual Mast Rotate

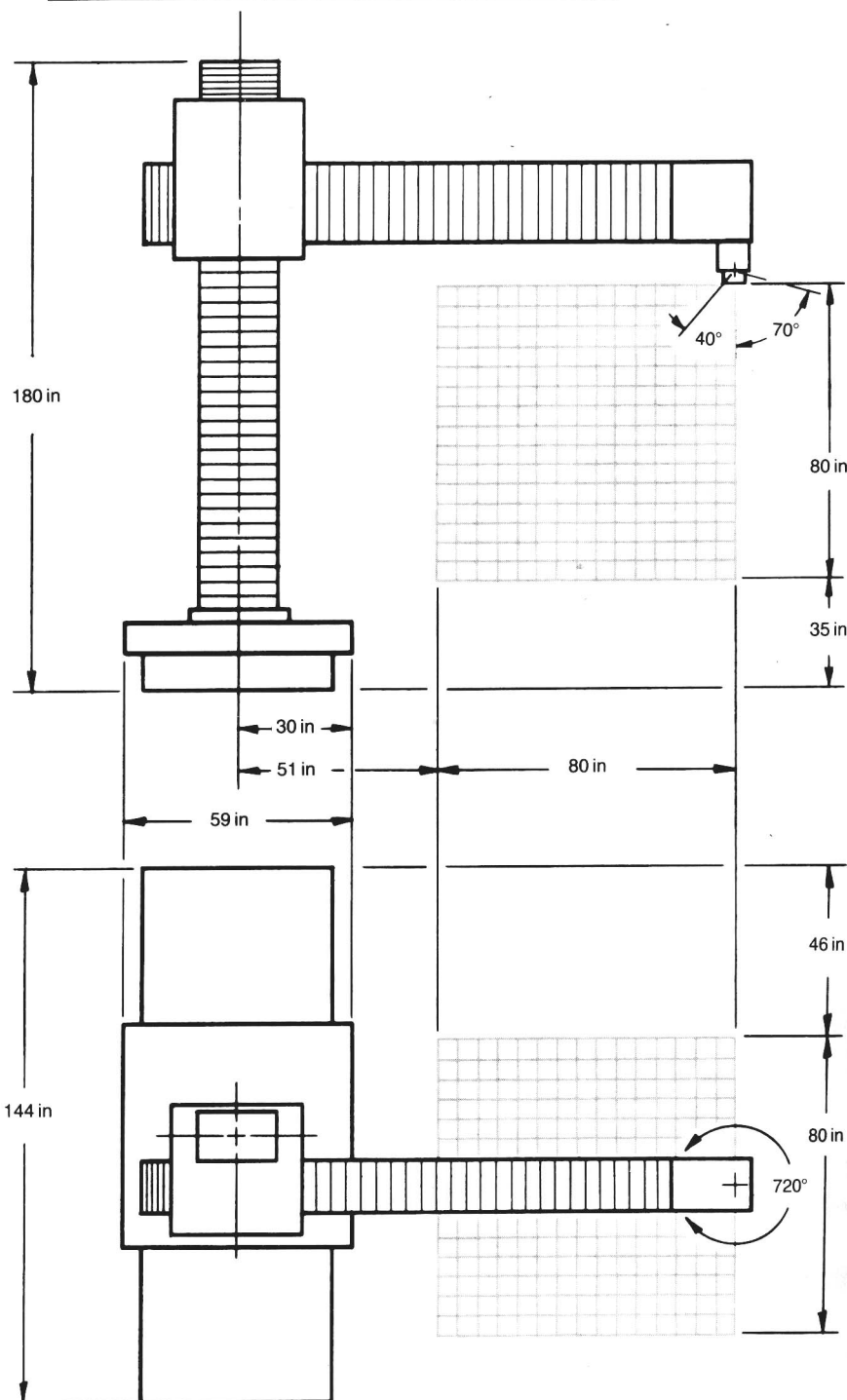
Options

- Coordinated Robotic Positioners
- X axis expansion
- Welding process packages including computer programmable weld parameters, voltage, wire speed, dwell, burnback

ArcScan™ welding seam tracker

Specifications subject to change without notice

Cyro®
2000 Robot



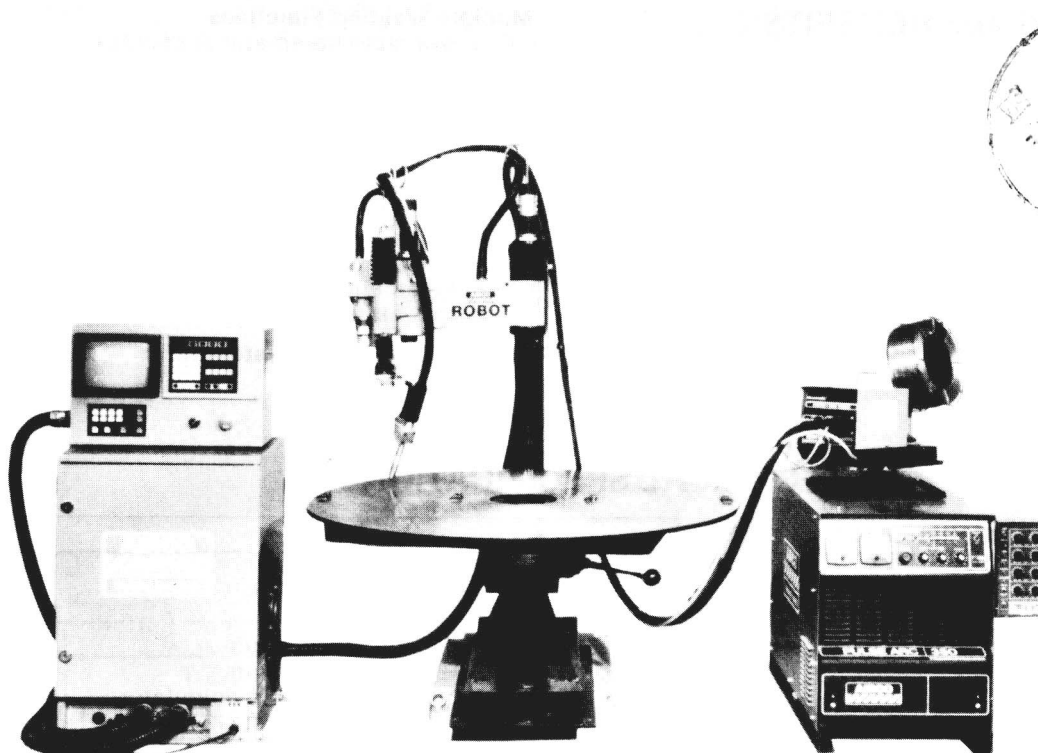
Advanced Robotics Corporation

777 Manor Park Drive
Columbus, OH 43228

Telephone 614/870-7778



AR-1 ROBOTIC WELDING SYSTEM



ROBOTS

DESCRIPTION

The Airco AR-1 Robotic Welding System is a low-priced, user-friendly, highly versatile complete welding system designed to perform a wide variety of GMAW and FCAW welding applications.

The system consists of:

- The AR-1 4-axis articulated welding robot including manipulator, control unit and power unit.
- A complete integrated welding equipment set-up including power source, wire feeder, torch and interfacing accessories.
- Optional accessory items including a stationary table or a 2-station rotatable work table for mounting tooling or fixturing.

The AR-1 Robotic Welding System is available in five basic configurations, the difference being in the welding equipment. The systems are available with the following Airco welding equipment setups:

- Dip-Pak[®] 200 Welding System
- Phase Arc[™] 350 Welding System
- Phase Arc 500 Welding System
- Pulse Arc[™] 350 Welding System
- Pulse Arc 500 Welding System

APPLICATIONS

The functional capabilities of the system are as follows:

It is designed for virtually any GMAW or FCAW applications which will fit into the robot's work envelope which covers an effective volume of approximately 54" x 20" x 3".

It is designed primarily for small parts welding or welds on larger parts which can be effectively presented to the robot's work envelope.

Many applications which can be done on more expensive 5- or 6-axis robots can be easily accomplished on an AR-1 Robotic Welding System. The Airco AR-1 Robotic Welding System is an excellent alternative to high-priced, complex robots or limited-capability, dedicated automatic welding setups.

FEATURES and BENEFITS

— Fully Integrated Compact System

— User-Friendly Operation

- Point to Point Direct Teaching
- Menu-Prompt Programming in plain English
- No previous robot or computer experience required
- Eight Program Memory with cassette memory expansion capability
- Continuous path linear interpolation

— Multiple Welding Functions

- Four available parameter schedules (on all systems which include Multi-Schedule Interface)
- Weld sequence arc start and arc end
- Programmable weaving

— Designed for Rugged Production Welding Conditions

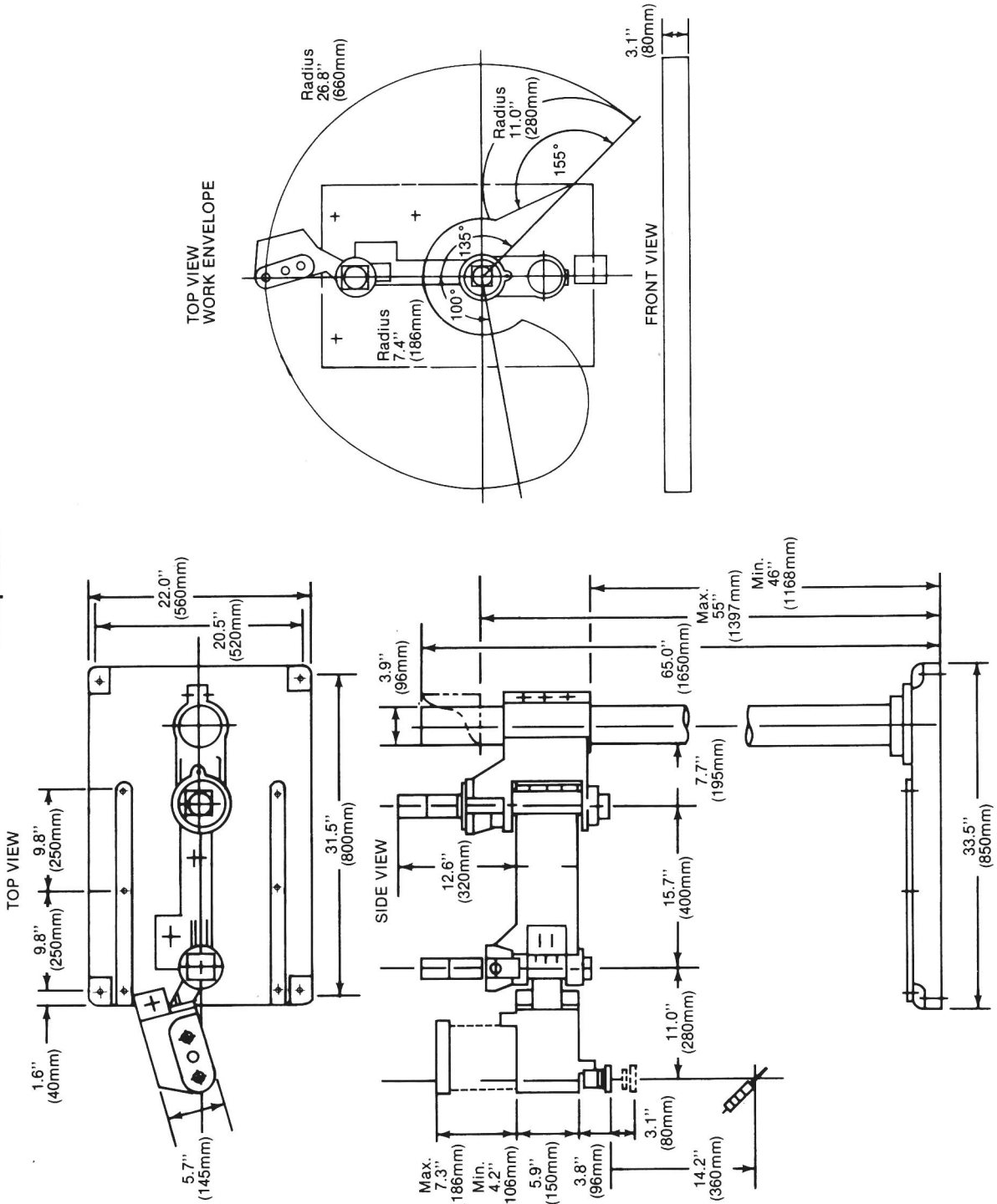
- Dust-free controller case with membrane key-board
- Self-diagnostics system
- Compact size

— Low-Cost, Versatile System

TECHNICAL SPECIFICATIONS

AR-1 ROBOT MANIPULATOR	
Structure Axes of Motion Load Carrying Capacity Position Repeatability Position Accuracy Weight	Horizontally articulated 4 11 lbs. (5kg) 0.008 inches (± 0.2 mm) maximum 0.008 inches (± 0.2 mm) maximum 370 lbs. (168kg) (including the manipulator base of 279 lbs. (127kg))
Operating Range of Each Axis: First Arm Second Arm Vertical Motion Rotation Wrist	0°-230° 0°-155° 3.14 inches (80mm) 0°-380°
Maximum Arm Speed: First Arm Second Arm Vertical Motion Rotation Wrist	143°/sec. 204°/sec. 7.9 inches/sec. (200mm/sec) 150°/sec.
Effective Working Speed Range	0.06 m/min. to 60 m/min.
Driving System: First Arm Second Arm Vertical Motion Rotation Wrist	80W DC Servo-motor, Harmonic Drive 80W DC Servo-motor, Harmonic Drive 22W DC Servo-motor, Ball screw 22W DC Servo-motor, Harmonic Drive

Manipulator



ROBOTS