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## **Safety**

**Safety cannot be overemphasized. Before performing any work on the manufacturing systems described in this book, be sure to read and understand the following safety notices.**

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### **Installation Site Safety Precautions**

- Ensure compliance with all local and national safety codes for the installation and operation of the system.
- Observe the manufacturer's power and grounding instructions for electrical equipment installed with the manufacturing system.
- The system must not be installed in an explosive atmosphere.
- Fire extinguishers must be located within easy access.
- Consider installing intrusion devices or safety mats around the manipulator to drop power if the work area is penetrated.
- Consider installing additional emergency power-off (EPO) switches for feeders and other fixtures.
- Consider installing an emergency-off switch in the 19-inch rack to simultaneously power off the 7537 Industrial Computer / Motion Controller and the Servo Power Module in an emergency.

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## Operation and Maintenance Safety Procedures

Safety precautions should always be observed by all personnel operating or servicing a manufacturing system. As with any electromechanical machine, unpredictable failures could occur while the system is in operation.

**Whenever possible, power to the manipulator and to the Servo Power Module should be disconnected before starting any maintenance and before penetrating the manipulator work area. If it is not possible to disconnect power due to the nature of the work to be performed, extreme caution must be observed.**

If you must penetrate the work area without disconnecting machine power, press the **Manip Stop** pushbutton on the Servo Power Module operator control panel or the remote **Manip Stop** pushbutton on the end of the pendant cable to remove power to the manipulator. Then place a "DO NOT OPERATE" sign on the operator panel and, if possible, carry the remote cable into the work area with you, to ensure that you remain in control of manipulator power.

**Note:** Pressing the **Manip Stop** pushbutton on the Servo Power Module operator control panel or on the end of the remote cable does not remove potential dangers created by other devices in the work area. **You must make sure that all potentially hazardous devices are powered off or otherwise secured before penetrating the work area.**

Because the manipulator arm moves with such force and speed, serious injury could result from failure to observe caution whenever the work area is penetrated. As stated above, power to the manipulator must be disconnected first, whenever possible.

**Before reconnecting power, always check the manipulator work area for adequate clearance; be absolutely sure no one is in the manipulator work area.**

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## Electrical Safety

Look for the following warning labels when working on electrical equipment.



**Hazardous voltage inside. Do not open.  
Gefährliche Spannung. Abdeckung nicht öffnen.  
Tension dangereuse à l'intérieur. Ne pas ouvrir.  
Voltaje peligroso en el interior. No abra.  
Tensione pericolosa all'interno. Non aprire.**

1. You should not work alone under hazardous conditions or around equipment which could expose you to hazardous voltages. Always advise your manager if there is a potential problem or if you must work alone.
2. Disconnect all power before removing or assembling major components, working in the immediate area of power supplies, performing mechanical inspection of power supplies, or installing changes to machine circuitry.

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3. Unplug the machine's power cord whenever possible before working on the machine. The wall box switch when turned off should be locked in the off position or tagged with a "DO NOT OPERATE" sign. Be aware that a non-IBM attachment to an IBM machine may be powered from another source and be controlled by a different disconnect or circuit breaker.
  4. When it is absolutely necessary to work on equipment having exposed electrical circuitry, observe the following precautions:
    - a. Another person familiar with power off controls must be in the immediate vicinity. (Someone must be there to turn off the power if it should become necessary.)
    - b. Do not wear jewelry, chains, metallic frame eyeglasses, or metal cuff links. (In the event of contact, more current can flow because of the greater contact area afforded by the metal.)
    - c. Use only those tools and test equipment that are appropriate to the task to be performed.

**CAUTION:**

**Cushioning grips are made for comfort and do not provide adequate insulation for working with live electrical circuits.**

- d. Use only one hand when working on energized equipment. Keep the other hand in your pocket or behind your back. (Remember, there must be a complete circuit to cause electrical shock. This procedure will help prevent a current path through vital organs of the body.)
  - e. When using test equipment, be certain that controls are set correctly and that insulated probes of the proper capacity are used.
  - f. Avoid contacting ground potential (metal floor strips, machine frames, etc.); use suitable rubber mats purchased locally, if necessary.
- Note:** Many customers use rubber floor mats near their equipment which contain tiny carbon or metal fibers to help reduce static discharges. Be especially cautious of this type of mat and do not use it to provide protection from electrical shock.
5. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in IBM safety service memorandums (SMs) and the safety portions of maintenance documentation. Use extreme care when measuring high voltage.
  6. Avoid use of tools and test equipment which have not been approved. (Electrical hand tools like wire wrap guns, drills, etc., should be inspected periodically.)
  7. Do not use worn or broken tools and test equipment.
  8. After maintenance, restore all safety devices such as shields, guards, signs, and ground leads. Replace any safety device which is worn or defective. (These safety devices are there to protect you from hazards. You can defeat their purpose by not replacing them at the completion of service.)

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9. Safety glasses must be worn when:

- Using a hammer to drive pins, etc.
- Power hand drilling
- Using spring hooks, attaching springs
- Soldering, wire cutting, removing steel bands
- Parts cleaning, using solvents, chemicals, and cleaners
- All other conditions which might be hazardous to your eyes.

10. Never assume that a circuit is de-energized. Check it first.

11. Always be alert to potential hazards in your working environment (for example: damp floors, non-grounded extension cords, power surges, missing safety grounds, etc.).

12. Do not touch live electrical circuits with the surface of plastic dental mirrors. The glass surface of the mirror is conductive and can result in machine damage and personal injury.

13. Power supplies, pumps, blowers, motor generators, and other similar units must not be serviced with power on them when they are removed from their normal operating position within the machine unless specifically prescribed in the maintenance documentation. (This is done to assure that proper grounding is maintained.)

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## Safety Notices

This document may contain the following safety notices:

### **DANGER**

This notice advises of a condition that could present a potential hazard where serious personal injury or loss of life is possible unless care is used.

### **CAUTION:**

This notice advises of a condition that could present a potential hazard where personal injury, except as defined for a DANGER notice, is possible unless care is used.

**Warning:** This notice advises of a potential condition that could cause machine or program damage unless care is used.

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In addition to the precautions previously stated, the following precautions must also be observed when performing any maintenance or service on the manufacturing system:

- All personnel working with the system must have, at a minimum, instruction and practice in the use of the safety devices on the system. Safety procedures should be practiced enough to ensure familiarity.
- Observe safe access routes to and from the system.
- Utilize signs around the system and at power disconnects to alert others to potential hazards.
- Remove watches and rings before servicing the system.
- Always wear safety glasses around the manipulator and when servicing the system.
- If heavy units are to be installed or removed, wear safety shoes or other appropriate foot protection.
- Stay out of the manipulator work area when manipulator power is on. The manipulator arm moves rapidly and with great force.
- Press the **Manip Stop** pushbutton on the Servo Power Module operator control panel or the remote **Manip Stop** pushbutton on the the end of the pendant cable to stop the manipulator in an emergency.

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## Safety Inspection

Before you service the Manufacturing System, you should perform the following inspection. Verify that:

- There are shields installed over all terminal blocks on power supplies and capacitors.
- The **Manip Stop** pushbuttons on both the Servo Power Module operator panel and on the end of the pendant cable will drop manipulator power when pressed.
- The **On/Off** switch located on the Servo Power Module operator panel will drop all power to the Servo Power Module and manipulator.
- The **Power** indicator located on the Servo Power Module is lit when there is power applied to the Servo Power Module.
- The **On/Off** button located on the front of the 7537 Industrial Computer will drop all power to the 7537.
- The **Power** indicator located on the front of the 7537 Industrial Computer is lit when there is power applied to the 7537.
- All primary power cord grounds are properly attached and labeled.
- Line voltage warning labels are located inside the 7537 and inside the Servo Power Module.
- **No external power sources are connected to the power supply of either the 7537 or the Servo Power Module.**

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## Preface

This manual provides Installation Information, Operator's Guide and Diagnostic Information for the IBM 7537 Motion Controller and optionally, other compatible equipment provided by non-IBM vendors.

This book is based on the contents of previous IBM Manufacturing Systems Hardware Library books, *Maintenance Information Manual* and *Site Preparation, Installation, Specifications and Operator's Guide*. Thus, many of the references are made to previous IBM manipulators and Servo Power Modules (SPMs) which are no longer available, but the information content is applicable to most of the systems currently supported by IBM. If your system does not contain all IBM components, you must refer to the documentation provided with your non-IBM components.

In general, this manual can be used to help diagnose the source of failures and to repair problems on those manufacturing systems. Readers are expected to be trained on the operation and maintenance of the manufacturing systems, and they must know how to use the Triplett Model 310 Multimeter<sup>1</sup> (or equivalent).

The subject matter in this manual is divided into the following chapters and appendices:

- **Chapter 1, "Locations,"** provides the location of components on the manufacturing system.
- **Chapter 2, "Specifications,"** contains physical dimensions and specifications of the system unit, other specifications of adapter cards, and system software.
- **Chapter 3, "Theory of Operation,"** explains the operational theory for the manufacturing system.
- **Chapter 4, "Installation,"** discusses electrical noise, electromagnetic interference, safety devices, and motion controller setup.
- **Chapter 5, "Operator's Guide,"** contains instructions for basic operation of the manufacturing system controls and indicators.
- **Chapter 6, "Checks and Adjustments,"** contains the information needed to check and adjust components of the manufacturing system.
- **Chapter 7, "Diagnostic Testing,"** describes how to run the diagnostics that help you to determine the cause of problems.
- **Chapter 8, "Symptom/Fix,"** provides step-by-step instructions that lead you to the failing component.
- **Chapter 9, "Wiring Diagrams,"** contains wiring diagrams for the manufacturing system.
- **Appendix A, "Glossary,"** gives the definitions of some of the special terms used in the manual.
- **Appendix B, "Checking DI/DO Points With the Pendant,"** explains how to use the pendant to display and set DI/DO points.

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<sup>1</sup> Manufactured by the Triplett Corporation, Bluffton, Ohio 45817

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- **Appendix C, "Useful AML/2 Information,"** briefly describes the AML/2 Configuration Utility and the two files APPLNAME.AML and HWDEF.CFG.
  - **Appendix D, "Local RS-232-C Cable Wiring,"** describes the connections for the cable that allows the attachment of a host computer, roll-up tool, or other RS-232-C data line to the controller (7537 Industrial Computer) via the 4-Port RS-232 Asynchronous Adapter.
  - **Appendix E, "DI/DO,"** gives some technical information on the basic operation of optically isolated Digital I/O.

**Note:** The keybutton functions and procedures described in this publication assume that the standard AML/2 Manufacturing Control System<sup>2</sup> software is being used. This software can, however, be modified. If your software has been modified, the keybutton functions described herein might not work the same way.

## Ordering This Publication

When ordering copies of this publication, you should request Publication Number S92F-2340-00

## Related Publications

Related publications are:

- *IBM 7537 Industrial Computer - Quick Reference*, Publication Number S04G-1875-00
- *IBM 7537 Industrial Computer - Hardware Maintenance Reference*, Publication Number S04G-1880-00
- *IBM 7537 Industrial Computer - Hardware Maintenance Service*, Publication Number S04G-1885-00
- *IBM Manufacturing Systems Software Library AML/2 Manufacturing Control System User's Guide*, Publication Number S91F-7802-00
- *IBM Manufacturing Systems Software Library AML/2 Language Reference*, Publication Number S91F-7816-00
- *IBM Manufacturing Systems Software Library AML/2 Application Development Environment User's Guide*, Publication Number S91F-7822-00

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<sup>2</sup> AML/2 is a trademark of International Business Machines Corporation.

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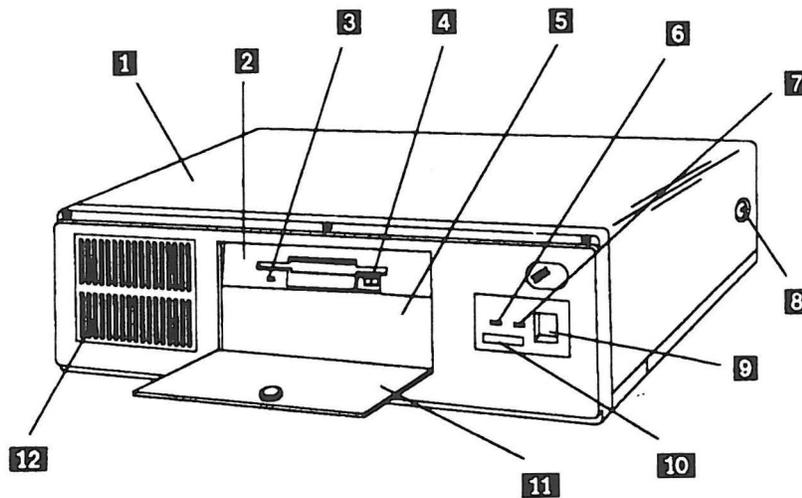
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## 7537 Industrial Computer

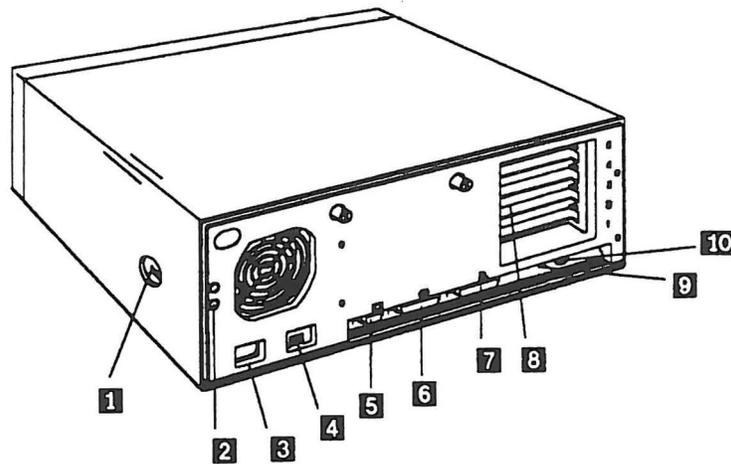
### 7537 Front View

1. System Unit
2. Upper-Left Drive Location
3. Diskette Drive In-Use Light
4. Diskette Eject Button
5. Middle-left Drive Location
6. Fixed Disk Drive In-Use Light
7. Power-Good Light
8. Cover Lock
9. Power Switch
10. Serial Number
11. Diskette Drive Door
12. Filter



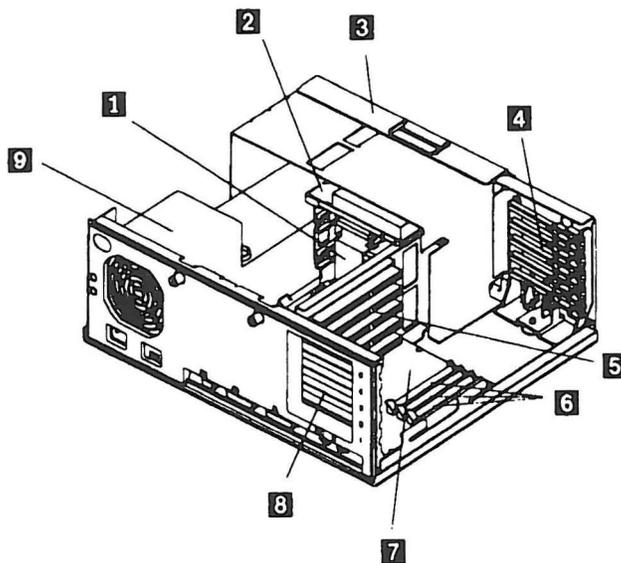
## 7537 Rear View

1. Cover Lock
2. U-Bolt Opening
3. Power Cord Connector
4. AC Voltage-Selector Switch
5. Display Connector
6. 25-Pin Serial Connector
7. 25-Pin Parallel Connector
8. Expansion Slots
9. Keyboard Connector
10. Pointing-Device Connector



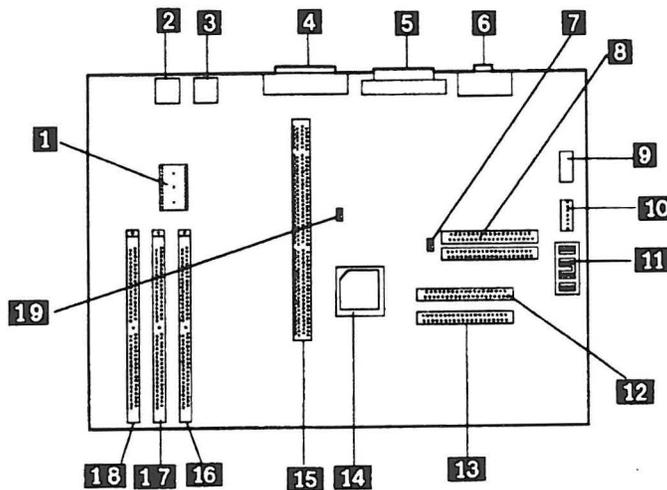
## 7537 Internal View

1. Fixed Disk Drive
2. Diskette Drive
3. Retainer Plate
4. Front Adapter Support Guide
5. Bus Adapter and Support Bracket
6. Memory Module Connectors
7. System Board
8. Expansion Slots
9. Power Supply



## 7537 System Board

1. Real-Time Clock Module Socket
2. Pointing Device Connector
3. Keyboard Connector
4. Parallel Port
5. Serial Port
6. Display Connector
7. Password-override Jumper (J14)
8. Video Memory 1 & 2
9. Control Panel Connector
10. Power-Supply Connector (P2)
11. Power-Supply Connector (P1)
12. Diskette Drive Connector
13. Fixed-Disk Drive Connector
14. Math Coprocessor Socket
15. Bus-Adapter Connector
16. Memory-Module Connector 1
17. Memory-Module Connector 2
18. Memory-Module Connector 3
19. Parallel Port IRQ Level Jumper (J10)



## 7537 Feature Cards

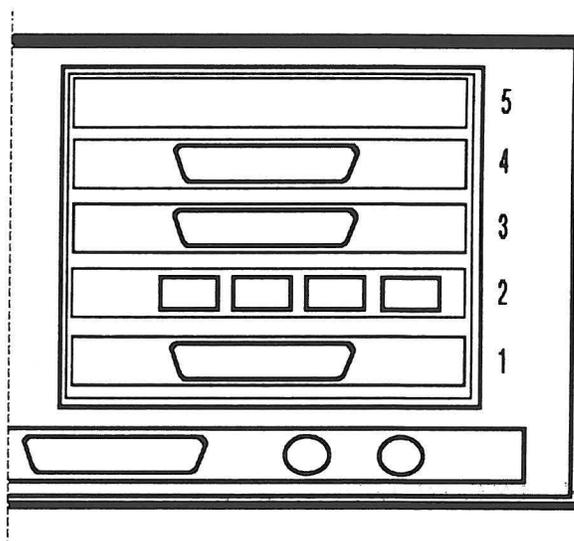
Expansion Slot

DI/DO Adapter #1 \*\*

Axis Control Adapter #2

4-Port Adapter #1

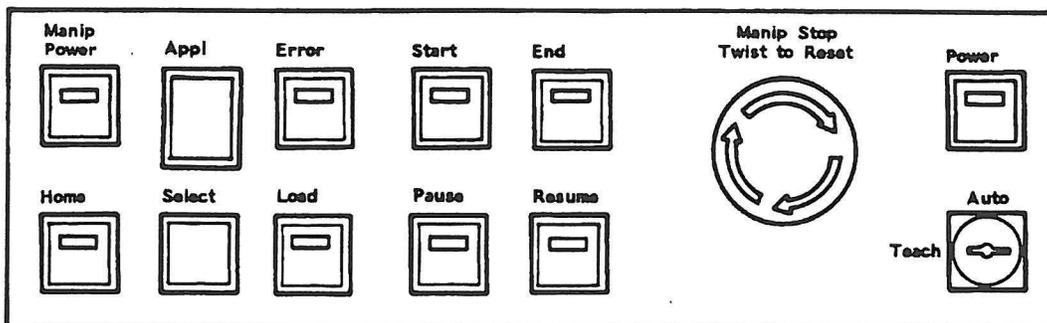
Axis Control Adapter #1



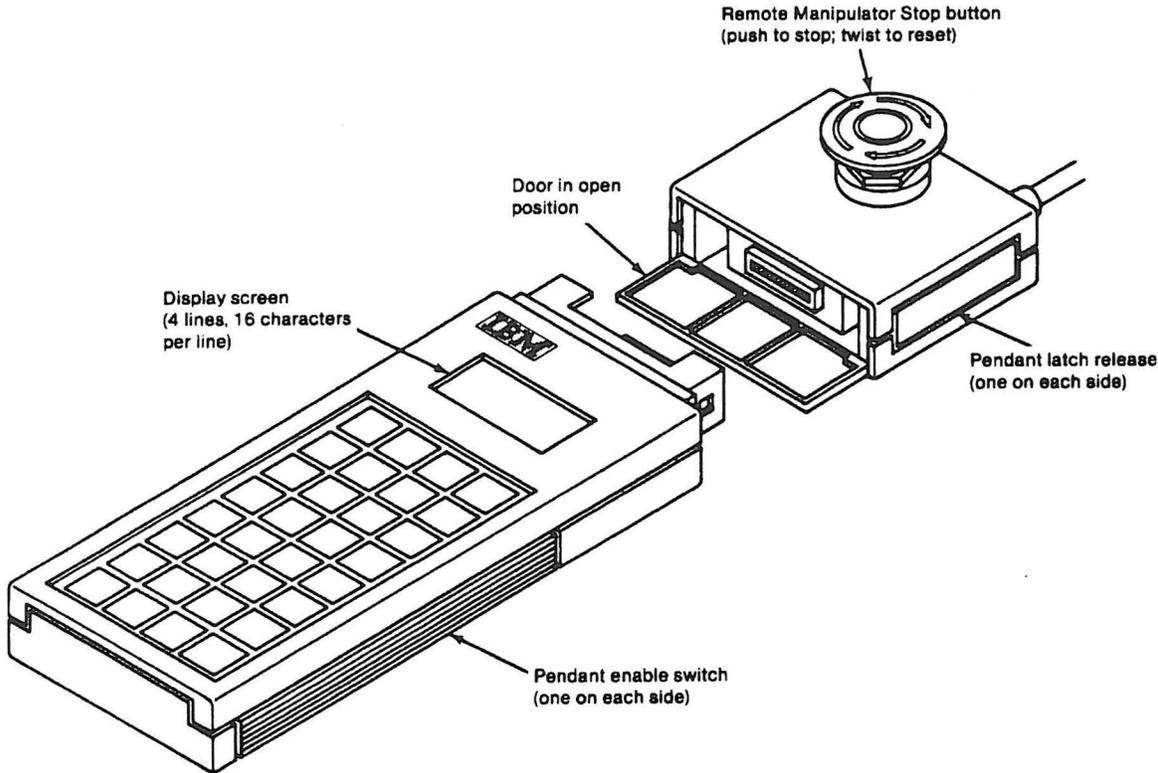
\*\* Note: Your DI/DO Adapter may have a different connector than shown

Servo Power Module Control Panel

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Remote Manipulator Stop Switch and Pendant



### Pendant Keybutton Overlay (Standard)

