Chapter 4. Installation Instructions

Contents

Installation Instructions

This chapter describes the procedures for the installation and setup of a manufacturing system. Particular emphasis is given to the discussion dealing with the preparation, installation, and setup of the manufacturing system's controller, a special configuration of the IBM 7537 Industrial Computer.

During the initial installation of a manufacturing system, the procedures in this chapter should be performed in the order in which they appear; however, individual procedures may also be used for reference when features are added or replaced.

The mounting platform or table on which the manipulator is to be installed must be drilled and the mounting holes tapped as described by the manipulator manufacturer. Also, the user-supplied 19-inch rack into which the Servo Power Module and the 7537 Industrial Computer are to be installed must be of adequate size and prepared.

CAUTION:

1. **Before starting any procedure in this section, ensure that the 7537 power button is off and that the power cable is removed.**
2. **Observe cable routing and other precautionary measures to avoid damage to cables, connectors, and other components.**
3. **While removing or replacing components on the 7537 adapters or the system board, maintain contact with frame ground. (This is necessary because components could otherwise be damaged by static discharge.)**

Site Requirements

Electrical Noise

Assure that the electrical power source (branch circuit) that you intend to use for your manufacturing system does not exhibit excessive electrical noise. Some common sources of electrical noise are:

- Air conditioning units
- Electric welders
- Electric furnaces
- Elevators
- Electrostatic copiers
- Any large, brush-type motor

If high noise levels cannot be avoided, it may be necessary to install an RF filter or an isolation transformer or both. In either case, the filter and transformer must be capable of withstanding an in-rush current 11 times the rated system load while maintaining voltage within ±5% of nominal.

Electromagnetic Interference

Avoid placing the system near sources of radiated or conducted electromagnetic energy. Such areas may exist near:

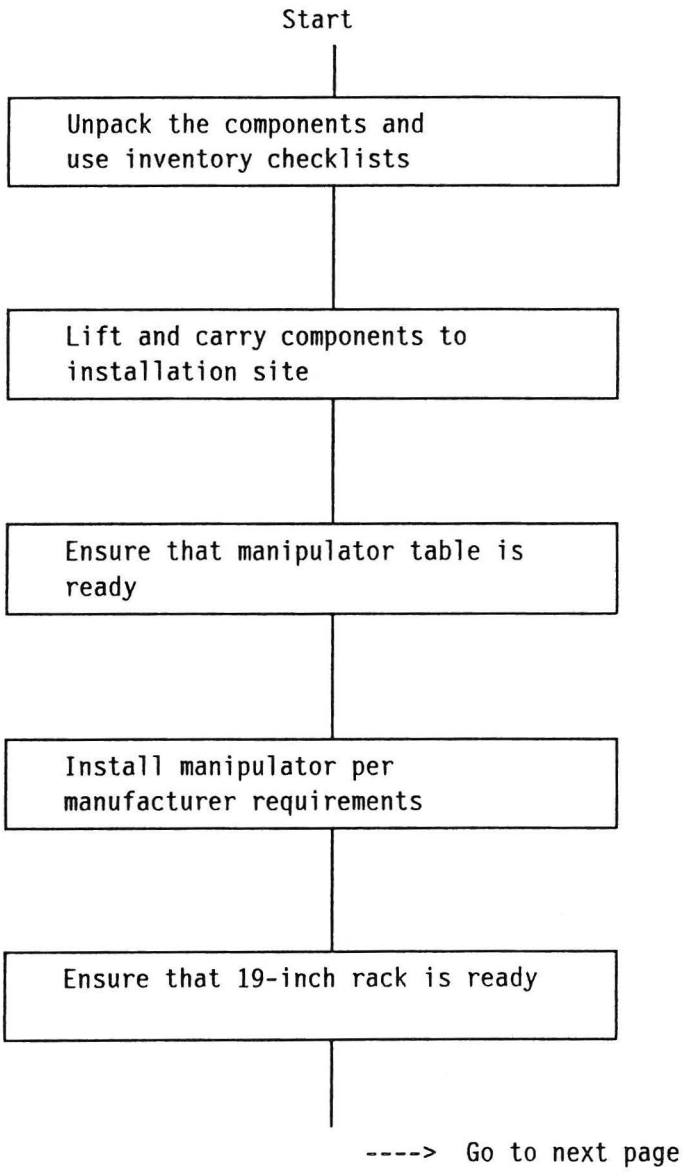
- Radio-transmitting antennas
- Radar
- RF induction welders, RF arc welders, and insulation testers
- Time clocks
- High-energy power lines

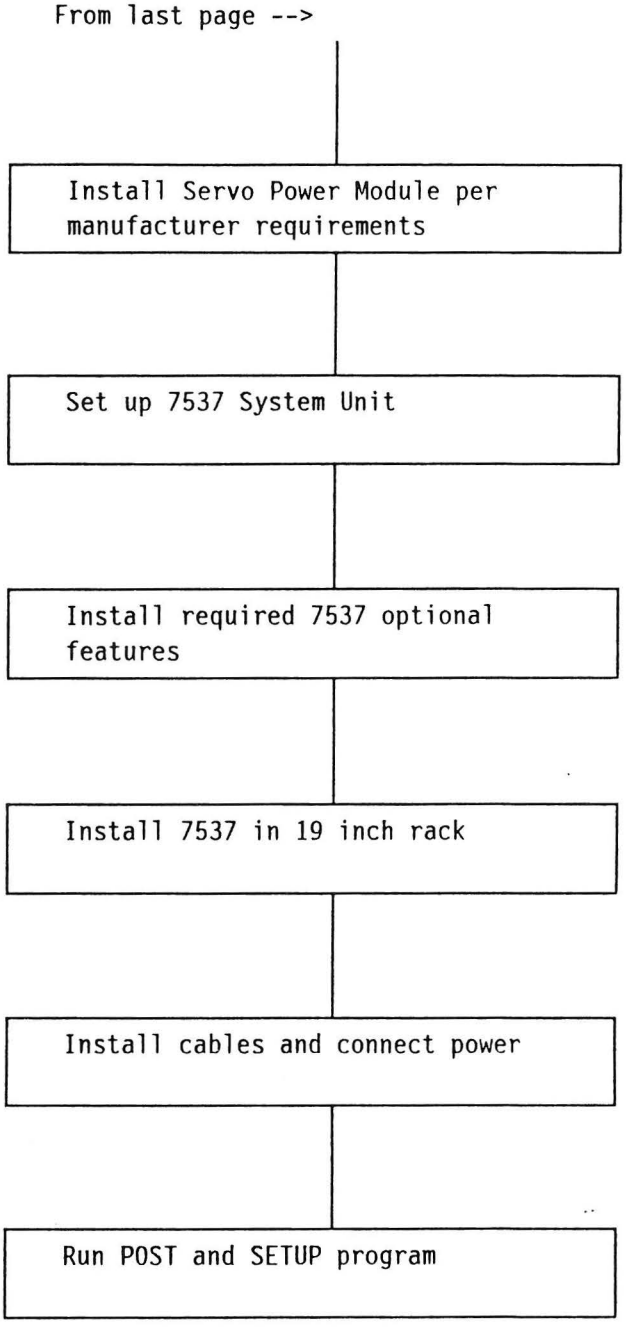
Installation Guide

The installation of your manufacturing system can be facilitated by the advance preparation discussed in this manual. You should prepare the following in advance:

- Manipulator mounting table
- 19-inch rack (including rack-mounting hardware, electrical service, and EPO switch)
- Safety devices and related cabling
- Input and output devices

The following flowchart can be used to guide you through the installation of your manufacturing system:




From last page -->
Install Servo Power Module per manufacturer requirements
Set up 7537 System Unit
Install required 7537 optional features
Install 7537 in 19 inch rack
Install cables and connect power
Run POST and SETUP program

Unpacking the Components

For each manufacturing system, you will need the following packages:

- A crate containing the manipulator
- A box containing the Servo Power Module
- A box containing the 7537 Industrial Computer
- A box containing the 7537 Features that you ordered
- An Intel 80387SX 20MHz Math Coprocessor

7537 System Unit Setup

This section explains how to set up a new 7537 Industrial Computer / Motion Controller for installation. This section also points the reader to the appropriate pages in the this book for instructions on how to install supported internal features in the 7537 system unit.

Your particular installation may not contain the standard set of cards outlined in this procedure. At least two Axis Control Adapters are required in a 7537 Motion Controller. The remaining three slots may be filled with different mixtures of communications, DI/DO, or other third-party adapters.

If you are in the process of upgrading from an IBM 7532-310 Motion Controller, please use the following procedures along with the guidelines given in "Upgrading from an IBM 7532-310 Motion Controller" on page 4-22.

CAUTION:

1. **Only the adapters listed in the "Specifications" section of this manual are formally supported by IBM when installed in the 7537 Motion Controller.**
2. **Before starting any installation procedure, ensure that all power switches are off and power is removed from the power junction box.**
3. **Observe cable routing to avoid damage to cables or connectors.**
4. **While removing or replacing components on the 7537 adapters or the system board, maintain contact with frame ground. (This is necessary because components could otherwise be damaged by static discharge.)**

To appropriately configure your IBM 7537 Industrial Computer as a Motion Controller, you should follow the procedures below in the order given. If your particular installation does not use one or more of the adapters specified, skip that procedure.

7537 Standard Feature Installation Procedures

1. Unpack the system unit and ship group, if not already done. Open the packing box and use the unpacking diagram found inside.
2. Find and use the "Inventory Checklist" to verify that all items listed have been received in good condition.
3. On the rear of the system unit, find the 230V/115V selection switch and, using a ballpoint pen, set it to the correct voltage for your application.
4. Remove the top cover, using "Top Cover Removal/Replace" on page 4-10.
5. Set the system unit jumpers, using "System Unit Jumpers" on page 4-11.
6. Install the Math Coprocessor, using "Math Coprocessor" on page 4-12.
7. Install the Axis Control Adapters, using "Axis Control Adapters" on page 4-14.
8. Install the 4-Port Adapter(s), using "4-Port Adapters" on page 4-16.
9. Install the DI/DO Adapter(s), using "DI/DO Adapters" on page 4-17.

7537 Optional Feature Installation Procedures

If your installation has any of the following features, install them with the referenced procedures.

10. "Multiport Model 1" on page 4-18
11. "Serial Parallel Adapter" on page 4-20
12. "Internal Drives" on page 4-21

After Completing Features Installation

13. Replace the top cover, using "Top Cover Removal/Replace" on page 4-10.
14. Proceed to "Installing the 7537 Industrial Computer" on page 4-23.

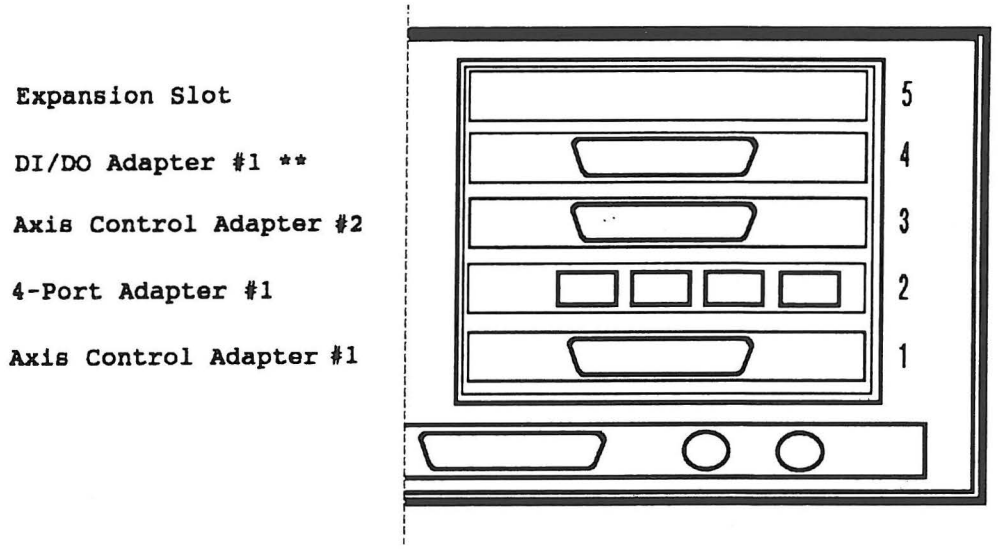
Standard Card Plugging, Switch Settings, and Jumpers Summary

Your 7537 typically will contain four standard feature cards. These feature cards should have the card plugging assignments, switch settings, and jumpers as indicated in the chart below and as shown in the figures that follow. While these exact card slot and feature address assignments are not required for proper operation, it is recommended that the cards are set as recommended by IBM, in order to avoid confusion at a later time.

Card slot	Feature	Address switch settings and jumpers
1	Axis Control Card 1 - Version 1	Switchpack 2: switch 4 on. Jumpers: switch 3 - pins 1-2; switch 8 - pins 1-2; switch 11 - pins 1-2.
	Axis Control Card 1 - Version 2	Switchpack 1: switch 4 on. Jumpers: JP8 on.
2	4-Port RS-232 Asynchronous Communications Adapter	Switchpack 1: switch 2 on. Switchpack 2: switch 1 on.
3	Axis Control Card 2 - Version 1	Switchpack 2: switches 2 & 4 on. Jumpers: switch 3 - none; switch 8 - pins 1-2; switch 11 - pins 1-2.
	Axis Control Card 2 - Version 2	Switchpack 1: switches 2 & 4 on. Jumpers: No jumpers on.
4	DI/DO Card	Switchpack 1: switch 1 on.
* All switches and jumpers not specified as being on must be off.		

Note: The two Axis Control Cards are integral parts of the manufacturing systems. Their card connectors are intended solely for attaching the Servo Power Module cables; they are not to be used for any other interface. Only Version 2 cards are now available.

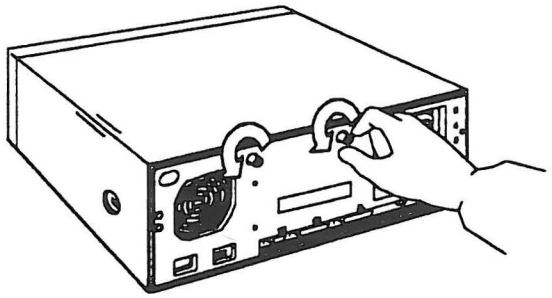
Card Plugging Slot Assignments



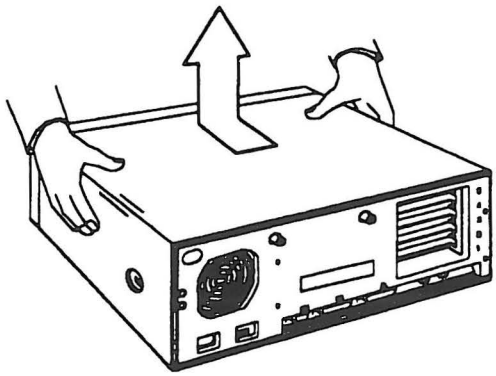
** Note: Your DI/DO Adapter may have a different connector than shown

Top Cover Removal/Replace

1. Turn off the computer (system unit and all attached options).
2. Unplug the computer power cord from the electrical outlet.
3. Check that the cover lock (on the side of the system unit) is unlocked.
4. Loosen the cover screws. If they are too tight, use a coin.



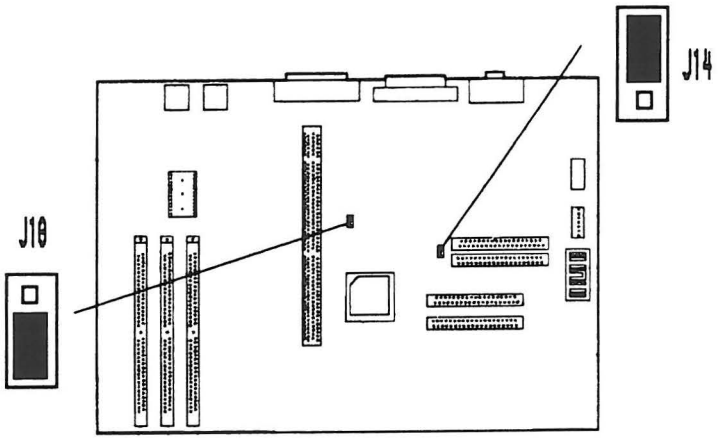
5. Remove the cover by sliding it forward approximately 50 millimeters (2 inches) and lifting it.



6. Replace the cover by reversing the above steps.

System Unit Jumpers

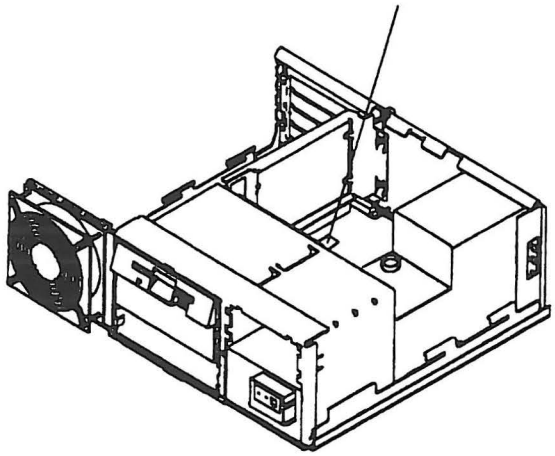
1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Set the password override jumper (J14) to disable password protection as shown the figure below.
4. Set the printer IRQ jumper (J10) to IRQ 5 as shown in the figure below.



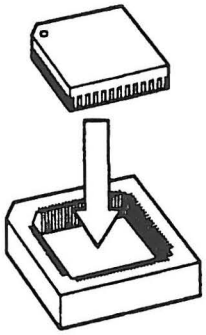
Math Coprocessor

Warning: Incorrect placement of the math coprocessor can damage the system board or the math coprocesscr.

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Locate the math coprocessor socket on the system board.

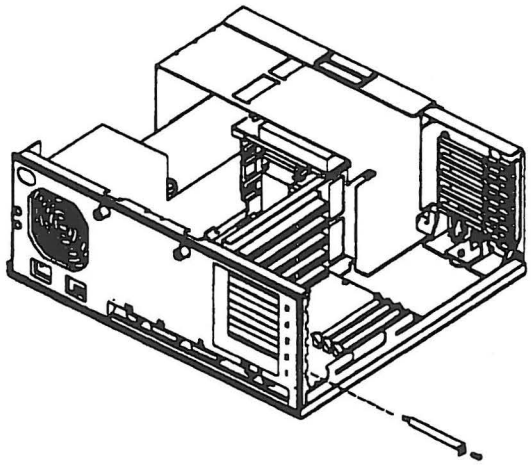


4. Find the recessed dot on the math coprocessor. (Some math coprocessors have one slightly beveled corner.) Hold the math coprocessor with the recessed dot or the beveled corner over the socket such that the they are nearest to the large "PIN1" printed next to the socket.
5. Carefully align the pins of the math coprocessor with the socket and firmly press it into place.

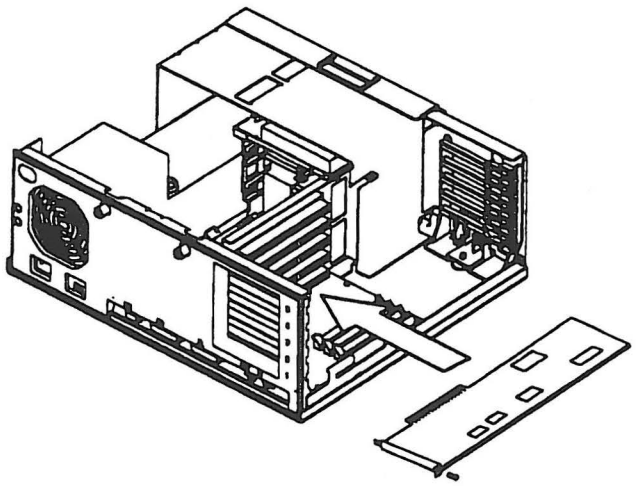


Standard Card Installation Procedure

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. If the adapter has switches or jumpers, insure they are set appropriately. IBM adapters that may be used in the 7537 Motion Controller have the switch settings documented in this section.
4. Remove the screw and expansion slot cover of the slot that is assigned to this adapter. Save the screw.



5. Hold the adapter by the edges, with the components facing upward, as shown. Alight the adapter with the adapter guide on one end and the expansion slot guide on the other end, and slide it into the expansion slot.



6. Push the adapter firmly into the connector. To secure the adapter, replace the screw you removed in step 4.

Axis Control Adapters

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Set the adapter switches according the table below.

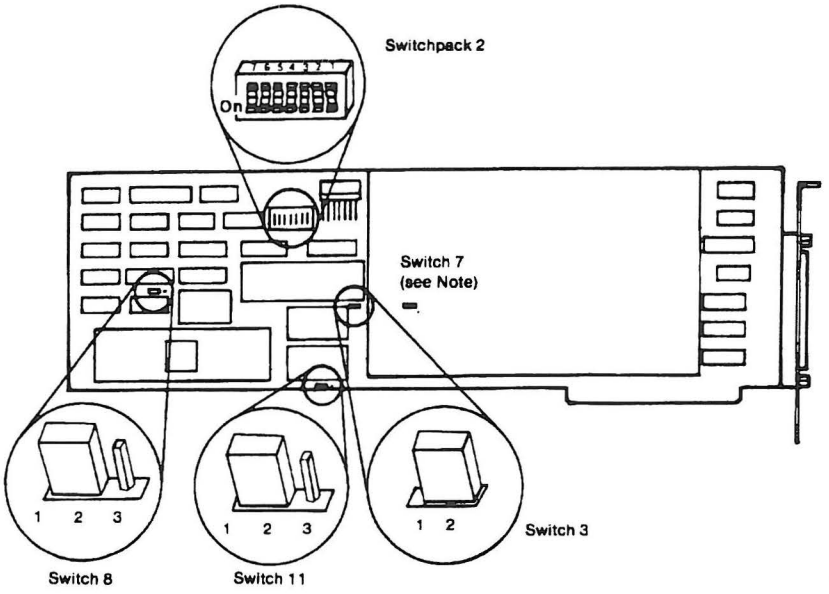
   Note: Cards 1 and 2 are standard and card 3 is optional.

	Card 1	Card 2	Card 3
Installation Slot	1	3	5
Version 1 Adapter Switchpack 2			
Switch 2	off	on	off
Switch 3	off	off	on
Switch 4	on	on	on
Jumper 3	on	off	off
Jumper 8	1-2	1-2	1-2
Jumper 11	1-2	1-2	1-2
Version 2 Adapter Switchpack 1			
Switch 2	off	on	off
Switch 3	off	off	on
Switch 4	on	on	on
Jumper 8	on	off	off

4. Install the adapter using "Standard Card Installation Procedure" on page 4-13 and the above table.

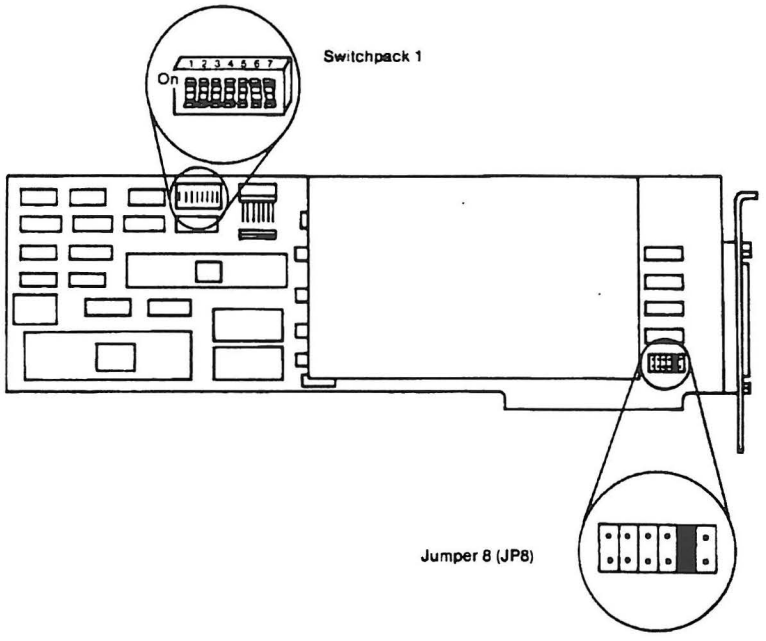
Axis Control Card

Version 1



Note: Some cards use a soldered wire on switch 7 instead of a jumper on switch 3. Switch 7 is also located on the mother card, but it is under the daughter card. (A card may contain either a jumper on switch 3 or a soldered wire on switch 7, but not both.)

Version 2



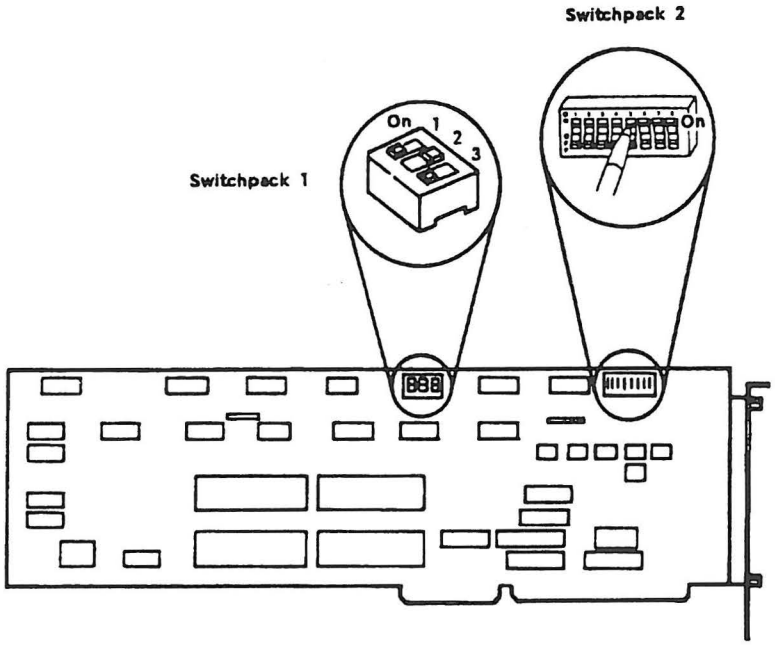
4-Port Adapters

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Set the adapter switches according the table below.

   Note: Card 1 is standard and card 2 is optional.

	Card 1	Card 2
Installation Slot	2	5
Switchpack 1 Switch 2	on	on
Switchpack 2 Switch 1 Switch 2	on off	off on

4. Install the adapter using "Standard Card Installation Procedure" on page 4-13 and the above table.



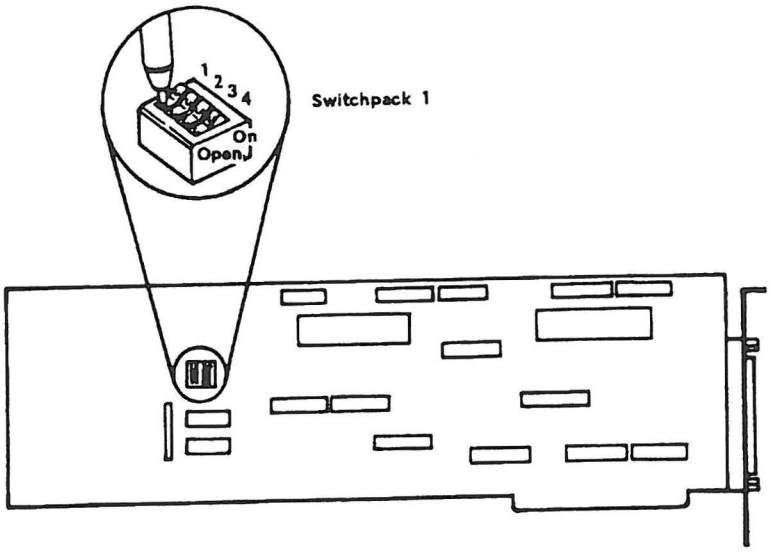
DI/DO Adapters

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Set the adapter switches according the table below.

   Note: Card 1 is standard and cards 2 and 3 are optional.

	Card 1	Card 2	Card 3
Installation Slot	4	5	2
Switchpack 1			
Switch 1	on	off	off
Switch 2	off	on	off
Switch 3	off	off	on
Switch 4	off	off	off

4. Install the adapter using "Standard Card Installation Procedure" on page 4-13 and the above table.

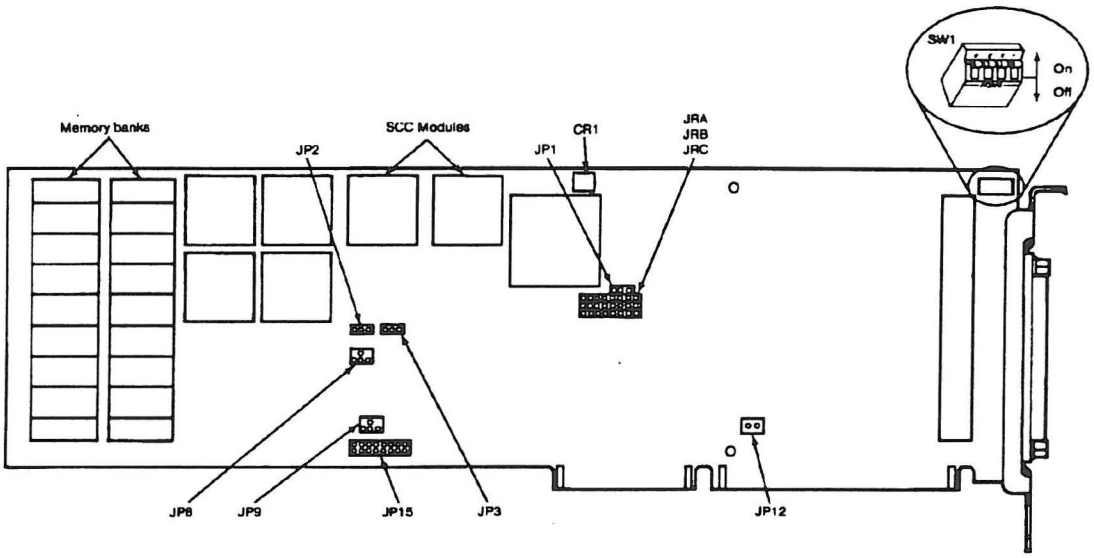


Multiport Model 1

Note: The Multiport adapter is provided with 128 Kb of memory installed on it. You have the option of changing the memory modules to supply the card with a total of 512Kb of memory with a separate option kit.

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. If you have ordered the optional 512Kb of memory, remove the 18 memory modules on the adapter and replace them with the modules provided in the memory expansion kit. Take careful note of the correct orientation of the module (the notch in the chip is to be inserted at the end of the socket with the "1" marking on the board).
4. Set the switches and jumpers on the card in accordance with the adapter number (card 1 or card 2) and the amount of memory you have installed on it (128Kb or 512Kb). Refer to the switch and jumper setting chart on the next page for proper settings for the adapter card to work with the communications software provided with AML/2.
5. If you have ordered an optional Electronic Interface Board (EIB) for your Multiport, install the supplied SCC modules and EIB according to the instructions provided with the optional hardware.
6. Install the adapter using "Standard Card Installation Procedure" on page 4-13 into slot 5 for card 1 and either slot 2 or 4 for card 2.

Multiport Communications Adapter Switch/Jumper Settings

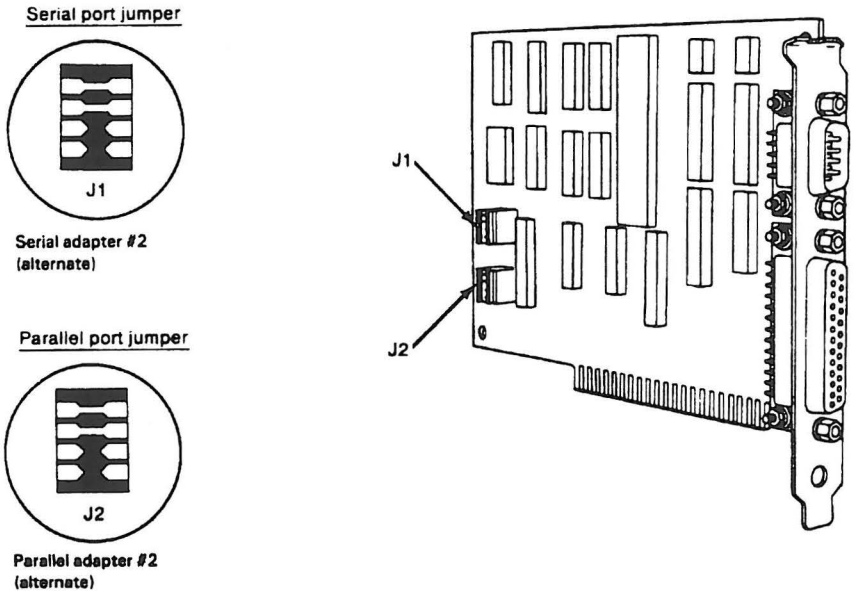


	MEMORY INSTALLED	Card 1	Card 2
SW1		On Off	On Off
JP1			
JRA JRB JRC	128 KB		
	512 KB		
JP2 JP3			
JP8 JP9			
JP12			
JP15			

Serial Parallel Adapter

1. Turn the computer off.
2. If the top cover has not been removed, do so using "Top Cover Removal/Replace" on page 4-10.
3. Set the adapter jumper modules according the figure below.

Modules J1 and J2



4. Install the adapter using "Standard Card Installation Procedure" on page 4-13 into slot 5.

Internal Drives

The IBM 7537 Motion Controller supports a maximum of two removable media drives, such as any combination of the following list of diskette drives:

- 1.2 Mb
- 1.44 Mb
- 2.88 Mb

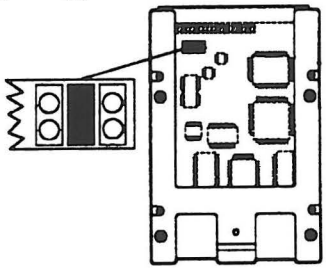
The IBM 7537 Motion Controller also supports one internal fixed disk drive, either one of the two following fixed disk drives:

- 40 Mb
- 80 Mb

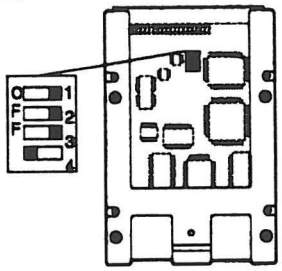
To install any of the features into your 7537 Motion Controller, please follow the instructions in the "Internal Drive Installation" section in Chapter 2 of the *IBM 7537 Industrial Computer - Quick Reference*, Publication Number S04G-1875-00.

When installing a fixed disk drive, insure that jumper setting on the drive matches the following figure:

Jumper-Type Drives



Switch-Type Drives



Upgrading from an IBM 7532-310 Motion Controller

If you currently have an IBM 7532-310 Manufacturing System Controller and wish to upgrade it to use the IBM 7537 Motion Controller, you may do so with the following guidelines.

The following IBM adapters used in the 7532-310 may be used in the 7537 Industrial Computer / Motion Controller.

- IBM Axis Control Adapter
- IBM 4-Port Adapter
- IBM 48 Point DI/DO Adapter
- IBM Serial Parallel Adapter
- IBM Multiport Model 1 Adapter
- IBM Combination Adapter II without 128KB memory expansion

The following IBM adapters used in the 7532-310 CANNOT be used in the 7537 Industrial Computer / Motion Controller.

- IBM Color Graphics Adapter
- IBM Combination Adapter II 128KB memory expansion
- IBM Disk/Diskette Adapter
- IBM AT Memory Expansion Adapters

When IBM Axis Control Adapters shipped with the 7532-310 are used in an IBM 7537 Motion Controller, the pendant must remain attached to the system unit via the port 1 of the first 4-Port adapter.

The Axis Control Adapters shipped as a feature of the IBM 7537 only support the pendant by attachment to the system unit serial port. This feature allows the user to replace the 4-Port adapter with a different type of communications or DI/DO adapter when using the updated IBM Axis Control Adapter.

Installing the 7537 Industrial Computer

Install your 7537 Industrial Computer / Motion Controller into the 19 inch rack by following the "Rack Mount Installation" instructions in Chapter 2 of the *IBM 7537 Industrial Computer - Quick Reference*, Publication Number S04G-1875-00.

Cabling the Manufacturing System

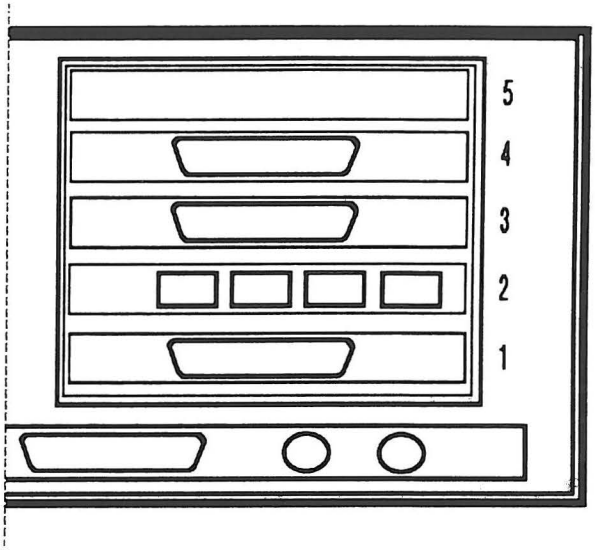
After all components of the manufacturing system are properly mounted, use the following procedure to connect any cables that were not already connected in a previous procedure. Be careful to route each cable so that it will not be pinched or scraped, especially when the 7537 is moved on its sliding mounts.

CAUTION:
Ensure that all power switches are switched off and that power is removed from the power junction box.

While connecting cables, use the following two figures for reference.

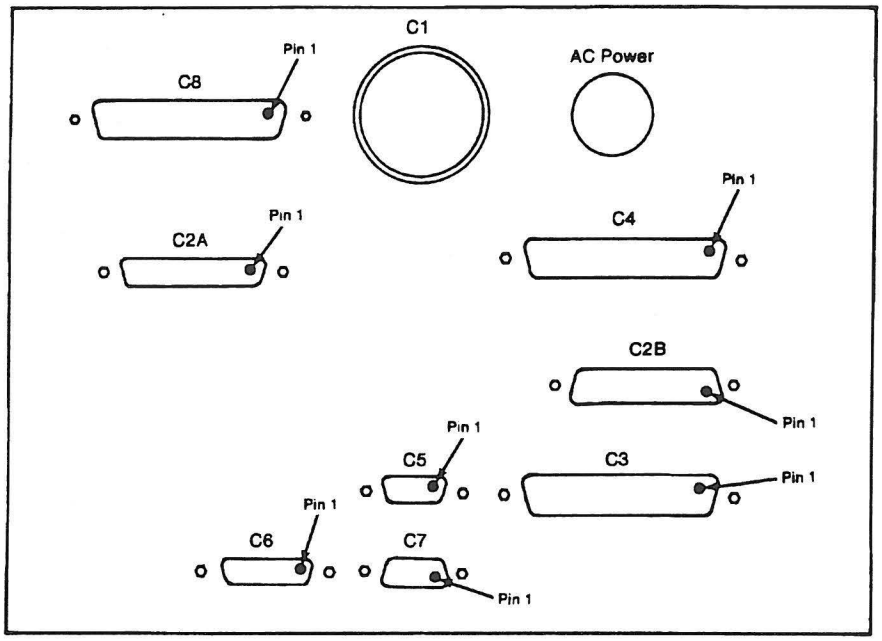
7537 Circuit Card Cable Connectors

Expansion Slot	
DI/DO Adapter #1 **	4
Axis Control Adapter #2	3
4-Port Adapter #1	2
Axis Control Adapter #1	1



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

Servo Power Module Cable Connectors

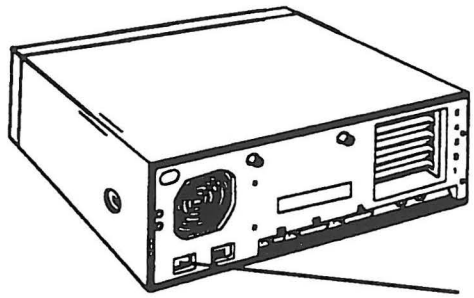


Cabling chart

C1 Manipulator
C2A Manipulator
C2B Manipulator
C3 Axis Control Card 1 (card slot 1)
C4 Axis Control Card 2 (card slot 3)
C5 External safety circuit
C6 Remote "Stop" switch/Pendant
C7 Pendant Serial Port (System Unit Serial Port or 4-Port, Port 1)
C8 Remote Operator Panel

To connect the cables:

1. Locate the power cord connector on the rear of the 7537 system unit.



2. Connect the system unit's power cord to the rear of the system unit.

   CAUTION:
   The 7537 is equipped with a line cord and plug assembly designed for safety. That assembly must be used with a properly grounded power receptacle to avoid possible electrical shock.

3. Connect the three cables between the manipulator and the Servo Power Module (C1, C2A, and C2B). These cables have different connectors from each other, so they cannot be connected incorrectly.

4. Using the press-on labels that were supplied with the cables, label the card connectors on the 7537 as follows:

Card Slot	Feature	Label
1	Axis Control Card 1	1
2	4-Port RS-232 Asynchronous Communications Adapter	None
3	Axis Control Card 2	2
4	48-Point DI/DO Card	A
5	Blank (optional feature)	None

Note: The 7537 typical feature cards that are used in a manufacturing system are located according to the card slot assignments shown above. While these card slot assignments are not required for proper operation, it is recommended that the cards remain in those slots, in order to avoid confusion at a later time.

5. Use the following procedure to connect the two Axis Control Card cables between the 7537 and the Servo Power Module (C3 and C4).

   Note: These two cables have similar connectors, so you must be careful to connect them correctly.

   a. Using the labels supplied with the cables, mark one cable with a "1" at each end.

   b. Using the labels supplied with the cables, mark the other cable with a "2" at each end.

   c. Connect the cable that you labeled with 1's between connector C3 on the Servo Power Module and Axis Control Card 1, which you labeled "1." (If your 7537 has the standard card plugging assignments, Axis Control Card 1 is in card slot 1.)

   d. Connect the cable that you labeled with 2's between connector C4 on the Servo Power Module and Axis Control Card 2, which you labeled "2." (If your 7537 has the standard card plugging assignments, Axis Control Card 2 is in card slot 3.)

6. Use the following procedure to connect the DI/DO cables between the user-supplied I/O boards and the DI/DO card(s) in the 7537.

   Note: Two of these cables have similar connectors, so you must be careful to connect them correctly.

   a. Using the labels supplied with the cables, label the DI/DO connector with an "A".

   b. Using the labels supplied with the cables, label the 24-pin card edge connector marked with "1 – 24" with an "A".

   c. Using the labels supplied with the cables, label the 24-pin card edge connector marked with "25 – 48" with an "AA".

   d. Connect the DI/DO connector that you labeled with an "A" to the DI/DO Card. (If your 7537 has the standard card plugging assignments, the DI/DO Card is in card slot 4.)

   e. Connect the 24-pin card edge connector that you labeled with an "A" to the user-supplied optical isolation I/O board that has been designated for pins 1 – 24. Also label that I/O board with an "A".

   f. Connect the 24-pin card edge connector that you labeled with an "AA" to the user-supplied optical isolation I/O board that has been designated for pins 25 – 48. Also label that I/O board with an "AA".

   If optional DI/DO cards are installed in the 7537, repeat this procedure for labelling and installing the respective DI/DO cables, using "B" and "C" (instead of "A") for the successive cards.

7. Connect the pendant communications cable between the Servo Power Module (C7) and the system unit serial port of the 7537.

   Note: If you are upgrading from a 7532-310, then you must continue to use port 1 of the first 4-port adapter for the pendant.

8. Connect the cable from the remote Stop switch to the Servo Power Module (C6).

   Note: This cable must be connected for initial system setup. However, if the cable is to be removed, a jumper must be installed to connect pins 11 and 12 on C6.

9. Connect the pendant to the remote Stop switch.

10. Using the connector supplied with your Servo Power Module, connect the customer safety circuit cable (described in the "Theory of Operation" section of this manual) to the Servo Power Module (C5).

    Note: If an external safety circuit is not to be connected to C5, a jumper must be installed to connect pins 1 and 2.

CAUTION:
Before proceeding, again ensure that all power switches are off and that power is removed from the power junction box.

Also ensure that the voltage selection switch (230V/115V) on 7537 system unit is correctly set for the voltage to be supplied. If any other devices also have a voltage selection switch, ensure that they are also correctly set.

11. Connect the AC power cable from the system unit of the 7537 computer.
12. Connect AC power to any optional 7537 features that require their own power source.
13. Connect the AC power cable from the Servo Power Module per the manufacturers specifications.

Running the 7537 Power-On Self-Test (POST) and Setup Program

Before switching the power on, ensure the following:

- All mounting screws are tightened.
- All cables and connectors are properly connected.
- All power cords are plugged in the power distribution panel.
- The system unit, when extended out from the rack, does not bind, chip, or jam with the other installed devices.

Explanation of the Power-On Self-Test (POST)

The IBM 7537 Industrial Computer automatically runs a Power-On Self-Test (POST) every time the power is switched On or the Reset button is pressed. The Power-On Self-Test checks out the base 7537 system and memory. It takes between 13 and 90 seconds to run, depending on the amount of memory installed in the system.

Explanation of the Setup Program

Before the system unit can be used for the first time, or after the battery has been replaced, you must tell the system what options are installed.

Many of the options are sensed by the system unit when you set the Power switch to On; however, it still must be told the date and time. Then it must verify the diskette drive types and memory size.

You should have written the answers to the questions this program will ask on the "Option List."

Installation Setup Procedure

This Setup procedure requires the use of a pendant connected to the remote Stop switch.

1. Get the "Diagnostics" diskette located in the back of this manual.

   Note: Be sure to return the diskette when you have finished using it.

2. Open the drive door and insert the "Diagnostics" diskette into diskette drive A. (If you have two diskette drives, drive A is the one on the top.)

3. Power up the Servo Power Module and look for the POWER indicator to light. If that indicator appears dim or fails to light, refer to manual that came with that system.

4. Power up the 7537 and look for the POWER indicator to light. If that indicator appears dim or fails to light, refer to "Symptom Fix" section of this manual.

5. The system automatically runs its Power-On Self-Test (POST).

   - If no errors are detected by the POST, the system diagnostics automatically load and start.
   - If an error is detected by the POST, the ERROR indicator on the Servo Power Module lights and the error is displayed on the pendant. After noting each error, you should reset the error indication by holding in the Pendant Enable switch (located on each side of the pendant) and pressing the Recall Error button (located on the bottom right side of the pendant keybuttons). Errors 16X (X = any number) should be expected and ignored until later.

   After one of the above occurs, the following is displayed on the pendant for a few seconds:

```
Diagnostics
System
Test
    Version x.xx
```

6. After a few seconds, a second screen will appear.

```
Select Option
 A: SETUP
 B: DIAGNOSTICS
 C: POST DATA
```

7. Press "A" to start the 0160 test.

   Diagnostic test 0160 presents a series of prompts to configure the system. You must answer all questions prompted by the pendant. Each pendant button that is a possible response will be enabled, and its LED will be lighted. Buttons without a lighted LED are disabled and will not perform any function.

   Note: Remember, you must hold the Pendant Enable switch on the sides of the pendant in order to activate any of the pendant buttons.

8. Next, you will receive a sequence of displays that prompt you to specify the features installed on your system and to set the current time and date.

   Some of the questions are answered simply by holding the Pendant Enable switch in and pressing the the "Yes" button or the "No" button. Whenever you are required to set or change the value of the field indicated by the cursor (for example, to set the date and time), you must do so as follows:

   a. Hold the Pendant Enable switch in and press the "up" button (←↑) or "down" button (↓→) until the desired value is displayed.

   b. Then enter that value by pressing the "A" button.

   Note: You cannot manually move the cursor from one field to another. To advance the cursor to the next field position, simply press the "A" button while holding the Pendant Enable switch in. The current cursor field's value will then be entered, and the cursor will automatically advance to the next field position.

9. When you have completed test 0160, the following display will appear for a short time.

```
Test  0160
Complete

 A: Continue
```

   This indicates that the new information has now been entered into memory.

10. A second screen will then appear.

```
Select Option
 A: SETUP
 B: DIAGNOSTICS
 C: POST DATA
```

11. At this point, the POST test must be run again. To run the POST test again, power off the 7537 for at least 30 seconds, and then power it back on.

12. Proceed with one of the following:
    - If an error 016X occurs (where X = any number), it is possible that you have answered one or more of the prompt questions incorrectly. In this case, repeat this procedure, starting at the second bullet in step 6.
    - If any other errors occur, refer to the "Symptom Fix" section of this manual.
    - If no errors are detected by the POST, the system diagnostics automatically load and start. The following is then displayed on the pendant for a few seconds:

```
Diagnostics
System
Test
    Version x.xx
```

13. After a few seconds, a second screen will appear.

```
Select Option
 A: SETUP
 B: DIAGNOSTICS
 C: POST DATA
```

14. To proceed to the running of diagnostic tests, press "B". The following screen should then be displayed:

```
Select Option
     0200
 A: Automatic
 B: Select Test
```

15. Referring to the "Diagnostics" section of this manual, select and run each diagnostic test applicable to your system.

This completes the installation setup procedure. You should now proceed to "Installation Checkout Procedure."

Installation Checkout Procedure

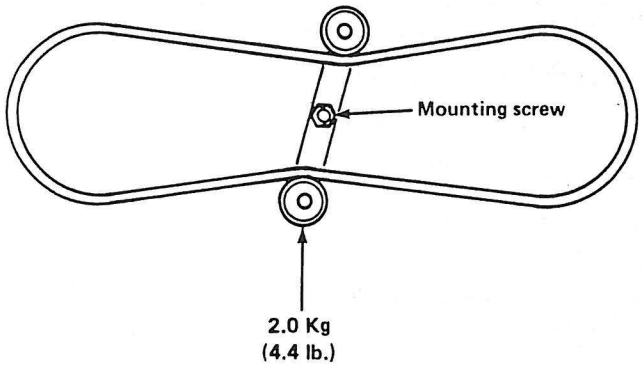
After all units have been properly installed, cabled, and set up according to the procedures given in this chapter, you should test the operation of the entire manufacturing system. If you have purchased the AML/2 Manufacturing Control System Licensed Program, you may use the "Exerciser" program on the "Control System" diskette. Refer to the "Diagnostics" section of this manual for an explanation of that test and of machine diagnostics.

Note: Refer to your Manufacturing Control System User's Guide for information about:

- Entering factory-specified manipulator offsets
- Selecting the default home
- DI/DO configuration
- Communications port configuration.

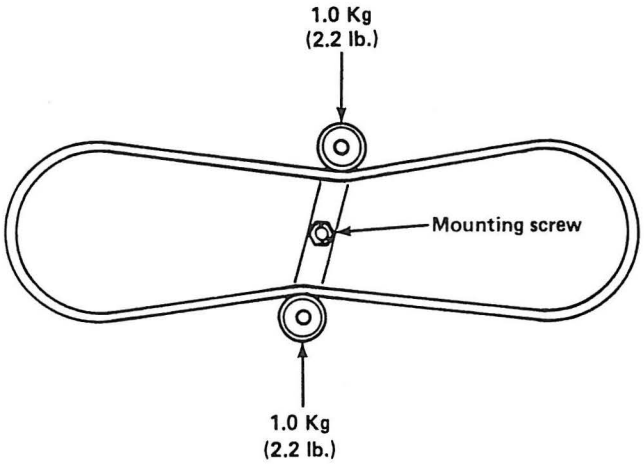
4015 Roll Drive Belt

1. Press the Manip Stop switch.
2. Loosen the belt tensioner mounting screw.
3. Tighten the belt by applying 2.0 kg (4.41 lb) to one of the rollers.
4. Tighten the belt tensioner mounting screw.



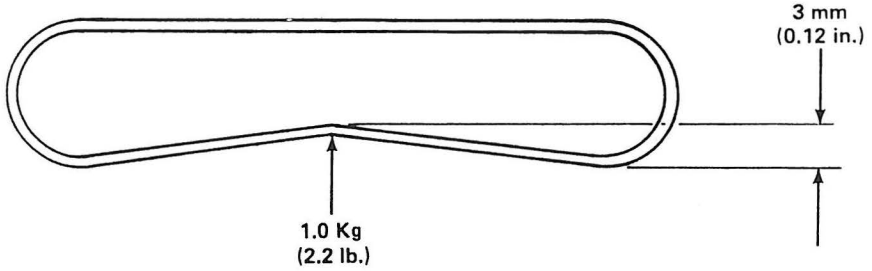
4016 Roll Driven Belt

1. Press the Manip Stop switch.
2. Remove the roll belt cover.
3. Loosen the belt tensioner mounting screw.
4. Tighten the belt by applying a 1 kg (2.2 lb) force to both of the rollers.
5. Tighten the belt tensioner mounting screw.
6. Replace the roll belt cover.



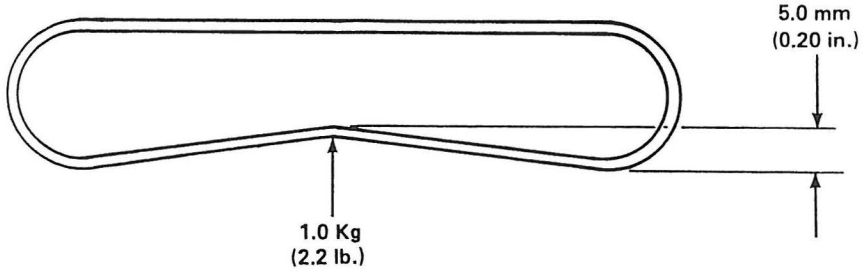
4017a Z Motor Drive Belt (7575 only)

1. Press the Manip Stop switch.
2. Remove the roll belt cover.
3. Loosen the four Z-axis motor bracket screws.
4. Tighten the belt by sliding the motor bracket away from the Z-axis until the belt will only deflect 3 mm (0.12 in.) in the middle of the belt with a 1.0 kg (2.20 lb) force applied.
5. Tighten the four Z-axis motor bracket screws.
6. Replace the roll belt cover.



4017b Z Motor Drive Belt (7576 only)

1. Press the Manip Stop switch.
2. Remove the roll belt cover.
3. Loosen the four Z-axis motor bracket screws.
4. Tighten the belt by sliding the motor bracket away from the Z-axis until the belt will only deflect 5 mm (0.20 in.) in the middle of the belt with a 1.0 kg (2.20 lb) force applied.
5. Tighten the four Z-axis motor bracket screws.
6. Replace the roll belt cover.



4018 Backlash Check

DANGER
THIS PROCEDURE WILL REQUIRE THE TECHNICIAN TO ENTER THE WORKSPACE WITH THE POWER ON. KEEP YOUR BODY AND HEAD CLEAR OF THE WORKSPACE. DO NOT PERFORM THIS PROCEDURE ALONE.

1. Exercise the machine for 15 minutes prior to performing the check.

2. Extend the manipulator arm in a straight line, preferably in the area where the repeatability failure is occurring, if localized.

3. Place a dial indicator near the Z shaft as shown in the top figure and adjust for zero.

4. Using a push-pull gauge, push with a force of 1 kilogram (2.2 pounds) in the direction as shown and record the dial indicator reading.

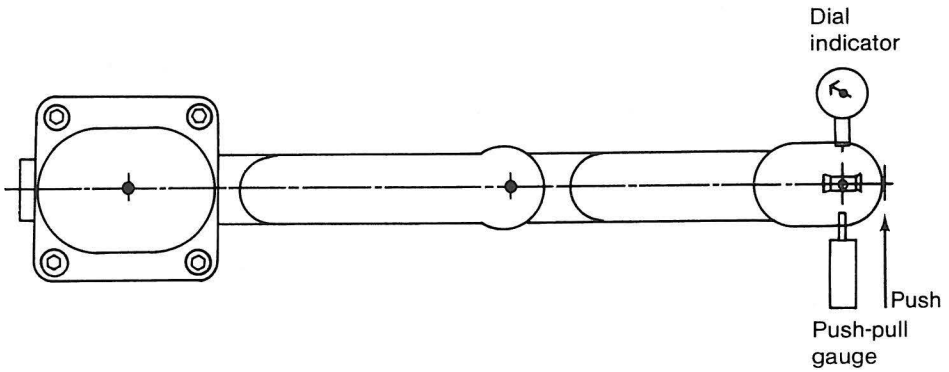
5. Leaving the dial indicator in the same place, relocate the push-pull gauge as shown in the bottom figure.

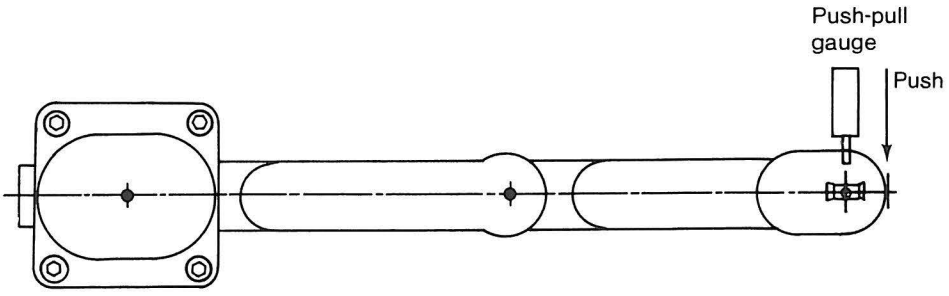
6. Push with a force of 1 kilogram (2.2 pounds) in the direction as shown and record the dial indicator reading.

7. Add the two readings and compare their sum to the maximum allowable sum found in the following table:

Manipulator	Maximum allowable sum
7575	0.38 mm (0.015 in.)
7576	1.27 mm (0.050 in.)

8. If the measurements are not in tolerance, refer to Chapter 8, "Symptom Fix"; "Manipulator/Servo Power Module Failures — Non-Error Decode," "Repeatability Varies."


Dial
indicator
Push
Push-pull
gauge


Push-pull
gauge
Push

4019 Z Axis Brake to Motor Pulley Adjustment

1. Loosen fully the three screws holding the brake to its mounting bracket.

2. Slide the brake to the center of the Z motor pulley. Tighten the three screws and retry the failing operation manually, and then with power applied to the manipulator.

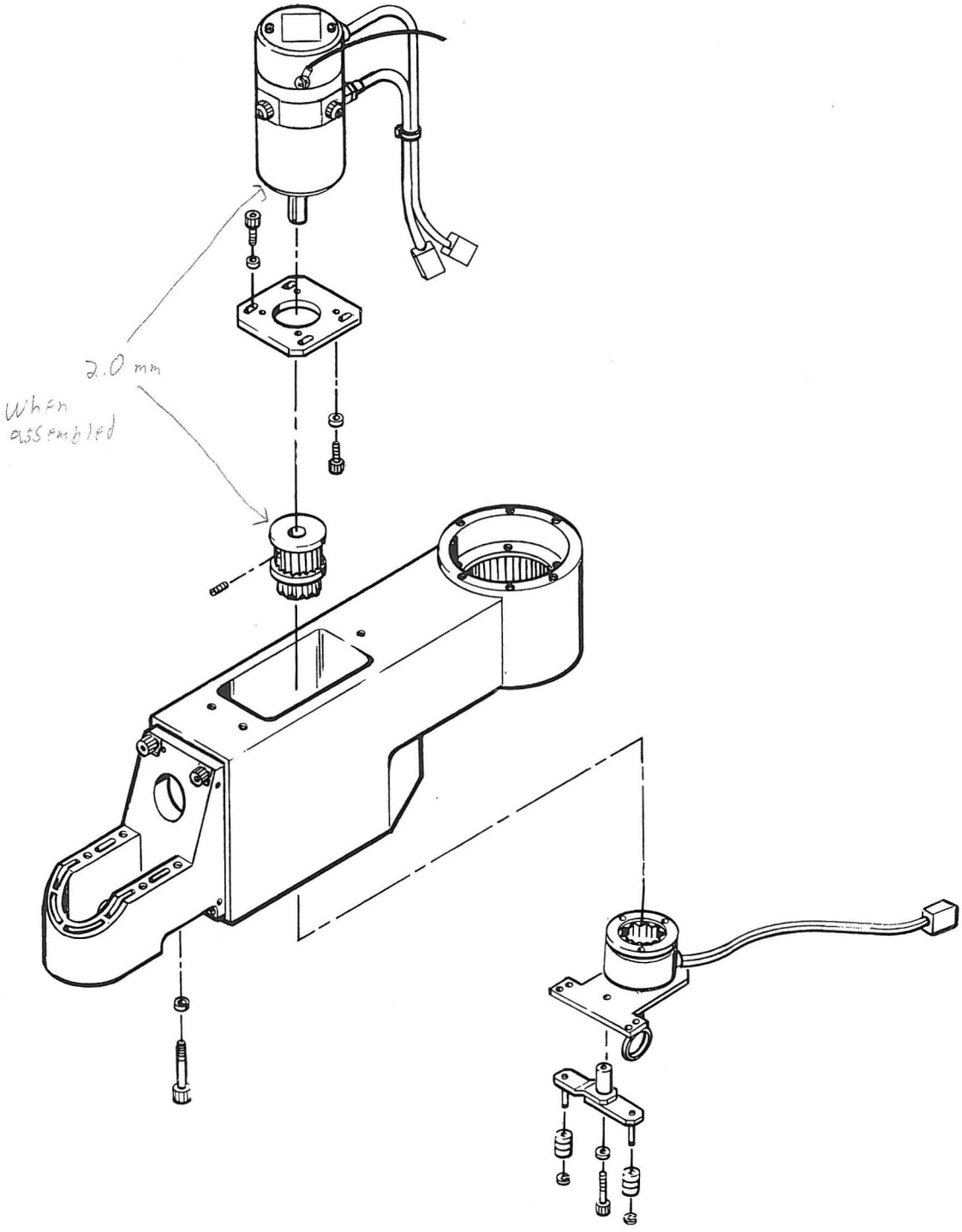
3. If incorrect operation continues, loosen the Z motor mounting screws enough to move the Z motor; then loosen the brake mounting screws. (It may be necessary to loosen also the brake bracket mounting screws.)

4. Try to again center the brake to the Z motor pulley.

5. Tighten the Z motor screws first, followed by the brake bracket mounting screws, and finally the brake mounting screws. Retry the failing operation manually and with power.

   Note: Z home and payload position may be lost with the following step.

6. If incorrect operation occurs again, you must remove the Z motor to check the clearance of the pulley to the Z motor. Refer to "Z Axis Motor and Brush Removal and Replacement" (3315 and 3316). Return to step 1 of this procedure when completed.


2.0 mm
When assembled

4020 Offset Program

CAUTION
Do not attempt to use the Offset Program without running the Home Flag Adjustment Program first (4008). Unpredictable results could occur.

Note: After reteaching the new point and entering the new values, the new point should be within 0.003 inch of the old point.

1. On your manufacturing system, load the AML/2 language diskette into the diskette drive and press the reset button.
2. After a few minutes, the Manip Power LED will flash. Press the Manip Power button.
3. Press the Home button.
4. Obtain from your software/application person, the most critical point for the axis that requires adjustment.
5. Write down the values for this critical point. This will be referred to as the "old" point value.
6. Turn the Auto/Teach keyswitch to the Teach position.
7. With the pendant in world frame, move the arm to the "old" point in the application program. (Get as close as possible — you may be slightly off.)
8. With the pendant, move the arm to the actual point in the workspace.
9. Write down the values for this critical point. This will be referred to as the "new" point value.
10. You must now retrieve (UPLOAD) a copy of your manufacturing system hardware configuration file, HWDEF.cfg, that will be on a media compatible with your rollup computer. Have your software/application person assist you, if necessary.
11. Obtain the diagnostic diskette from the back of the MIM and place it in your rollup computer. (The rollup computer should already be IPL'ed.)
12. Type in A: OFFSET and press the enter key.
13. Follow the prompts and enter the "old" and "new" values when requested.
14. Answer yes to the prompt "Do you wish to update the hardware configuration file?" Key switch to auto
15. Copy (DOWNLOAD) the new hardware configuration file, HWDEF.cfg that applies to your system, to your AML/2 diskette/disk.

16. On your manufacturing system, load the AML/2 language diskette, which contains the new hardware configuration file, HWDEF.cfg, into the diskette drive and press the reset button.

17. Turn the Auto/Teach keyswitch to the Auto position.

18. After a few minutes, the Manip Power LED will flash. Press the Manip Power button.

19. Press the Home button.

20. Verify that the Offset Program has been updated correctly by running the application program.

Note: Be sure to update your Backup Copy of the AML/2 diskette/disk with the new HWDEF.cfg file obtained in this procedure.

10) RCOPY:HWDEF.CFG A:HWDEF.CFG

EXIT → DOS
ROLLUP
Scratch Diskette

15) RCOPY A:HWDEF.CFG R:HWDEF.CFG

4021 Wave Generator Adjustments

Adjustment	7575	7576
Theta 1 motor to wave generator:		
– Place the wave generator all the way on the shaft so that it butts against the motor housing.	Yes	Yes
Theta 2 motor to drive pulley:		
– Recess motor shaft 4 mm inside drive pulley.	Yes	—
– Place drive pulley flush with end of motor shaft.	—	Yes
Theta 2 wave generator to drive pulley:		
– Place wave generator all the way on so that it is against the stop.	Yes	Yes
Z motor to drive pulley:		
– Recess motor shaft inside drive pulley 9.5 mm.	Yes	—
– Recess motor shaft inside drive pulley 8.5 mm.	—	Yes
Roll motor to wave generator:		
– Recess motor shaft inside wave generator 2 mm.	Yes	Yes

4022 Generating Theta 2 Offsets

Use the following procedure to manually generate Theta 2 offsets for the 7575 and 7576 Manipulators.

1. Place the following program in one of the manipulator application spaces (APPL1 - APPL6).

   Note: In this program, the use of "APPL1" assumes that the application names file has not been altered.

```
APPL1:SUBR();
 PDISPLAY( 1,'Theta 2 Angle   ');
 PDISPLAY(17,'is ',WHEREJ(2),'            ');
 PDISPLAY(33,'degrees         ');
 PDISPLAY(49,'                ');
END;
```

2. Using the "UTILS" facility on the pendant:

   a. Select the home position (right or left) for which you want to generate offsets.

   b. Set the corresponding Theta 2 offset to 0.0.

3. Power on the manipulator.

4. Press the Home button.

5. Enter teach mode.

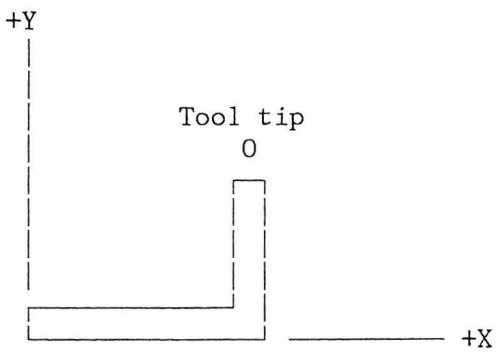
6. Put the arm in "right hand mode".

7. Send the manipulator to the following location:

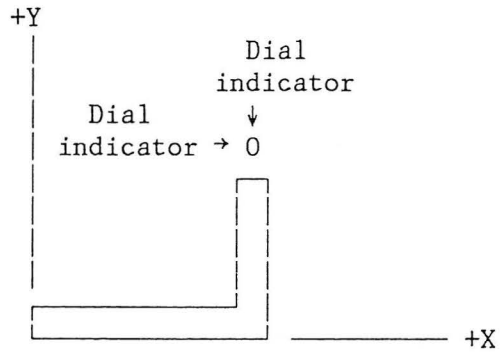
   For 7575 — (325,225,XXX,0) (within ±0.01 for each coordinate)
   For 7576 — (400,400,XXX,0) (within ±0.01 for each coordinate)

   where XXX doesn't matter.

   The arm should look like this:



8. Position two dial indicators against the smooth round portion of the manipulator tool-tip shaft, as shown in the following diagram:



9. Zero the dial indicators.

10. Exit teach mode.

11. Run APPL1. (The manipulator won't move.)

12. Record the number in degrees displayed on the pendant. This reading will be referred later to as "RA" (for right angle).

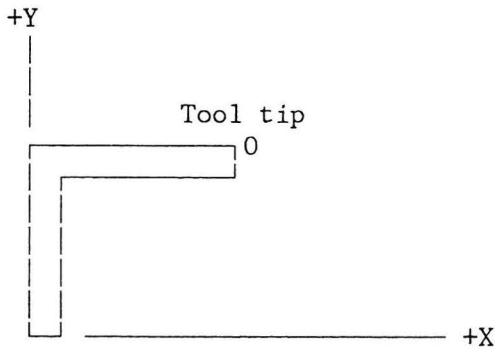
13. Re-enter teach mode.

14. Being careful not to disturb the dial indicators, move the arm away from them.

15. Put the arm in "left hand mode". (This can be done by pressing the Manipulator Power Off button and manually moving the arm. Then re-power the manipulator.)

16. Move the arm such that the dial indicators are again "zeroed", thus teaching the same point in left hand mode that you had in right hand mode.

    The arm should look like this:



17. Exit teach mode.

18. Run APPL1 again.

19. Record the number in degrees displayed on the pendant. This reading will be referred to later as "LA" (for left angle).

20. Calculate the Theta 2 offset as follows:

    Theta 2 offset = (RA + LA) / 2

21. Enter the Theta 2 offset into the manufacturing system as described in the section "Configuring the AML/2 Manufacturing System", found in Chapter 2 of Manufacturing Control System User's Guide.

Note: Remember, you have only done one home position. You must change home positions and repeat the procedure if you require both Theta 2 offsets.