Chapter 6. Checks and Adjustments

Note: If you are not familiar with the safety notices located in the front of this manual, you should review them before proceeding.
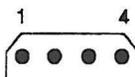
Contents

Controller Checks and Adjustments
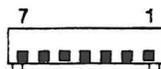
4001 Controller Power Supply Checks

1. Power-off the system and disconnect the system power cord

2. Remove the power supply connectors from system board and drives

3. Connect the system power cord

4. Check the voltages listed on the next page.

5. If any the voltages are less than the minimum or exceed the maximum, replace the power supply.
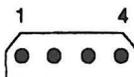
System Board Connector P1

```
    1         4
 ┌─────────────┐
 │ ● ● ● ● │
 └─────────────┘
```

V dc Minimum	V dc Maximum	—Lead Pin	+Lead Pin
+3.75	+6.25	P1-3	P1-1
+3.75	+6.25	P1-3	P1-2

System Board Connector P2

```
   7           1
 ┌─────────────┐
 │▫▫▫▫▫▫▫│
 └─────────────┘
```

V dc Minimum	V dc Maximum	—Lead Pin	+Lead Pin
+9	+15	P2-6	P2-1
+9	+15	P2-6	P2-2
+9	+15	P2-5	P2-6
+3.75	+6.25	P2-7	P2-6

Drive Connectors 1 - 4

```
    1         4
 ┌─────────────┐
 │ ● ● ● ● │
 └─────────────┘
```

V dc Minimum	V dc Maximum	—Lead Pin	+Lead Pin .
+9	+15	2	1
+3.75	+6.25	2	4

If the voltages are not correct, check the power cord for continuity. If the power cord is good, replace the power supply.

4002 Controller Fan Check

1. Power the system OFF.

2. Remove the cover

3. Disconnect fan (J1) from the power supply.

4. Place the red (+ lead) probe in Pin 1 and the black (- lead) probe in Pin 2 in the power supply connector.

5. Power ON the system and check for +12 vdc.

6. If voltage is present and the fan was not running, replace the fan. If voltage is not present, replace the power supply.

7. Set the Controller power switch to OFF.

4003 Controller Speaker Check

1. Set the Controller power switch to OFF.

2. Remove the cover

3. Disconnect the Control Panel Connector from the system board.

4. Set the ohmmeter to the RX1 scale.

5. Check for a resistance of about 8 ohms between pins 2 and 4 on the cable. If you measure 0 ohms or greater than 20 ohms, replace the control panel assembly.

6. Reverse the above procedure to restore the controller to operation,

Manipulator Checks and Adjustments

4008 Home Flag Adjustment Program

1. Install the AML/2 diskette in the diskette drive and power on the controller and the Servo Power Module.

2. Attach a pendant to the remote stop cable.

3. When the Manip Power LED flashes, press that button.

4. Download APPL6.AML from the 7537 Motion Controller Diagnostic Diskette to the controller. If your rollup computer cannot handle the 3.5″ media of the diagnostic diskette, you may place the diagnostic diskette in the A: drive of the 7537 Motion Controller and upload APPL6.AML to the rollup computer and then download it to the AML/2 diskette.

5. Select program level 6, and press the Load button. (The name of the program should be APPL6.AML.)

6. When the diskette drive LED turns off, press Start.

Display screen 1

```
Home Flag
Adjustment
Program
```

The Home Flag Adjustment Program will run and the pendant display as shown at the left will appear. A return to home will be initiated by the program.

Display screen 2

```
Of 4 Axes, these
are adjusted OK
 1 2   4
A: to Continue
```

This display shows the axes that are within adjustment by displaying that axis number. In the example at the left, axis 3 will require an adjustment. Press the A button.

Display screen 3 .

```
┌─────────────────┐
│ Do you wish     │
│ to make the     │
│ adjustment ?    │
│                 │
└─────────────────┘
```

If all axes are adjusted correctly, press the No button and display screen 2 will appear after a return to home sequence.

If the Yes button is pressed, continue with display screen 4.

Display screen 4

```
┌─────────────────┐
│ Ax1 = X  Ax2 = X │
│ Ax3 = X  Ax4 = X │
│ Ax5 = X  Ax6 = X │
│ A: to Continue   │
└─────────────────┘
```

If X = 1, the axis home sensor is covered. If X = 0, the axis home sensor is exposed. Only those axes configured are shown.

For any axis adjustment, this screen will tell you when the home sensor is properly adjusted by physically moving the home flag to the location where the "X" changes from 1-0 or 0-1.

Display screen 5

```
┌─────────────────┐
│ Press           │
│ Manip Power     │
│ to continue     │
│                 │
└─────────────────┘
```

If you wish to once again verify the home position, press Manip Power and you will be returned to display screen 2.

7. If an adjustment is required, move that axis home flag as needed.

8. If no adjustment is required, you are finished with this procedure. Go to "4020 Offset Program" to verify the integrity of the points in the application program. (You may wish to test the application program first.)

Note: If after repeated attempts to adjust the home flag, the program still indicates that it is not adjusted correctly, you may have an motor-encoder problem. If an encoder index line is grounded or open, this adjustment will not work until it is corrected.

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, to your rollup computer. Have your software/application person assist you, if necessary.

11. Obtain the diagnostic diskette from the back of this manual. Copy OFFSET.EXE and OFFSET.TXT from the diagnostic diskette to the same directory on the rollup computer as the HWDEF.CFG file.

12. Change the default drive to the directory containing the HWDEF.CFG file.

13. Type in OFFSET and press the enter key.

14. Follow the prompts and enter the "old" and "new" values when requested.

15. Answer yes to the prompt "Do you wish to update the hardware configuration file?"

16. Copy (DOWNLOAD) the new hardware configuration file, HWDEF.CFG that applies to your system, to your AML/2 diskette/disk.

17. 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.

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

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

20. Press the Home button.

21. 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.

4022 Generating Theta 2 Offsets

Use the following procedure to manually generate Theta 2 offsets for SCARA 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;
    ```
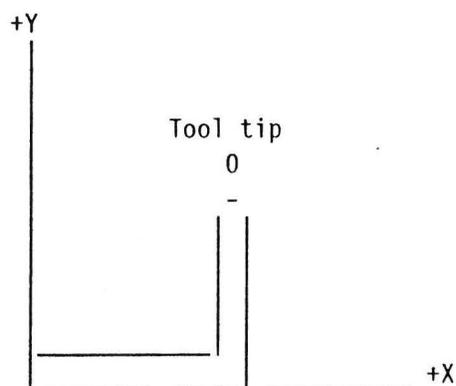
2. Using the "UTILS" facility on the pendant:

    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 $\pm$0.01 for each coordinate)
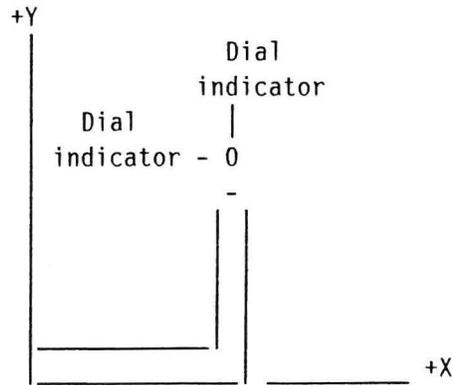   For 7576 — (400,400,XXX,0) (within $\pm$0.01 for each coordinate)

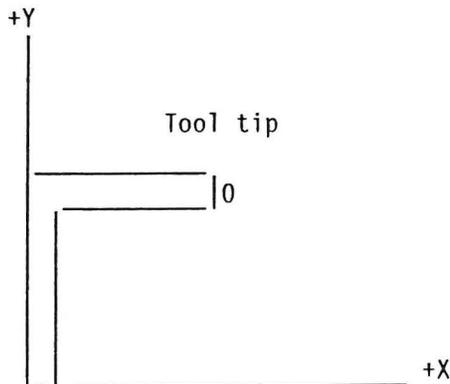   where XXX doesn't matter.

    The arm should look like this:

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

```
+Y
|
|                    Dial
|                    indicator
|         Dial          |
|         indicator - 0
|                       -
|              _____| |
|             |         | |
|          ___|         | |
|         |   |_____| |_____  +X
|_____|
```

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 Manipu-
    lator 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:

```
+Y
|
|
|              Tool tip
|          _____
|         |         |0
|       __|         |
|      |  |_____|
|      |
|      |
|      |
|      |
|_|____|_____  +X
```

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:

$$\text{Theta 2 offset} = (RA + LA) / 2$$

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.

Chapter 7. Diagnostic Testing

Note: If you are not familiar with the safety notices located in the front of this manual, you should review them before proceeding.

Contents

Running the Diagnostic Tests

Note: If you determine that a component of the controller needs to be replaced, refer to the *IBM 7537 Industrial Computer - Hardware Maintenance Service* for the component part number.

The "Diagnostics" Diskette

The diagnostic tests described in this chapter are contained on a single "Diagnostics" diskette that is located in the back of this manual. **You should always return that diskette to this manual when it is not in use.**

Before using your "Diagnostics" diskette, you should make a backup copy, as follows:

1. Obtain a rollup computer that contains DOS 3.0 or higher, and at least one diskette drive.

2. Format a new diskette with the statement "format a:/s".

3. Use the DOS DISKCOPY command to create an image of the IBM Diagnostic diskette on the new diskette

4. Perform a directory command on the new diskette. The following files should be displayed:

   - COMMAND.COM
   - APPL6.AML
   - APPLNAME.AML
   - OFFSET.EXE
   - OFFSET.TXT
   - MANIP.DEF

Using a Pendant

The diagnostic tests provide messages and prompts that are displayed on the pendant and that often require a response by the user. Thus, **a pendant must be attached to run the diagnostic tests.**

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

7537 Power-On Self-Test (POST)

The IBM 7537 Industrial Computer automatically runs a Power-On Self-Test (POST) every time the power is switched to **On**. 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.

Setup Program

Explanation of the Setup Program

Before the 7537 can be used for the first time, or after the battery has been replaced, you must tell it 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, time, and the type of diskette and fixed disk drive installed. Then it must verify the drive types and memory size. (The answers to the questions that this program will ask should already be written on the "Option List" for that specific manufacturing system.)

Running the Setup Program

1. Obtain the "Diagnostics" diskette from the back of this manual.

2. 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 7537 Industrial Computer. (The 7537 POWER indicator should light. If that indicator appears dim or fails to light, refer to the 7537 Hardware Maintenance Service Manual).

4. Power up the Servo Power Module. (The SPM POWER indicator should light. If that indicator appears dim or fails to light, refer to manual provided with that system).

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.

The following is then displayed on the pendant for a few seconds:

```
Diagnostics
System
Test
        Version 3.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 (Setup) 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.

8. 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 "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.

```
Testing 0160
```

This display is only on for less than a second. Do not be concerned if you do not see it.

```
Is this the
right type of
Manipulator ?
   IBM-7575
```

Press either the "Yes" button or the "No" button. If "No" is pressed, another machine type will be displayed.

```
Is this the
right type of
Servo Power Mod?
   IBM-7572
```

Press either the "Yes" button or the "No" button. If "No" is pressed, another machine type will be displayed.

```
Choose "A:" type
A: 1.2MB
B: 1.44MB
C: 2.88MB
```

Press either the "A", "B" or "C" button, according to the type of diskette drive in the "A:" slot, normally a 1.44MB.

```
Choose "B:" type
A: 1.2MB  D:None
B: 1.44MB
C: 2.88MB
```

Press either the "A", "B". "C", or "D" button according to your configuration.

```
Is the fixed
disk drive
installed ?
```

Press either the "Yes" button or the "No" button.

```
┌─────────────────────────┐
│   Memory Installed      │
│        02 MB            │
│   <: up      >: down    │
│        A: Save          │
└─────────────────────────┘
```

Set the total memory to the amount you have installed by pressing the "arrow" keys. Then, save the amount you have selected by pressing "A".

Typical memory configuration is 2MB.

```
┌─────────────────────────┐
│   DATE 01/dd/yy         │
│   TIME hh:mm            │
│   <: up      >: down    │
│   A: Next   D: Quit     │
└─────────────────────────┘
```

Set the date and time by pressing one of the "arrow" keys to reach the desired number and then "A" to advance to the next field.

Note: Option D is used only when you want to start over.

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, execution of the Setup program is complete. In this case, the system diagnostics automatically load and start. The following is then displayed on the pendant for a few seconds:

```
Diagnostics
System
Test
      Version 3.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 other diagnostic tests, press "B". The following screen should then be displayed:

```
Select Option

 A: Automatic
 B: Select Test
```

15. Select and run each diagnostic test applicable to your system, as described throughout the rest of this chapter.

Note: If you press the "D: Quit" option when prompted, the pendant will reply with "Error Code 110". This means that you have intentionally aborted the SETUP procedure.

Basic Diagnostic Tests

The basic diagnostic tests are a pre-selected group of tests that should be run whenever any diagnostic tests are run.

1. Insert the "Diagnostics" diskette into diskette drive A.

2. Set the 7537 Industrial Computer power button to (On).

3. Set the Servo Power Module power switch to (On).

4. The diagnostic programs will load and prompt you with the message:

```
Diagnostics
System
Test
      Version 3.xx
```

The Version 3.xx will indicate the current level of the diagnostics.

Note: If an error code is displayed with the Recall Error LED on, press the Recall Error button to continue.

5. After a few seconds, a second prompt will appear.

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

Option A: SETUP is used for installation and when features are added or deleted. See "Setup Program" in this chapter.

6. Press "B" on the pendant.

7. The following menu will appear.

```
Select Option

  A: Automatic
  B: Select test
```

8. Select option A: Automatic.

9. The diagnostics now prompt with the following display and automatically select tests to run. As each test is selected by the basic diagnostics, the test number will change to indicate the test to be run.

```
Testing 0200
```

10. In the event of a failure, the pendant will indicate the error with the following display.

```
Test  tttt
Error uuuu


A: Continue
```

Test tttt indicates the test number of the failing test. Error uuuu indicates the error code. Press "A" to continue.

11. When the test passes, the pendant will prompt by flashing the following display:

```
Test  tttt
Complete


A: Continue
```

Test tttt indicates the test number which was completed and passed.

12. The next diagnostic test will automatically run, and the other basic tests will follow.

   During this section of testing, the diagnostic will run each test in the following sequence:

   0200 - Memory test

   0610 - Disk/Diskette Adapter test

   0701 - Math Coprocessor test

   0910 - Primary Parallel port presence test (system unit)

   1110 - Primary Serial port presence test (system unit)

   2610 - 4-Port Card 1 presence

   5510 - DI/DO Card 1 presence test

   6011 - Axis Control Card 1 test

   6021 - Axis Control Card 2 test

   If your particular setup is not configured with one or more of the above adapters, ignore the errors from those not installed.

13. After test 6021 has completed, the diagnostics now prompt with the following display.

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

14. Select option B: DIAGNOSTICS. The following display will appear.

```
Select Option

 A: Automatic
 B: Select test
```

15. Select option B. The following display will appear, and extended diagnostic testing can be performed.

```
Select Test
    0200
<: up    >: down
A: Start Test
```

where 0200 is the number of the test selected. Press one of the "arrow" keys to change the test or "A" to start the test.

Extended Diagnostic Tests

The extended diagnostic tests can be entered after running all of the basic diagnostic tests or by pressing "B" when the "Select Option" display is on at the beginning of the basic diagnostic tests.

```
Select Option

 A: Automatic
 B: Select Test
```

The following display will appear and the operator will have control of test selection for running the extended diagnostics.

```
Select Test
    0200
<: up    >: down
A: Start Test
```

Test 0200 is the number of the test selected at this time.

Diagnostic Tests 0200 through 6031

Tests 0200 through 6031 run with similar displays. Press one of the "arrow" buttons to change Test 0200 to the desired test.

```
Select Test
      tttt
<: up    >: down
A: Start Test
```

Test tttt is the number of the test selected. Press one of the "arrow" keys to change the test and "A" to start the test.

```
Run this test
more than once?

 Yes        No
```

Press either the "Yes" button or the "No" button.

```
Enter count:  xx

<: up    >: down
A: Start Test
```

Count xx is the number of times to run the test. Press one of the "arrow" keys to change the number, and then "A" to start the test.

```
Test  tttt
Complete

 A: Continue
```

Test tttt indicates the test number which was completed and passed.

Each test number represents the following tests:

0160 **Setup Program** — Configures CMOS memory with the time, date, and features installed. For more information refer to the next section.

0200 **Memory Test** — Writes and reads into all RAM locations installed and configured in the CMOS memory.

0500 **Test Option 0: Adapter Test** — Tests the memory and correct addressing on the Color Display and Graphics Adapter.

0501 **Test Option 1: Display Attributes** — Tests the display attribute logic for intensity, reverse video, blinking, non-display, and underline modes.

0502 **Test Option 2: Character Set** — Tests character ROM by displaying all of the available characters.

0503 **Test Option 3: 80 X 25 Display** — Fills the screen with a pattern of characters in the 80-by-25 display mode.

0504 **Test Option 4: 40 X 25 Display** — Fills the screen with a pattern of characters and intensified white border in the 40-by-25 display mode.

0505 **Test Option 5: 320 X 200 Graphics** — Tests the 320-by-200 graphics mode and displays color set 0 and color set 1.

0506 **Test Option 6: 640 X 200 Graphics** — Tests the 640-by-200 graphics mode.

0508 **Test Option 8: Screen Paging** — Tests the addressing circuitry from the video controller chip to the Color/Graphics Adapter.

0610 **Diskette A: Adapter Presence Test** — Tests for the presence of the diskette adapter card.

0611 **Diskette A: Sequential Access Test** — Tests the basic diskette operations, including a sequential write, read, and comparison of data on all sectors of the diskette.

0612 **Diskette A: Random Seek Test** — Tests the basic diskette operations, including a series of 50 random seeks, each seek being followed by a write, read, and comparison of data.

0613 **Diskette A: Verify Diskette Test** — Verifies data accessing and each sector.

0614 **Diskette A: Speed Test** — Measures the time required for one revolution of the diskette.

On diagnostic test 0614, the pendant will display the following prompt for all passing tests.

```
Test  0614
Complete
Speed = tttt
A: Continue
```

Test tttt indicates the speed of the diskette drive. For a 1.44Mb diskette drive, tttt should be between 1970 and 2030.

0620   **Diskette B: Adapter Presence Test** — Tests for the presence of the diskette adapter card.

0621   **Diskette B: Sequential Access Test** — Tests the basic diskette operations, including a sequential write, read, and comparison of data on all sectors of the diskette.

0622   **Diskette B: Random Seek Test** — Tests the basic diskette operations, including a series of 50 random seeks, each seek being followed by a write, read, and comparison of data.

0623   **Diskette B: Verify Diskette Test** — Verifies data accessing and each sector.

0624   **Diskette B: Speed Test** — Measures the time required for one revolution of the diskette.

On diagnostic test 0624, the pendant will display the following prompt for all passing tests.

```
Test  0624
Complete
Speed = tttt
A: Continue
```

For each drive, tttt should be within the indicated range.

1.2Mb   range is 1640 to 1695
1.44Mb range is 1970 to 2030
2.88Mb range is 1970 to 2030

0701   **Math Coprocessor Test** — Tests the math coprocessor for correct operation.

0910   **Primary Parallel Port Presence Test** — Tests for the presence of the primary parallel port adapter card and the proper switch settings.

0911   **Primary Parallel Port Test Through The Wrap Plug** — Tests the parallel port by connecting the transmitters to the receivers through the wrap plug (P/N 72X8546).

0920   **Secondary Parallel Port Presence Test** — Tests for the presence of the secondary parallel port adapter card and the proper switch settings.

0921   **Secondary Parallel Port Test Through The Wrap Plug** — Tests the parallel port by connecting the transmitters to the receivers through the wrap plug (P/N 72X8546).

1110   **Primary Serial Port Presence Test** — Tests for the presence of the primary serial port adapter card and the proper switch settings.

1111   **Primary Serial Port Test Through The Wrap Plug** — Tests the serial port by connecting the transmitters to the receivers through the wrap plug (P/N 72X8546).

1120   **Secondary Serial Port Presence Test** — Tests for the presence of the secondary serial port adapter card and the proper switch settings.

1121   **Secondary Serial Port Test Through The Wrap Plug** — Tests the. serial port by connecting the transmitters to the receivers through the wrap plug (P/N 72X8546).

1710   **Disk C: Presence Test** — Tests for the presence of the disk adapter card.

1711   **Disk C: Write, Read, Compare (On Test Cylinder) Test** — Tests the fixed disk drive portion of the fixed disk and the fixed disk drive's read and write operations.

1712   **Disk C: Seek Test** — Sequentially moves the fixed disk's heads inward one cylinder at a time until the last cylinder is reached; the heads are then reset to the first cylinder, and a random seek test is performed.

1713   **Disk C: Head Select Test** — Data is written to the test cylinder by each fixed disk head; the data is then read and checked for any errors.

1714   **Disk C: Error Detection and Correction Test** — Tests the fixed disk's error checking and correction circuits by reading data, altering the data, and writing the data at the test cylinder. A comparison test is made to detect any errors.

1715   **Disk C: Run All Test** — Runs tests 1, 2, 3, and 4.

1717   **Disk C: Hard Format** — Formats the fixed disk, except for any manufacturing defective sectors. This will cause all of the data on the disk drive to be lost. Following this, the disk must be formatted with DOS.

1718   **Disk C: Parking the Heads** — Parks the disk drive heads whenever a 7532 Industrial Computer Model 310 with an optional disk drive is to be relocated.

Note: When executing the following 4-Port Card tests, the pendant display will typically fill with indecipherable characters while the test is being performed (up to 1 minute in length).

2610   **4-Port Card 2: Presence Test** — Tests for the presence of the second 4-Port adapter card.

2611   **4-Port Card 1: Port 1 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

Note: The 4-Port adapter wrap connector (P/N 04G2123) is also known as P/N 6298966. The IBM 48 Point DI/DO Adapter Wrap Plug (P/N 04G2143) is also known as P/N 67X1349.

2612   **4-Port Card 1: Port 2 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2613   **4-Port Card 1: Port 3 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2614   **4-Port Card 1: Port 4 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2620   **4-Port Card 2: Presence Test** — Tests for the presence of the second 4-Port adapter card.

2621   **4-Port Card 2: Port 1 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2622   **4-Port Card 2: Port 2 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2623   **4-Port Card 2: Port 3 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

2624   **4-Port Card 2: Port 4 Test Through The Wrap Plug** — Tests the 4-Port Card port by connecting the transmitters to the receivers through the wrap plug (P/N 04G2123).

4610   **Multiport Communications Adapter Card 1** — Tests the base card of the first Multiport Communications Adapter.

4620   **Multiport Communications Adapter Card 2** — Tests the base card of the second Multiport Communications Adapter.

5500   **DI/DO Card Summary** — Lists the type and settings of IBM or Sankyo DI/DO cards found installed in the system.

```
DI/DO Cards:
#1:48Pt   #2:None          IBM 48 PT card ==> 48Pt
#3:None   #4:None          Sankyo 72 PT card ==> 72 Pt
A: Continue
```

5510   **DI/DO Card 1: Presence Test** — Tests for the presence of the first DI/DO adapter card.

5511   **DI/DO Card 1: Test Through Wrap Plug** — Tests the DI/DO Card by connecting the digital outputs to the digital inputs through the wrap plug (P/N 04G2143).

5520 **DI/DO Card 2: Presence Test** — Tests for the presence of the second DI/DO adapter card.

5521 **DI/DO Card 2: Test Through Wrap Plug** — Tests the DI/DO Card by connecting the digital outputs to the digital inputs through the wrap plug (P/N 04G2143).

5530 **DI/DO Card 3: Presence Test** — Tests for the presence of the third DI/DO adapter card.

5531 **DI/DO Card 3: Test Through Wrap Plug** — Tests the DI/DO Card by connecting the digital outputs to the digital inputs through the wrap plug (P/N 04G2143).

5540 **DI/DO Card 4: Presence Test** — Tests for the presence of the fourth DI/DO adapter card.

5541 **DI/DO Card 4: Test Through Wrap Plug** — Tests the DI/DO Card by connecting the digital outputs to the digital inputs through the wrap plug (P/N 04G2143).

6011 **Axis Control Card 1: Run Bring Up Test** — Tests the Axis Control Card by making the card run the "Bring Up" test and checking for passing results.

6021 **Axis Control Card 2: Run Bring Up Test** — Tests the Axis Control Card by making the card run the "Bring Up" test and checking for passing results.

6031 **Axis Control Card 3: Run Bring Up Test** — Tests the Axis Control Card by making the card run the "Bring Up" test and checking for passing results.

POST Data Test

The "POST DATA" option from the main menu of the diagnostics program allows the user to review any errors that were detected during the "POST" test, as well as the diskette drives configured and the amount of memory found.

1. From the main diagnostics menu, press the "C" button on the pendant.

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

2. A screen similar to the following will be displayed:

```
Drive A:  1.44MB
Drive B:  None
Memory:   02MB
A: Continue
```

The diskette drives displayed are the ones currently configured in CMOS storage, not necessary the ones physically installed.

The amount of memory displayed is the amount of valid memory found. You may physically have more memory installed than what is shown, but it did not pass the POST test.

3. Press "A" to continue to the next screen.

4. If there were no POST errors, you will be returned to the main diagnostic menu, as shown in step 1. If an error was found, a screen similar to the following will be displayed:

```
POST ERROR 0162
Bad Setup Data

A: Continue
```

This error indicates that the CMOS setup information does not agree with the information found during POST testing.

The list of error codes that may be reported by "POST DATA" is:

- 0104 - Bad System Board
- 0109 - Bad System Board
- 0161 - Bad Battery
- 0162 - Bad SETUP Data
- 0163 - Bad Date & Time
- 0164 - Bad Memory Size
- 020X - Bad Memory
- 0601 - Bad Diskette Drive
- 178X - Bad Hard Disk

5. Press the "A" button on the pendant to continue. If there are no further errors, you will be returned to the main diagnostic menu, otherwise the next error will be displayed.

Verify Diagnostics

Note: If you are not familiar with the safety notices located in the front of this manual, you should review them before proceeding.

Verify diagnostics have been written in the AML/2 (A Manufacturing Language/2) code. After successfully loading your AML/2 Manufacturing Control System diskette, press the Select button to select program 7, as indicated by the **Appl** display. (The Verify program was written to load as application program 7.) Press Load, and then press Start. The main menu of the Verify program will appear on the pendant display.

While running any Verify diagnostic, select only those options that have been made available to you. For example, if a diagnostic requests that you press the "B" key on the pendant, you must do so. Pressing another button, such as on the Servo Power Module operator control panel may (depending on the routine) cause an EXCP_error that will require reloading of the Verify diagnostic.

Instructions

1. Plug the pendant into the remote Manip Stop cable.

2. Insert the AML/2 diskette into the diskette drive.

3. Set the 7537 Industrial Computer power button to (On).

4. Set the Servo Power Module power switch to (On).

   Note: If the Error LED on the operator control panel turns on, press the Recall Error key on the pendant; then continue.

5. In about four minutes the Manip Power LED will flash; press this button on the Servo Power Module operator control panel.

6. Press the select button until the number 7 is displayed in the Appl indicator.

7. Press the Load button, the diskette drive LED will come on.

8. After the diskette LED goes off, press the Start button. The MAIN MENU will appear (see following page), and Manip Power will turn off.

9. If an "EXCP_error" appears, press the Resume button to turn off the Error LED. If the manipulator power was on, the Manip Power LED flashes. Press that button, and then press Resume to retry the failing operation. If it does not continue, press Start for the MAIN MENU.

10. There are two scenarios for pressing the Manip Stop button.

    • If you press the Manip Stop button when the Exerciser or any other program is not loaded, pressing Resume is not necessary. After a few seconds, the Manip Power LED will flash. Press that button, after restoring the Manip Stop button. Press Start after loading the Verify program for the MAIN MENU.

    • If you press the Manip Stop button when the Exerciser or any other program is loaded and manipulator power was on before, the Manip Power LED will flash. Press that button, after restoring the Manip Stop button. Press Resume to continue the program.

11. To exit Verify diagnostics, insert a diskette that can be IPL'ed and reset the controller.

MAIN MENU

A COMMANDS
B PENDANT
C EXERCISER
D OPERATOR PANEL

After the Verify program has been loaded, the menu shown on the left will be displayed. Select the desired test from this menu and those routines will be called.

If an EXCP_error occurs while running Verify, the current Verify pendant display will be over written.

For options "A COMMANDS", "B PENDANT", and "D OPERATOR PANEL", press the "D" key on the pendant to return to the MAIN MENU. Select the test you were running before.

For option "C EXERCISER", the next time the speed changes, the EXERCISER pendant display will resume.

For option "B" the pendant display should continue if the error can be reset. If the error cannot be reset, you must reload the Verify program.

A COMMANDS

```
A STARTUP
B HOME
C SHUTDOWN
D MAIN MENU
```

This diagnostic will allow the selection of a STARTUP();, HOME();, or a SHUTDOWN(); command. When you are finished, press the "D" key to return to the MAIN MENU.

If an EXCP_ error occurs when Manip Power is on, perform the following steps to recover:

1. Press Resume. The Manip Power LED will flash.

2. Press Manip Power.

3. Press Start. The MAIN MENU will be displayed.

4. Select option "A COMMANDS".

B PENDANT

A DISPLAY
B BUTTON/LED
.
D MAIN MENU

The DISPLAY routines display all characters. The BUTTON/LED routines require the technician to press the buttons for a thorough check of the pendant. Press the "D" key for MAIN MENU.

A DISPLAY

Pendant display 64 position test All characters will display.

This routine of the pendant diagnostic displays one character at a time in all 64 positions.

End of pendant display checkout Press D key for MAIN MENU.

As instructed, pressing the "D" key will return you to the MAIN MENU. There is no other option.

B BUTTON/LED

All LEDs should now be on for 5 seconds.

This routine will first check the on/off status of all the LEDs. The test will start by turning all the LEDs ON. You have 5 seconds to ensure the routine was successful.

All LEDs should now be off for 5 seconds.

This routine will turn all the pendant LEDs OFF. Again, you have 5 seconds to ensure the routine was successful.

Press key to alter state of LED

Press D to exit. |

Press any key on the pendant, (except the "D" key), and the associated pendant LED will turn OFF. The next time that key is pressed, the LED will turn on. Press the "D" key to exit.

End of button and LED checkout Press D key for MAIN MENU.

As shown on the left, press the "D" key for the MAIN MENU.

C EXERCISER

CAUTION:
While the program is running, do not enter the workspace.

Note: The manipulator must not be at its home position. The reason for this is that the Exerciser program requires ±200 mm (8 inches) of movement for testing in the X-Y plane. The Z axis also requires a clearance of -50mm (-2 inches).

Press key "A" when called for and wait for the next display on the pendant.

```
Move arm to safe
area, push key A
then Manip Power
I need +/- 200mm
```

This routine will perform manipulator movement. The technician is instructed to manually move the arm to a safe spot in the workspace. This routine requires a space of ±200 mm (8 in.).

When the arm is placed properly, press key "A" on the pendant, this will issue a STARTUP.

```
Startup issued,
do NOT home.
Press B key to
continue testing
```

After the STARTUP is issued, the Manip Power LED will flash. Ensure that both Manip Stop buttons are reset. Press the Manip Power button, and the display shown on the left will be displayed.

```
Executing
   EXERCISER
speed is now 0.2
```

The speed of the manipulator will start at 0.2 and increment by 0.2 to a top speed of 0.8. The speed will reset to 0.2 and the routine will run again. This routine uses the system default parameters.

```
End of Exerciser

Press D key for
MAIN MENU
```

After the EXERCISER program completes and performs a shutdown, the message as shown on the left will be displayed. Press the "D" key for MAIN MENU.

If an EXCP_ error occurs, press the Resume button and the Manip Power LED should flash once again. Press Manip Power and then press Resume to retry the failing operation. (If Resume does not work, press Start for MAIN MENU.) Press the "D" key for for MAIN MENU.

If you wish to stop the exerciser routine, press the Pause button on the Servo Power Module operator control panel. The Pause LED will flash. When the speed is ready to increment again, the motion will stop and the Pause LED will stay on. To resume motion, press the Resume button on the Servo Power Module operator control panel. If you press the Start button while the pause led is on solid (not flashing), the program returns to the MAIN MENU.

D OPERATOR PANEL

```
Pendant displays
button name when
it is pressed...
wait 10 seconds.
```

This routine allows the technician to press each SPM operator panel button, excluding Manip Stop and Manip Power. The button name will display on the top line of the pendant.

```
Press any button
on the SPM panel
Press D key for
MAIN MENU
```

At this time the technician may press any button on the operator panel, except the Manip Power and the Manip Stop buttons. See the example pendant display which follows.

```
KEYSWITCH button
on the SPM panel
Press D key for
MAIN MENU.
```

Example menu. The keyswitch will display in any switch position. For example, if you turn the keyswitch from "Auto" to "Teach", you must select another button, such as Home.

Turning the keyswitch from "Teach" back to "Auto" will then display KEYSWITCH again. Press the "D" key for MAIN MENU.