FRONT

PICTURE 1

Part Number 04G3889
Form Number S15F-2247-02

FRONT

PICTURE 1

Part Number 04G3889
Form Number S15F-2247-02

FRONT_1 Special Notices

Subtopics
FRONT_1.1 Safety Information

FRONT_1.1 Safety Information

Refer to the *Hardware Maintenance Service General Information* pamphlet for
the following information:
    General Safety
    Electrical Safety
    Safety Inspection Guide.

Third Edition (October 1991)

**The following paragraph does not apply to the United Kingdom or any
country where such provisions are inconsistent with local law:**
INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS
IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING,
BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS
FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express
or implied warranties in certain transactions, therefore, this statement
may not apply to you.

This publication could include technical inaccuracies or typographical
errors. Changes are periodically made to the information herein; these
changes will be incorporated in new editions of the publication. IBM may
make improvements and/or changes in the product(s) and/or the program(s)
described in this publication at any time.

It is possible that this publication may contain reference to, or
information about, IBM products (machines and programs), programming, or
services that are not announced in your country. Such references or
information must not be construed to mean that IBM intends to announce
such IBM products, programming, or services in your country.

Requests for technical information about IBM products should be made to
your IBM Authorized Dealer or your IBM Marketing Representative.

IBM may have patents or pending patent applications covering subject
matter in this document. The furnishing of this document does not give
you any license to these patents. You can send license inquiries, in
writing, to the IBM Director of Commercial Relations, IBM Corporation,
Purchase, NY 10577.

FRONT_2 Special Notices
References in this publication to IBM products, programs, or services do
not imply that IBM intends to make these available in all countries in
which IBM operates. Any reference to an IBM product, program or service
is not intended to state or imply that only IBM's product, program, or
service may be used. Any functionally equivalent product, program, or
service that does not infringe any of IBM's intellectual property rights
or other legally protectible rights may be used instead of the IBM
product, program, or service. Evaluation and verification of operation in
conjunction with other products, programs, or services, except those
expressly designated by IBM, are the user's responsibility.

IBM may have patents or pending patent applications covering subject
matter in this document. The furnishing of this document does not give
you any license to these patents. You can send license inquiries, in
writing, to the IBM Director of Commercial Relations, IBM Corporation,
Purchase, NY 10577.

The following terms, denoted by an asterisk (*) in this publication, are
trademarks of the IBM Corporation in the United States and/or other
countries:

    IBM
    Personal System/2
    XGA
    XP.

The following terms, denoted by a double asterisk (**) in this
publication, are trademarks of the Intel corporation in the United States
and/or other countries:

    486
    487
    SX.

CONTENTS Table of Contents

1.0 General Checkout

Familiarize yourself with the model-specific *Hardware Maintenance Reference* pamphlet and the following information before starting with step 1.

The diagnostic tests are intended to test *only* IBM (*) marketed products. Non-IBM marketed products, prototype cards, or modified options can give false errors and invalid system responses.

Running Automatic Configuration

Warning: Running Automatic Configuration may alter customized configuration settings. Note the current settings using **View configuration**. If the configuration was customized, restore it to the customized settings after service is complete.

Diagnosing Combined FRUs: If an adapter or device consists of more than one FRU, an error code may be caused by any of the FRUs. Before replacing the adapter or device, remove the FRUs, one by one, to see if the symptoms change.

If you are instructed to replace either the processor board or the system board, and the first board that you replaced does not correct the problem, then replace the other board (processor or system) and reinstall the original board.

Using Error Messages: Use the error codes displayed on the screen to diagnose failures. If more than one error code is displayed, diagnose the first error code first. The cause of the first error code can cause false error codes to be displayed.

If there is not an error code on the screen, see if the error symptom is listed in the Symptom-To-FRU Index.

```
+---+
¦001¦
+---+
```
- Power-off the system and all external devices.
- Verify the power-on password is inactive.
- Check all cables and power cords.
- Make sure there are no diskettes in the drives.
- Power-on all external devices.
- Power-on the system.

  Note: If you get a POST error code, press the pause key (while the
          error code is on the screen) to hold the error code on the
          screen. Write down any error codes that are displayed, then
          press F1 to continue. If the test stops and you cannot continue,
          go to "Symptom-to-FRU Index" in topic 14.0.

ARE ANY EXTERNAL SCSI DEVICES ATTACHED TO THE SYSTEM?
Yes No
```
 ¦    ¦
 ¦    +---+
 ¦    ¦002¦
 ¦    +---+
 ¦    Continue with Step 005.
 ¦
+---+
¦003¦
+---+
```
DID THE POWER-GOOD LIGHT ON ALL OF THE EXTERNAL SCSI DEVICES COME ON?
Yes No
```
 ¦    ¦
 ¦    +---+
 ¦    ¦004¦
 ¦    +---+
 ¦    Go to the external devices service pamphlet.
 ¦
 ¦
 ¦
+---+
¦005¦
+---+
```
DID YOU RECEIVE A POST ERROR CODE?
Yes No
```
 ¦    ¦
 ¦    +---+
 ¦    ¦006¦
 ¦    +---+
 ¦    Continue with Step 014.
 ¦
+---+
¦007¦
```

```
+---+
```
**IS THE FIRST POST ERROR CODE WITHIN THE RANGE OF 02080000 190I TO 02410000
190I?**
Yes No
```
 ¦    ¦
 ¦   +---+
 ¦   ¦008¦
 ¦   +---+
 ¦    Continue with Step 014.
 ¦
+---+
¦009¦
+---+
```
- Restart the system and verify that the "Enable" and "Disable" settings
  are correct. (For more information, go to "Enable and Disable Settings"
  in topic 5.0.) If you receive a warning on the screen regarding the
  "Keep" and "Remove" settings, follow the instructions on the screen
  before continuing.
DID YOU HAVE TO CORRECT ANY OF THE ENABLE AND DISABLE SETTINGS?
Yes No
```
 ¦    ¦
 ¦   +---+
 ¦   ¦010¦
 ¦   +---+
 ¦    Go to "Symptom-to-FRU Index" in topic 14.0.  Before replacing any
 ¦    SCSI devices, verify there are no duplicate SCSI ID settings.
 ¦
+---+
¦011¦
+---+
```
- Restart the system.
DID THE POST ERROR REMAIN?
Yes No
```
 ¦    ¦
 ¦   +---+
 ¦   ¦012¦
 ¦   +---+
 ¦    Continue with Step 014.
 ¦
+---+
¦013¦
+---+
```
Go to "Symptom-to-FRU Index" in topic 14.0.

```
+---+
¦014¦
+---+
```
- Press Ctrl+Alt+Del. When the cursor moves to the upper right, press
  Ctrl+Alt+Ins and check for the following responses:
  1. One or two short beeps.
  2. Readable instructions or the Main Menu.
DID YOU RECEIVE THE RESPONSES LISTED PREVIOUSLY?
Yes No
```
 ¦    ¦
 ¦   +---+
 ¦   ¦015¦
 ¦   +---+
 ¦    Go to the "Symptom-to-FRU Index" in topic 14.0.
 ¦    - or -
 ¦    If that does not correct the problem, go to the "Undetermined
 ¦    Problem" in topic 4.0.
 ¦
+---+
¦016¦
+---+
```
- If you are not at the Main Menu, follow the instructions on the screen
  to advance to the Main Menu, then press Ctrl+A and run system checkout.
- If the test stops and you cannot continue, go to "Undetermined Problem"
  in topic 4.0.

  Notes:

  1. If the system has incorrect keyboard responses, go to "Keyboard" in
      topic 11.0.
  2. If the printer has incorrect printer responses, go to "Printer" in
      topic 8.0.
  3. If the display is jittering, rolling, has unreadable characters,
      shifting, or out-of-focus, go to "Display Self-Test" in topic 7.0.
  4. If a minimum of 896KB of memory is not active, the diagnostic tests
      cannot be loaded.
IS THE LIST OF INSTALLED DEVICES CORRECT?

Note: Memory, 487SX (option), and processor board cache (256KB) will not

```
       be listed.


Yes  No
  ¦    ¦
  ¦    +---+
  ¦    ¦017¦
  ¦    +---+
  ¦    Go to "Installed Devices List" in topic 2.0.
  ¦
+---+
¦018¦
+---+
```
- Run the advanced diagnostic tests.
DID THE TESTS IDENTIFY A FAILURE?

**Note: If the test stops and you cannot continue, replace the last device
        being tested.**

```
Yes  No
  ¦    ¦
  ¦    +---+
  ¦    ¦019¦
  ¦    +---+
  ¦
  ¦    Note:  If you noticed an error symptom or if you received any POST
  ¦           error codes when the system was powered-on, go to
  ¦           "Symptom-to-FRU Index" in topic 14.0.
  ¦
  ¦    You may have an intermittent problem:
  ¦         Check for damaged cables or connectors.
  ¦         Reseat all adapters, drives, and modules.
  ¦         Check the system fans.
  ¦         Start an error log and run the tests multiple times.
  ¦
+---+
¦020¦
+---+
```
Follow the action described on the screen. If that does not correct the
problem, go to the "Symptom-to-FRU Index" in topic 14.0.

 (*) IBM is a trademark of the International Business Machines
     Corporation.

2.0 Installed Devices List

If the list contains an adapter or device that is not installed, go to
"Undetermined Problem" in topic 4.0.

If an adapter or device is missing from the list, you have one of the
following conditions:
    The fixed disk drive (hard disk drive) (or Reference Diskette) does
    not contain the module of code required to support that device.
    The device missing from the list is an unrecognizable adapter.
    The missing device requires an additional diskette or service manual.
    The missing device is defective.
    An adapter is defective.

Subtopics
2.1 Device Type
2.2 SCSI Devices
2.3 Non-SCSI Devices

2.1 Device Type

Run **Automatic Configuration** (see "Running Automatic Configuration" in topic 1.0 before continuing) and determine which type of device, SCSI or non-SCSI, is missing from the Installed Devices List (in Advanced Diagnostics), then continue with the following steps. (If SCSI and non-SCSI devices both are missing, go to "Undetermined Problem" in topic 4.0.)

2.2 SCSI Devices

The adapter supporting the missing device may be defective. If more than
one SCSI adapter is installed, isolate them one at a time.
1. Power-off the system and disconnect all internal and external SCSI
    devices from the SCSI adapter (except the default hard disk drive).
2. Terminate the adapter, as required (see "Running Automatic
    Configuration" in topic 1.0 before continuing).
3. Power-on the system and run **Automatic Configuration**. If the adapter
    is not on the Installed Devices List (in Advanced Diagnostics), the
    adapter is defective. If the adapter is on the list, run the adapter
    diagnostic tests.
4. If the adapter fails the tests, replace it. If the adapter passes the
    tests, a different adapter may be defective.
5. Reconnect the devices to the adapter, then terminate the adapter, as
    required.
6. Go to "Undetermined Problem" in topic 4.0 to find the problem.

2.3 Non-SCSI Devices

Replace the missing device.

Note: If the number of diskette drives shown on the list is incorrect, an
error can occur during the tests. Restart the system, select **View
Configuration** from the Set Configuration menu and verify that the
drive information is correct, then continue testing.

3.0 Power-On Password

To service a system with an active, unknown, power-on password do the
following:
1. Power-off the system.
2. Move the system board jumper J10, to connect the center pin and the
    pin on the opposite end of the connector. J10 is located between the
    processor board and the memory-riser card (in J11) on the system
    board.
3. Power-on the system.

The system detects the change and removes the password. Do not move the
jumper back to its original position.

4.0 Undetermined Problem

You are here because the diagnostic tests did not identify which adapter
or device failed. Do not isolate FRUs that are known to be good.

If the power-on light is not on, verify (with power off) that the
voltage-select switch is in the correct position. Then check the power
supply voltages. If the voltages are not correct, replace the power
supply. If the voltages and switch setting are correct, do the following:
1. Power-off the system.
2. Remove or disconnect one of the following:

> **Note:** Minimum operating requirements are one *pair* of 1MB kits (type 1
> systems) or one 2MB kit (type 2 systems), the processor board,
> the default drive 6.

    Non-IBM devices
    Modem, printer, mouse, or other device
    Any adapter (except the Processor Board)
    Processor board cache option (256KB)
    487SX math coprocessor option
    Hard disk or diskette drive
    Memory-riser card, memory-module kits.
3. Power-on the system.
4. If the problem remains, repeat steps 1 through 3 until you find the
    failing adapter or device.
5. If all adapters and devices have been removed and the problem remains,
    suspect the system board, processor board, then the power supply.

5.0 Enable and Disable Settings

To check the settings, select **Set and View SCSI Device Configuration** from
the Set Configuration menu and see if any Presence Error Reporting devices
are listed (not all devices report). Set devices connected to the system
to "Enabled." Set devices listed but *not connected* to "Disabled." Press
F5 to make changes then press F10 to save the changes.

For more information, see "Presence Test" in the *Diagnostic Information
for Micro Channel Computers* pamphlet.

6.0 Power Supply Voltages

Check the voltages with P1 and P2 plugged into the system board.

P1 Voltages:

Pin	Signal	V dc Min.	V dc Max.
1	Ground		
2-7	+ 5 volts	+ 4.8	+ 5.25
8, 9	+12 volts	+11.5	+12.6

P2 Voltages:

Pin	Signal	V dc Min.	V dc Max.
1	-12 volts	-10.9	-13.2
2-7	Ground		
8	On/Off		
9	Power Good		

PICTURE 2

P3 / P4 Voltages:

Pin	Signal	V dc Min.	V dc Max.
1	+12 volts	+11.5	+12.6
2, 3	Ground		
4	+ 5 volts	+ 4.8	+ 5.25

PICTURE 3

7.0 Display Self-Test
1. Power-off the system unit and display.
2. Disconnect the display signal cable.
3. Power-on the display.
4. Turn the contrast to its maximum position.
5. Turn the brightness control to the center detent position.

The screen should be white with a black margin, as described below
(shading may occur near the edges).

    8503, 8512, 8513, 8514, 8515: 2--20 mm (0.08--0.79 in.) wide on one
    or both sides.
    8506: 2-50 mm (0.08-1.97 in.) wide on the top, or bottom, or both.
    8507, 8508: 2-20 mm (0.08-0.79 in.) wide on the top, or bottom, or
    both.

If the screen does not meet the test specifications, replace the display.
If it meets the test specifications, replace the system board.

Note: Certain adapter failures can cause video problems. Before
       replacing FRUs, remove any option adapters to see if the problem
       disappears.

8.0 Printer
1. Make sure the printer is properly connected and powered-on.
2. Run the printer self-test.

If the printer self-test does not run correctly, the problem is in the
printer. Refer to the printer service manual.

If the printer self-test runs correctly, install a wrap plug on the
parallel port and run the advanced diagnostic tests to determine which FRU
failed.

If the advanced diagnostic tests do not detect a failure, replace the
printer cable. If the problem remains, replace the system board.

9.0 IML / IPL

You are here because you have an Initial Machine Loading (IML) or an
Initial Program Loading (IPL) problem resulting in one of the following
symptoms:
    You have an I999XXXX error
    The system was powered-on without a POST error, but the operating
    system does not work or the system starts up in BASIC.

Verify that the system has a valid Selectable Startup Sequence. To do
this:
1. Start the system from the Reference Diskette and select **Set Features**
    from the Main Menu.
2. Select **Set Startup Sequence** and see if the *default* hard disk drive
    (drive 6) is in the startup sequence. If you receive an error
    message, follow the instructions on the screen, then return here.
3. If the default drive is in the startup sequence, exit from the screen
    and the Main Menu, then go to the next step. If the default drive is
    not in the startup sequence, follow the instructions on the screen,
    then continue with the next step.
4. Power-off the system, remove the Reference Diskette, then power-on the
    system. If the "F1" (Insert Diskette) icon appears on the screen,
    continue with the next step. If the "Not OK" icon appears on the
    screen, go to step 6.
5. Change the startup sequence to include a device that has an operating
    system, then go to step 8. The system didn't detect an operating
    system on any of the devices in the startup sequence.
6. Restart the system from the Reference Diskette. Select **Update System
    Programs** from the Main Menu and wait for the program to complete
    running.
7. Power-off the system, remove the Reference Diskette and continue with
    the next step.
8. Power-on the system, check for the normal power-up sequence and then
    Run the Advanced Diagnostic tests. If the problem still exists, go
    back to the "Symptom-to-FRU Index" in topic 14.0.

Note: If the startup sequence was customized, restore it to the
       customized settings after service is complete.

10.0 Processor Board

You are here because the system has the following symptoms:

    No beep
    No message on the display
    Fan runs
    Power-on light is on.

Remove the adapters (except the processor board), the processor board
cache option (256KB), the memory-riser card, and the memory-module kits,
one at a time, until you find the failing adapter. If all adapters have
been removed and the problem remains, replace the processor board. If the
problem still remains, replace the system board.

11.0 Keyboard
1. Power-off the system.
2. Disconnect the cable from the keyboard.
3. Power-on the system and check the connector for the voltages shown.
    All voltages are ± 5%.

PICTURE 4

If the voltages are correct, replace the keyboard.

If the voltages are not correct, suspect the keyboard cable, then the
system board.

12.0 Memory

Use the riser card figure below to locate the memory-module-kit connectors
J4 to J1. The riser cards are located in slots J11 and J14 on the system
board.

PICTURE 5

Note: Power-off the system before removing or replacing memory.

Type 1 systems run only interleaved memory configurations.

Type 2 systems run interleaved, noninterleaved, or a combination of both
configurations. The processor board that is installed determines which
type of memory (type 1 or type2) is supported. Use the FRU number on the
processor board or the submodel code from **Display Revision Levels** to
determine which processor board is installed.

To view the submodel code, go to the Main Menu and select **Display Revision
Levels**. Make note of the submodel code displayed on the screen.

The following figure converts the submodel code (and FRU number) to the
system memory type.

Submodel Code	FRU Number	System Memory Type
11	64F0201	Type 1
13	64F0198	Type 1
2D	92F0065	Type 1
2F	92F0049	Type 1
2B	92F0048	Type 1
57	92F0079	Type 2
59	92F0079	Type 2

Subtopics

12.1 Memory (Type 1 Systems)

Notes:

1. Only interleaved memory is supported. Interleaved memory-module kits
    operate in pairs (for example J1 and J3, J2 and J4). Each pair must
    be the same memory size and speed. Total system memory capacity is
    64MB. Minimum operating requirement is one *pair* of 1MB kits.

2. Running customer diagnostic tests will deallocate defective memory.
    After you replace defective memory, run the advanced diagnostic memory
    test. Otherwise, the replacement memory might not be recognized.

Run the advanced memory diagnostic test. If the test does not indicate
which memory-module kit failed, continue with the following process.

Note: If a screen message appears asking if you have replaced a specific
       memory module, suspect that *it* is the failing module.

Subtopics
12.1.1 Finding the Failing Memory

12.1.1 Finding the Failing Memory

Test the kits by removing, testing and replacing them on the riser cards
(starting with J11), one at a time (within each matched pair) until you
find the kit that caused the failure. Reinstall each kit in the same
connector on the same riser card from which it was removed. If the
problem remains, replace the riser card. If the problem still remains,
replace the processor board.

12.2 Memory (Type 2 Systems)

Notes:

1. Interleaved and noninterleaved memory is supported. If the kits are
   installed in matched pairs (for example J1 and J3, J2 and J4) of the
   same memory size and speed, the kits will automatically run in
   interleaved mode. Any other configuration is supported, but will run
   in the less-efficient noninterleaved mode. Total system memory
   capacity is 64MB. Minimum operating requirement is one 2MB kit.

2. Running customer diagnostics will deallocate defective memory. After
   you replace defective memory, run the advanced diagnostic memory test
   or the replacement memory might not be recognized.

Run the advanced memory diagnostic test. If the test does not indicate
which memory-module kit failed, continue with the following process.

Note: If a screen message appears asking if you have replaced a specific
      memory module, suspect that *it* is the failing module.

Subtopics
12.2.1 Finding the Failing Memory

12.2.1 Finding the Failing Memory

Test the kits by removing, testing and replacing them on the riser cards,
(starting with J11), one at a time (within each matched pair), until you
find the kit that caused the failure. Reinstall each kit in the same
connector on the same riser card from which it was removed. If the
problem remains, replace the riser card. If the problem still remains,
replace the processor board.

Note: If the kits are installed in a noninterleaved configuration, you
can remove and replace them in *any* order.

13.0 Processor Board and Reference Diskette Matrix

There are two types of Model 90 Reference Diskettes (labeled 1 or 2). The
processor board installed in the system determines which one to use. You
can use any of the following methods to identify the type of processor
board installed and the Reference Diskette Required:

Display Revision Levels: Go to the Main Menu and select **Display Revision
Levels**. Note the submodel code displayed on the screen (this screen is
also available to the customer).

FRU Number: Read the FRU number printed near the card-edge of the
processor board.

Upgrade Label: Check the system for an additional label next to the front
serial number. If the system is upgraded with a *different* processor
board, an upgrade label (marked P1 - P6) is added.

Use the following matrix to identify which processor board is installed
and which Reference Diskette is required.

Submodel Code Number	Processor Board FRU Number and Description	Upgrade Label Number	Reference Diskette Type Required
2F	92F0049 486SX/20	- -	1
11	64F0201 486/25	P1	1
13	64F0198 486/33	P2	1
2B	92F0048 486/50	P3	1
2D	92F0065 487SX/20	P4	1
57	92F0079 486SX/25	P5	2
59 *	92F0079 486SX/25	P6 *	2

* Also requires a 487SX processor (FRU 92F0100).

Note: For a layout of the processor board, see "Processor Board" in the
Hardware Maintenance Reference manual.

 (**) 486, 487, and SX are trademarks of the Intel Corporation.

14.0 Symptom-to-FRU Index

Error symptoms and the FRUs that might be responsible for the failure are
listed in the "Symptom-To-FRU Index." The most-likely failing FRU is
listed first. If you are unable to correct the problem using this index,
go to "Undetermined Problem" in topic 4.0.

If the system displays an error message and gives an incorrect audio
response, start with the FRUs listed for that error message. An "X" in an
error message can be any number.

Note: If an error message is not listed, there is a device installed that
        requires an additional diskette or service manual. Refer to the
        diskette or service manual for that device.

How to Read POST Error Messages

POST error messages are displayed on the screen as three, four, five, or
eight digits. The error messages that can be displayed as shorter POST
messages are highlighted in this index. Some digits will represent
different information for SCSI errors versus non-SCSI errors.

The following example shows which digits display the shorter POST error
messages and defines the SCSI information in an eight-digit error message.

```
          Shorter POST Messages
          +------------------+
          ¦    ¦    ¦    ¦    ¦
  +---------------------------------------+
  ¦ 0 ¦ 0 ¦ 0 ¦ 0 ¦ 0 ¦ 0 ¦ 0 ¦ 0 ¦
  +---------------------------------------+
    ¦    ¦    ¦    ¦    ¦    ¦    ¦    ¦
    ¦    ¦    ¦    ¦    ¦    ¦    ¦  Size (SCSI)
    ¦    +---------+    ¦    ¦   Slot Number (SCSI)
    ¦     Device Code   ¦   Logical Unit Number (SCSI)
Information         SCSI ID
```

All SCSI devices must be set to a different SCSI ID. Duplicate SCSI ID
settings can generate a false error message. Use the SCSI ID to determine
whether the error message is coming from an internal or an external
device.

Note: If you are instructed to replace either the processor board or the
        system board, and the first board that you replaced does not
        correct the problem, then replace the other board (processor or
        system) and reinstall the original board.

Subtopics
14.1 No-Beep Symptoms
14.2 Beep Symptoms
14.3 Miscellaneous Symptoms
14.4 Numeric Error Codes

14.1 No-Beep Symptoms

Symptom/Error	FRU / Action
No beep, power-on light does not light, and fan does not run. (See "Undetermined Problem" in topic 4.0 before replacing any FRUs.)	**Power Supply** Processor Board System Board Any device or adapter
No beep, fan runs, and 000**215**XX is displayed. (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** Processor Board System Board
No beep, fan runs, power-on light is on, and system stops during POST with a message displayed. (See "Undetermined Problem" in topic 4.0 before replacing any FRUs.)	**System Board** Processor Board Power Supply
No beep, fan runs, power-on light is on, and system stops during POST with no message displayed, or an unreadable display. (See "Processor Board" in topic 10.0 before replacing any FRUs.)	**Processor Board** System Board Power Supply
No beep, fan runs, power- on light lights, memory count and blinking curser continuously loops.	**Processor Board Cache**
No beep and the system is otherwise functional	**Speaker/Switch Assembly** System Board

14.2 Beep Symptoms

Symptom/Error	FRU / Action
Operating system does not work, or the system starts up in BASIC. (See "IML / IPL" in topic 9.0 before replacing any FRUs.)	**Default SCSI Hard Disk Drive**
One long and two short beeps (See "Display Self-Test" in topic 7.0 before replacing any FRUs.)	**Display Option Adapter** System Board Processor Board Power Supply Video Memory (System Board)
One or two short beeps and a blank or unreadable display or a blinking cursor. (See "Display Self-Test" in topic 7.0 before replacing any FRUs.)	**Display Option Adapter** System Board Power Supply Display Video Memory (System Board)
One long and one short beep (See "Display Self-Test" in topic 7.0 before replacing any FRUs.)	**Display Option Adapter** System Board Power Supply
Continuous beep	**Power Supply** System Board
Repeating short beeps	**Power Supply** System Board Keyboard (Stuck Key)

14.3 Miscellaneous Symptoms

Symptom/Error	FRU / Action
Program loads from the hard disk drive or a non-system disk or disk error (with the Reference Diskette in drive A.)	**Diskette Drive** System Board Power Supply
Display screen changes colors	**Display** Video Memory
Power-on light does not light and fan runs	**Speaker/Switch Assembly**
IML image has been updated and the Insert-diskette icon appears on the display.	Verify an operating system has been loaded onto the default hard disk drive.
Memory count displayed does not match memory installed. (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** Memory Riser Card
One or more keys do not work and system is otherwise functional	**Keyboard** Keyboard Cable System Board
Intermittent Failures (See "Undetermined Problem" in topic 4.0 before replacing any FRUs.)	**Power Supply** System Fans Any device or adapter
System will not power-off	**Switch/Speaker Assembly** System Board Power Supply
LED for hard drive disk stays on.	**Hard Disk Drive** System Board Power Supply
LED for hard disk drive is not working, and the system is otherwise functional.	**Hard Disk Drive LED Assembly** System Board
Unable to Start Reference Diskette.	**Diskette Drive** System Board Diskette Drive Cable

14.4 Numeric Error Codes

Symptom/Error	FRU / Action
000**102**XX, 000**104**XX	**Processor Board** System Board
000**103**XX (If a 20-MHz board is installed, and the processor is not a 487SX, verify that the jumper is in positions 2 and 3.) (487SX is indicated on the processor.)	**Processor Board** System Board
000**107**XX, 000**110**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** System Board
000**112**XX, 000**113**XX 000**114**XX	**Any Adapter** System Board
000**118**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory**
000**161**XX	**Battery** System Board
000**163**XX, 000**164**XX, 000**165**XX, 000**169**XX (If setting configuration does not solve the problem, see "Installed Devices List" in topic 2.0.)	**Set Configuration/Features** System Board Processor Board
000**166**XX	**Any Adapter**
000**171**XX	**Battery** System Board
000**173**XX (Verify the "Enable," "Disable" settings are correct before replacing any FRUs, see "Enable and Disable Settings" in topic 5.0.)	**Any Device**
000**174**XX (If Automatic Configuration does not solve the problem, run Advanced Diagnostics.)	**Set Configuration/Features**
000**194**XX	**System Board**
0001**XX**XX (not listed above)	**Processor Board** System Board
000**201**XX	**System Board Memory** System Board
0002**0X**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** Processor Board
000**210**XX, 000**211**XX	**Processor Board** System Board Memory System Board
000**215**XX, 000**221**XX, 000**225**XX, 000**240**XX, 000**255**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** System Board Processor Board
000**252**XX, (Intermittent error. Run advanced memory diagnostics in loop mode before replacing any FRUs.)	**System Board**
000**295**XX, 000**296**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board Memory** System Board

Error Code	FRU
000**298**XX (See "Memory" in topic 12.0 before replacing any FRUs.)	**System Board** System Board Memory
00030**X**XX	**Keyboard** Keyboard Cable System Board
000**401**XX	**System Board**
000**602**XX	**Defective Diskette**
0006**XX**XX	**Diskette Drive** System Board Power Supply Diskette Drive Cable
001**102**XX, 001**106**XX	**System Board** Any serial device
001**107**XX	**Communications Cable** System Board
0011**XX**XX (not listed above) (See "Power Supply Voltages" in topic 6.0. before replacing any FRUs.)	**System Board**
001**207**XX	**Communications Cable** Dual Async Adapter/A
0012**XX**XX (not listed above)	**Dual Async Adapter/A** System Board Any Serial Device
0014**XX**XX (See "Printer" in topic 8.0 before replacing any FRUs.)	**Printer** System Board
0020**XX**XX	**Video Memory**
002**401**XX	**Display** System Board Video Memory
002**410**XX	**System Board**
004**611**XX, 004**630**XX	**Multiport/2 Interface Board** Multiport/2 Adapter
004**612**XX, 004**613**XX, 004**640**XX, 004**641**XX	**Memory Module Package** Multiport/2 Adapter
00**465**000	**Multiport Interface Cable**
0046**XX**XX (not listed above)	**Multiport/2 Adapter** Multiport/2 Interface Board Memory Module Package
0075**XX**XX (See "Display Self-Test" in topic 7.0 before replacing any FRUs.)	**Display Adapter** System board Video-Memory Module Display
0086**XX**XX	**System Board** Pointing Device
0096**XX**XX	**SCSI Adapter (with cache)** Any SCSI Device System Board
0**10007**XX	**Communications Cable** Multiprotocol Adapter/A
0100**XX**XX (not listed above)	**Multiprotocol Adapter/A** System Board
0101**XX**XX (not listed above)	**Modem Adapter/A** System Board Any Serial Device

0107XXXX	**5.25-inch External Diskette Drive** 5.25-inch Diskette Drive Adapter/A
0112XXXX	**SCSI Adapter (without cache)** Any SCSI Device System Board
012917XX (If a 20-MHz board is installed, and the processor is a 487SX, verify that the jumper is in positions 1 and 2.) (487SX is indicated on the processor.)	**Processor Board**
0129XXXX (not listed above)	**Processor Board Cache (256KB)** Processor Board System Board
0137XXXX	**System Board**
0141XXXX	**Realtime Interface Coprocessor Portmaster Adapter/A**
014710XX	**System Board**
0147XXXX, 148XXXX (not listed above)	**Video Memory** System Board Processor Board
0152XXXX	**XGA Display Adapter/A** Video-Memory Module System Board
0164XXXX	**120MB Internal Tape Drive** Diskette Cable System Board
0165XXXX	**6157 Streaming Tape Drive** 6157 Tape Attachment Adapter
0166XXXX, 0167XXXX (For diagnostic information refer to the Token-Ring Network Adapter/A service Information.)	**Token-Ring Network Adapter/A** System Board
0200XXXX	**Image Adapter/A** Video-Memory Module System Board
0208XXXX (Verify there are no duplicate SCSI ID settings.)	**Any SCSI Device**
0210XXXA 0210XXXB 0210XXXC 0210XXXD 0210XXXE 0210XXXF 0210XXXG 0210XXXH 0210XXXU (If the failing device is an external device, go to the external devices service pamphlet.)	**SCSI Hard Disk Drive (60MB)** **SCSI Hard Disk Drive (80MB)** **SCSI Hard Disk Drive (120MB)** **SCSI Hard Disk Drive (160MB)** **SCSI Hard Disk Drive (320MB)** **SCSI Hard Disk Drive (400MB)** **SCSI Hard Disk Drive (40MB)** **SCSI Hard Disk Drive (Size Undetermined)** SCSI Adapter SCSI Cable
0211XXXX (Go to the external devices service pamphlet.)	**2.3GB SCSI Tape Drive** SCSI Adapter SCSI Cable
0215XXXX (If the failing device is an external device, go to the external devices service	**SCSI CD-ROM Drive** SCSI Adapter SCSI Cable

```
¦ pamphlet.)                         ¦                                 ¦
+----------------------------------+---------------------------------¦
¦ 0217XXXX                          ¦                                 ¦
¦ (If the failing device is         ¦ SCSI Rewritable Optical Drive   ¦
¦ an external device, go to         ¦ SCSI Adapter                    ¦
¦ the external devices              ¦ SCSI Cable                      ¦
¦ service pamphlet.)                ¦                                 ¦
+----------------------------------+---------------------------------¦
¦ I99900XX                          ¦                                 ¦
¦ (Before replacing any FRUs, go to ¦ Default SCSI Hard Disk Drive    ¦
¦ "IML / IPL" in topic 9.0.)        ¦ SCSI Adapter                    ¦
¦                                   ¦ SCSI Cable                      ¦
¦                                   ¦                                 ¦
+----------------------------------+---------------------------------+
```

Symptom-to-FRU Supplemental Numbers:

15.0 How To Use This Parts Catalog

INDEX REFERENCE NUMBERS: Refer to the illustrations for index reference
numbers listed in the left margin of the parts listing.

SIMILAR ASSEMBLIES: If two assemblies contain a majority of identical
parts, they are broken down on the same list. Parts peculiar to one or
the other of the assemblies are listed separately and identified by
description.

AR: (As Required) indicates that the quantity is not the same for all
machines.

R: (Restricted) indicates that the part has a restricted availability.

INDENTURE: The indenture is marked by a series of dots located before the
parts description. The indenture indicates the relationship of a part to
the next higher assembly. For example:

Indenture Relationship of Parts
(No dot) Main Assembly
(One dot)   Detail parts of a main assembly
(One dot)   Subassembly of the main assembly
(Two dot)   Detail part of a one-dot
                subassembly
(Two dot)   Subassembly of a one-dot
                subassembly

Subtopics
15.1 Example of a Parts List

15.1 Example of a Parts List

Index   ***System Unit***
32   Cover   90X9288
03   Front Bezel/Logo (R)   72X8502
                Miscellaneous Hardware Kit (AR)   72X8580
                   Knob Assembly, Hard Disk
                    Drive Support Structure
                    Knob
                    Washer

16.0 System Overview

PICTURE 6

16.0 System Overview

PICTURE 6

17.0 System Overview (continued)

PICTURE 7

17.0 System Overview (continued)

PICTURE 7

18.0 Parts

Index	System Unit Exterior	
01	Cover	33F8350
05	Base Frame (R)	64F4116
	5.25-Inch Diskette Drive Bezel	33F8458
	5.25-Inch Hard Disk Drive Bezel	64F4104
16	Bezel for Hard Disk Drive	33F8361
17	3.5-Inch Diskette Drive Bezel	33F8360
	3.5-Inch device filler Bezel	64F4149
18	Blank Bezel for 5.25-inch Drive Bay	33F8362
	CD-ROM Framing Bezel	64F4122
	CD-ROM Drive Bezel	85F0018
	CD-ROM Drive Bezel (Bay B)	85F0016
	CD-ROM Drive Bezel (Bay D)	85F0017
	Bay B Large Shield	85F0006
	Bay B Small Shield	85F0005
	Bay C and D Shield	85F0034
	Keylock Assembly	33F8353

Index	System Unit Interior	
02	Power Supply	92F0088
	Power Supply Bracket	64F4131
03	System Board (without memory)	64F3287
04	Hard-Disk-Drive Removal Tool	64F4126
06	Hard Disk Drive	
	(See Hard Disk Drives)	
07	Diskette Drive	
	(See Diskette Drives)	
08	Air Baffle (processor)	85F0062
09	Fan (secondary)	64F4128
10	Power Switch/Speaker assembly	33F8352
11	Memory-Riser Card	33F4905
12	Memory-Riser Card	33F4905
	System-Board Memory-Module Kit	
	(See Options and Adapters)	
13	Processor Board	
	(See Processor Board)	
	Adapter Card-Guide Assembly	33F8363
14	SCSI Adapter (See Hard Disk Drives)	
15	Memory-Riser-Card Support Bracket	57F3029
19	SCSI Internal Cable	64F4127
20	Hard Disk Drive Cable	
	(See Hard Disk drives)	
21	Diskette Drive Signal Cable	57F3030
	Video Memory	75X5894
	Battery	33F8354
	3 Amp Fuse	72X8561
	Label Kit	33F8367
	Misc. Parts Kit	33F8370

Index	Power Cord	
	Display Power Cord, for:	
22	Colombia, U.S., Venezuela	68X3071
	System Unit Power Cord, for:	
23	Colombia, U.S., Venezuela	62X1045
	System Unit Power Cord, for:	
24	Hong Kong, Singapore, U.K.	14F0033
	System Unit Power Cord, for:	
25	France, Germany, Spain	13F9979
	System Unit Power Cord, for:	
26	Italy	14F0069
	System Unit Power Cord, for:	
27	Australia, New Zealand	13F9940

Diskette Drive	
1.44MB Drive	64F0162
Drive Slide	64F0156
Drive Signal Cable	57F3030
5.25-Inch Diskette Drive:	
360KB External (4869-001)	72X6759
360KB External (4869-501)	72X6768
1.2MB External (4869-002)	15F7993
1.2MB External (4869-502)	15F7994
1.2MB Internal Drive (with rails)	64F4102
1.2MB Rail kit (for 64F4102)	85F0041

Hard Disk Drive (SCSI)	
40MB Drive (AR)	56F8866
60MB Drive	6128296

```
        80MB Drive                          56F8854
        120MB Drive                         6128298
        160MB Drive                         56F8851
        320MB Drive                         85F0011
        400MB Drive                         85F0012
        Drive Slide                         85F0035
        SCSI Adapter (with cache)           85F0000
        SCSI Adapter (without cache)        85F0002
        Terminator, External (for 85F0000)  33F8464
        Terminator, Internal (for 85F0000)  34F0025
        Terminator, Internal (for 85F0002)  57F2870
        Power Cable (single)                33F8431
        Power Cable (dual)                  85F0007
```

Processor Board (with Connector for L2 Cache)
```
        80486 (25 MHz single socket)        64F0201
        80486 (33 MHz single socket)        64F0198
        256KB L2 Cache (17ns) (for 25,33 MHz)          64F0199
        80486 (50 MHz single socket)        92F0048
        256KB L2 Cache (12ns) (for 92F0048) 92F0050
        Cache Kit (Misc. Parts)             33F8435
```

Processor Board (without connector for L2 Cache)
```
 80487SX (20 MHz single socket)            92F0065
 80486SX (20 MHz single socket)            92F0049
 80486SX (25 MHz dual sockets)             92F0079
 80487SX Microprocessor (for 92F0079)      92F0100
```

CD-ROM Drive
```
 Internal CD-ROM Drive                     81F7930
 Terminator Kit (for 81F7930)              59F3530
 Ground spring (for 81F7930)               85F0067
 Rail Kit                                  34F0041
 Slide                                     85F0014
 Headphones                                59F3655
 Cleaning Kit                              59F3562
   Cleaning Disk
   Test Disk
   Disc Caddy
```

Options and Adapters
```
 300/1200 Modem Adapter/A                  34F0006
 Communications Cable (for 34F0006)        8285985
 300/1200/2400 Modem Adapter/A             65X1253
 Communications Cable (for 65X1253)        94X1540
 Baseband Card                             72X8102
 Baseband Cable                            72X8107
 Broadband Card                            72X8106
 3270 Connection                           74F3464
 6157 Tape Adapter                         92X1459
 Image Adapter/A                           07F2508
 Video-Memory Module (512K) (for 07F2508)  07F4401
 Video-Memory Module (1MB) (for 07F2508)   07F4402
 XGA Display Adapter/A                      75X5886
 Video-Memory Module (for 75X5886)         75X5894
 Dual Async Adapter/A                       34F0008
 Pageprinter Adapter                        75X8213
 Realtime Interface Coprocessor
  Portmaster Adapter/A                      53F2603
    512KB Memory Module Package             53F2656
    1MB Memory Module Package               53F2660
    2MB Memory Module Package               53F2664
   RS232 Interface Board                    53F2612
   RS422 Interface Board                    53F2615
 Multiprotocol Adapter/A                    90X8995
 Token-Ring Busmaster Adapter/A             74F4149
 Printer Accessory Kit                      1183003
 Token-Ring Network Adapter/A               83X7488
 Token-Ring Adapter/A RPL Module            83X9180
 Token-Ring 16/4 Adapter/A                  16F1144
 Token-Ring 16/4 Adapter/A RPL Module       53F7747
 Realtime Interface Coprocessor
  Multiport/2                               09F1888
```

Options and Adapters (continued)
```
    8-port RS232-C Electrical
      Interface Board                       91F7974
    4-port RS232-C Electrical
```

```
     Interface Board                        91F7976
     Electrical Interface Board             91F7966
   512KB Memory Module Package              16F2267
    Multiprotocol Interface Cable
     (for 09F1888)                          00F5524
    4+4-port RS232-C RS422-A
Screen Reader Keypad                        1393515
Screen Reader Keypad Cable                  72X8537
5.25-Inch External Diskette Adapter/A
(1.2MB or 360KB)                            15F7996
3.5-Inch 127MB Rewritable Optical Drive     85F0015
Drive mounting Tray (for 85F0015)           85F0023
Objective Lens Cleaning Cartridge (for 85F0015)     85F0043
Prism Lens Cleaning Cartridge (for 85F0015) 85F0054
Memory-Module Kits
    1MB (85ns) (type 1 systems only)        90X8624
    2MB (85ns) (type 1 systems only)        92F0104
    2MB (70ns)                              92F0102
    2MB (80ns)                              92F0103
    4MB (70ns)                              92F0105
    4MB (80ns)                              87F9980
    8MB (70ns)                              64F3606
    8MB (80ns)                              64F3607
Memory-Module Kit (replacement kit)         34F2825
```

Keyboards / Mouse
```
Belgian                                     1392012
Canadian French                             1392011
Danish                                      1392005
Dutch                                       1392013
French                                      1392000
German                                      1392001
Italian                                     1392002
Norwegian                                   1392007
Portuguese                                  1392008
Spanish                                     1392003
Spanish / Latin                             1392015
Swedish                                     1392009
Swiss / French / German                     1392010
U.K. English                                1392004
U.S. English                                1392090
Keyboard Cable Assembly 0.9 m (3 ft.)       61X8898
Keyboard Parts Kit                          33F8174
Mouse                                       61X8923
  Mouse Ball and Pop-Off Retainer           33F8461
  Mouse Ball and Twist-Off Retainer         33F8462
```

Tools and Miscellaneous
```
 Tri-Connector Wrap Plug                    72X8546
 Wrap Plug                                  59X4115
 Wrap Plug
  (for Token-Ring Network Adapter/A         6165899
 Wrap Plug (for Real-time Interface
  Co-Processor Multiport/2) 78-pin          16F2478
 Wrap Plug (for Multiport Interface Cable)
  Direct Connect 25-pin, ports 0 and 1      6425494
 Wrap Plug (for Multiport Interface
  Cable) Direct Connect 25-pin, ports 2
  through 7                                 09F1799
 Plastic Envelope (For Wrap Plug)           6138013
 Data Migration Facility                    61X8936
 Key Cap Removal (keyboard) Tool            6110464
 Hard-Disk-Drive Removal Tool               64F4126
 Video Memory Removal Tool                  79X5893
 Video Memory Insertion Tool                07F2518
```

8503 Monochrome Display (with tilt / swivel Stand)
```
110/120 Vac                                 68X3045
220/240 Vac (Northern Hemisphere)           68X3046
220/240 Vac (Southern Hemisphere)           72X7878
Tilt/Swivel Stand                           68X3061
```

8506 Monochrome Display (with tilt / swivel stand)
```
110/125 Vac (US/Canada)                     39F8087
110/125 or 200/240 Vac (Northern Hemisphere)     39F8088
110/125 or 220/240 Vac (Southern Hemisphere)     39F8089
```

8507 Monochrome Display (with tilt / swivel stand)

```
 110/120 or 220/240 Vac (Universal Model)     6247808
```

8508 Monochrome Display (with tilt / swivel stand)
```
 110/125 Vac (US/Canada)                      6247838
 110/125 or 200/240 Vac (Northern Hemisphere)      39F8067
 110/125 or 220/240 Vac (Southern Hemisphere)      39F8068
```

8512 Color Display (without tilt / swivel stand)
```
 110/120 Vac                                  61X8924
 220/240 Vac (Northern Hemisphere)            61X8928
 220/240 Vac (Southern Hemisphere)            61X8927
 Tilt/Swivel Stand                            61X8925
```

8513 Color Display (with tilt / swivel stand)
```
 110/120 Vac                                  68X3088
 220/240 Vac (Northern Hemisphere)            72X7870
 220/240 Vac (Southern Hemisphere)            72X7877
 Tilt/Swivel Stand                            68X3061
```

8514 Color Display (without tilt / swivel stand)
```
 110/120 Vac                                  75X5945
 220/240 Vac (Northern Hemisphere)            75X5946
 220/240 Vac (Southern Hemisphere)            75X5947
 Tilt/Swivel Stand                            75X5907
```

8515 Color Display (with tilt / swivel stand)
```
 Model 001 (90/137 Vac (U.S. and Canada) with
  tilt/swivel and packaging set              38F3911
 Model 002 (90/265 Vac, Universal voltage) with
  tilt/swivel and packaging set              38F3912
 Model A01 (90 Vac) with
  tilt/swivel and packaging set              38F3913
 Shipping material:                          16F0188
    Box
    Front cushion
    Rear cushion
 Power cable, 1.8 (6 ft), U.S.               38F3968
```

Supplemental Parts: