



*NOTICES Notices*

This Feature pamphlet is a component of PS/2 Bill of Forms number  
SB0F-2480-00.

*EDITION Edition Notice*  
**First Edition (October 1990)**

The drawings and specifications contained herein shall not be reproduced in whole or in part without written permission.

IBM has prepared this publication for the use of customer engineers in the installation, maintenance, or repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

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.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office servicing your locality.

Address comments concerning the content of this publication to IBM Corporation, Dept. 90A, Bldg. 234-2, Internal Zip 4307, 951 NW 51st St., Boca Raton, Florida, U.S.A. 33432. IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

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.

| **Copyright International Business Machines Corporation 1989, 1990.**  
**All rights reserved.**

Note to US Government users - Documentation related to Restricted rights - Use, duplication, or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

*LEGEND Special Notices*

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, is 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:

- Assistant Series
- IBM
- PC
- Personal System/2

The following terms, denoted by a double asterisk (\*\*) in this publication, are trademarks of other companies as follows:

- Okidata           Registered Trademark of Oki America, Inc.
- Lotus             Trademark of Lotus Development Corporation
- 1-2-3            Trademark of Lotus Development Corporation
- Disk Manager    Trademark of On Track Computer Systems, Inc.

CONTENTS Table of Contents

TITLE	Title Page
NOTICES	Notices
EDITION	Edition Notice
LEGEND	Special Notices
CONTENTS	Table of Contents
1.0	OEM Service
1.1	General Information
1.1.1	Printers
1.1.2	Modems
1.1.3	Internal Adapter Cards
1.1.4	Internal Fixed Disk and Tape Drives
1.1.5	External Cables
1.2	Okidata Printers
1.2.1	Online Testing
1.2.2	Microline 84-2
1.2.3	Microline 92/93
1.2.4	Microline 182/183
1.2.5	Microline 192/193
1.2.6	Microline 192/193 Plus
1.2.7	Microline 292/293/294
1.2.8	Microline 320/321
2.0	Formatting Fixed Disks
2.1	Disk Manager
2.1.1	Help
2.1.2	Invoking Disk Manager
2.1.3	Technical Support
2.1.4	Back-Up Copies
2.2	Formatting MFM/RLL Fixed Disk Drives in a 5160 with ST-412 or ST-506 Interfaces
2.2.1	Performing Low Level Format Using Debug
2.2.2	Partitioning the Drive
2.2.3	High Level Format
2.3	OEM IOE Service Enhanced with "Limited Repair" Option
2.3.1	Strategy Overview
2.3.2	Repair Parts
2.3.3	Call Reporting
2.3.4	Service Call Flow
2.3.5	Common Functional Checklist
2.3.6	CE Training
2.3.7	Support
2.4	General Guide to OEM Printer Function Sequences
2.4.1	Power-on-Reset (POR)
2.4.2	Index and Paperfeed
2.4.3	Print Function
2.4.4	Printer Self-testing
2.5	Common Parts Removal and Replacement Procedures
2.5.1	Platen Knobs
2.5.2	Cardholders
2.5.3	Printmask (Printshield)
2.5.4	Printheads
2.6	OEM Printer Functional Checklist
2.7	Electrical Power
2.8	Noise
2.9	POR Failures
2.10	Self-test Failures
2.11	Lights (and Beepers)
2.12	Print Quality
2.13	Paperfeed
2.14	Operator Panel Response
2.15	CPU Response
2.16	Limited Repair Service Call Flow
2.17	Invoking OEM Printer Self-tests
2.17.1	OEM Printer Self-tests
3.0	Call Reporting/Non-IBM Products (IOE, IOR and Labor Only Accommodations)
3.1	Non-IBM Products Call Reporting Matrix
3.2	Non-IBM Machine Types and Product Descriptions

1.0 OEM Service

Subtopics

1.1 General Information

1.2 Okidata Printers

### 1.1 General Information

The following information will provide IBM customer engineers (CEs) with general guidelines for servicing various types of original equipment manufacturer (OEM) devices.

It is recommended that the IBM customer engineer should retain the defective OEM device until a replacement device is obtained. The defective device can then be used to assist with setup information, such as switch and jumper settings and installing options on replacement device. If it is not possible or practical to keep the defective device until the replacement device arrives, ensure that applicable information is documented.

OEM manuals are also a valuable source of reference information and can generally be obtained from the customer.

If further assistance is required, remember that support is available from the Atlanta IBM Support Center for IBM CEs.

#### Subtopics

- 1.1.1 Printers
- 1.1.2 Modems
- 1.1.3 Internal Adapter Cards
- 1.1.4 Internal Fixed Disk and Tape Drives
- 1.1.5 External Cables

### 1.1.1 Printers

If you are experiencing problems identifying the correct part number for an OEM printer, verify the information below:

- Does the printer have a serial or parallel interface?
- Does the printer have IBM emulation or some other type emulation?
  - Okidata\*\* uses its Microline emulation on many of its printers. Refer to "Okidata Printers" in topic 1.2 for Okidata self-tests.
- Is the printer letter quality (LQ) or near letter quality (NLQ)?
- What are the printer options?
  - Some printers have multiple part numbers, which are dependent on the option content.

Always remove and retain the sheet-feed, tractor-feed, font-module, buffer-module, or personality-module options, if attached to the printer, before replacing the printer. These options should then be installed on the replacement printer.

If the defective printer is no longer available and has been substituted with another printer model, you must evaluate the compatibility of each option with the replacement printer. If the options are not compatible with the replacement printer, new options should be ordered separately. If necessary, contact technical support for assistance.

1.1.2 *Modems*

For internal and external modems, ensure that the switch settings of the defective modem are noted. The replacement modem switch settings should be set accordingly.

1.1.3 *Internal Adapter Cards*

When replacing a defective internal adapter card, ensure that switch settings and memory size are verified and documented. For a memory adapter card, order a replacement card with the same amount of memory or with more memory than the customer currently has. If you order a card with more memory, depopulate the new card to match the customer's current memory configuration. If the customer's configuration is not available, then a memory card may be purchased locally.

1.1.4 *Internal Fixed Disk and Tape Drives*

When replacing an internal fixed disk drive, verify that pin one (red stripe) goes to pin one on the fixed disk adapter card. Occasionally the cable will be keyed in reverse.

If you must replace a fixed disk adapter card with a substituted fixed disk adapter card, be sure to format the fixed disk. This will ensure that the fixed disk drive and fixed disk adapter card are compatible.

If you need to format an OEM hard drive, you can order a software program called Disk Manager\*\* from Mechanicsburg under part number 31F1038. (See "Formatting Fixed Disks" for more information.)

The internal tape backup device uses the diskette drive adapter card, and therefore does not require its own adapter card.

Many external tape units now require installation kits, if the unit being replaced is substituted for an obsolete or unavailable product. Order the appropriate adapter card for the new drive. Most adapter cards are packaged with the cables and software necessary to complete the installation.

1.1.5 *External Cables*

When replacing external devices, retain all external cables for use in the installation of the replacement device.

Replacement external cables should be ordered locally whenever possible.

## 1.2 Okidata Printers

Okidata printers are very popular OEM printers and are used by a significant number of IBM\* PC\* and PS/2\* customers. Many Okidata printers are available in two versions of software compatibility. The first is Okidata's own version, called Microline or Standard. The other version is known as the IBM version. Each version has its own unique command language, which means each version can be used only by software that recognizes this language.

If the software is a commercially available package, such as Lotus\*\* 1-2-3\*\* or IBM's Assistant Series\*, then users can choose the version they want by changing the printer options within the software package (usually from a selection menu of the most popular printers).

If the customer is using a custom software application, then it is impossible to change the choice of versions.

In addition to software compatibility, Okidata printers are available with either a parallel or serial interface, or both if it is a larger high-function model. One Okidata printer model may have as many as four IBM part numbers.

### Subtopics

- 1.2.1 Online Testing
- 1.2.2 Microline 84-2
- 1.2.3 Microline 92/93
- 1.2.4 Microline 182/183
- 1.2.5 Microline 192/193
- 1.2.6 Microline 192/193 Plus
- 1.2.7 Microline 292/293/294
- 1.2.8 Microline 320/321

1.2.1 *Online Testing*

Specific instructions follow for performing online tests for all Okidata printers. These tests clearly identify whether the printer is Microline or IBM compatible.

1.2.2 Microline 84-2

If you are servicing a Microline 84-2 printer, you must determine whether it is Standard or IBM compatible:

1. Before powering on the printer, set the yellow forms dial to "0."
2. Press and hold down the Line Feed button while powering on. After three seconds release the button.
3. The printer will print the self test. If the self test runs all the characters straight across the page, it is IBM compatible. If the test leaves a white gap in the middle of the page, it is Standard compatible.

1.2.3 Microline 92/93

If you are servicing a Microline 92/93 printer, you must determine whether it is Standard, IBM, or Apple compatible:

1. Press and hold down the Line Feed button while powering on. After three seconds, release the button.
2. The printer will print the self test. The first line of the test is the revision number of the printer. When the first line has printed, power off the printer. If the test has printed **REV. 3, 4, or 5**, it is a Standard-compatible printer. If it prints **REV. 1, 2 or 2.1**, it is either IBM or Apple compatible. Use the following procedure to determine which:
  - a. Press and hold down the FF button while powering on. Release the button.
  - b. Use the following BASIC program to determine if the printer prints the data it receives in correspondence-quality print. If your printout is correspondence quality, it is IBM compatible. If not, it is an Apple-compatible printer.
  - c. IBM COMPATIBLE:

```
10 LPRINT "This is a test of the MICROLINE 92/93 printer"
20 RUN
APPLE COMPATIBLE:
10 PR#1
20 PRINT "This is a test of the MICROLINE 92/93 printer"
30 PR#0
```

1.2.4 Microline 182/183

If you are servicing a Microline 182/183 printer, you must determine whether it is Standard or IBM compatible.

Use the following BASIC program to determine if the printer prints the data it receives in condensed print. If the printout is condensed, it is IBM compatible. If not, it is a Standard-compatible printer.

```
IBM COMPATIBLE:
10 LPRINT CHR$(15)
20 LPRINT "This is a test of the MICROLINE 182/183 printer"
30 RUN
```

1.2.5 Microline 192/193

If you are servicing a Microline 192/193 printer, you must determine whether it is Standard, IBM or Apple compatible.

1. Press and hold down the Form Feed button while you power on. Release the button. The printer will print **MENU PRINT?**
2. Now press the Select button once. The current print menu will be printed with the values of all the menu options listed. Now press the TOF button once. **MENU END** will print.
3. Look for the option **PROP SP**. If this option is *not* listed, it is an Apple-compatible printer. If **PROP SP** does appear, it is a Standard- or IBM-compatible printer. To determine which, follow this procedure: look for the option **APA-7/8**. If this option is *not* listed, it is IBM compatible. If it *is* listed, it is Standard compatible.

1.2.6 Microline 192/193 Plus

If you are servicing a Microline 192/193 Plus printer, you must determine whether it is Standard or IBM compatible:

1. Press and hold down the Form Feed button while you power on. Release the button. The printer will print **MENU PRINT?**
2. Now press the Select button once. The current print menu will be printed with the values of all the menu options listed. Now press the TOF button once. **MENU END** will print.
3. Look for the option **COMPATIBILITY**. If it *is* listed, it is IBM compatible. If it is *not* listed, it is Standard compatible.

1.2.7 Microline 292/293/294

If you are servicing a Microline 292/293/294 printer, you must determine whether it is Standard or IBM compatible:

1. Press and hold down the Line Feed button while you power on. After three seconds, release the button.
2. The printer will print the self test. The first line of the test will print the model number, followed by the version IBM or STD (for Standard). When the first line has printed, press the Select button to stop the test.

1.2.8 Microline 320/321

If you are servicing a Microline 320/321 printer, you must determine whether it is Standard or IBM compatible:

1. Press and hold down the Line Feed button while you power on. After three seconds, release the button.
2. The printer will print the self test. The first line of the test is the printer model and emulation, that is, **EI = EPSON/IBM** and **ML = MICROLINE** (Standard version and Revision number).
3. Press the Mode button to stop the test.

2.0 *Formatting Fixed Disks*

Subtopics

- 2.1 Disk Manager
- 2.2 Formatting MFM/RLL Fixed Disk Drives in a 5160 with ST-412 or ST-506 Interfaces
- 2.3 OEM IOE Service Enhanced with "Limited Repair" Option
- 2.4 General Guide to OEM Printer Function Sequences
- 2.5 Common Parts Removal and Replacement Procedures
- 2.6 OEM Printer Functional Checklist
- 2.7 Electrical Power
- 2.8 Noise
- 2.9 POR Failures
- 2.10 Self-test Failures
- 2.11 Lights (and Beepers)
- 2.12 Print Quality
- 2.13 Paperfeed
- 2.14 Operator Panel Response
- 2.15 CPU Response
- 2.16 Limited Repair Service Call Flow
- 2.17 Invoking OEM Printer Self-tests

## 2.1 Disk Manager

Disk Manager is a program that will allow IBM Customer Engineers to perform several tasks on OEM hard drives that were previous done using a DOS program (DEBUG). Disk Manager is a menu driven program that supports a significant number OEM hard drives and controller cards. Its primary use is to do low level formats on hard drives installed in the PC family products (5150, 5160, and so on).

Disk Manager will:

1. Verify that the drive you intend to install can communicate properly.
2. Prompt you to specify the drive model.
3. Optionally allow you to enter the defect list. (If you have a defect list you should enter it or you may lose detail.)
4. Perform low level format, partition the disk, perform high level format, and leave you with a bootable hard disk.

Subtopics

- 2.1.1 Help
- 2.1.2 Invoking Disk Manager
- 2.1.3 Technical Support
- 2.1.4 Back-Up Copies

2.1.1 Help

Disk Manager has an online help screen that can also be printed out. See the *Disk Manager User's Guide* under "The HELP Utility" for instructions on its use.

2.1.2 *Invoking Disk Manager*

It is recommended that you use Disk Manager in the MANUAL mode. At the DOS prompt, type:

**DM /M**

or

**DM /M/C** if you have a color monitor.

You will be guided through menus for all tasks that need to be performed.

2.1.3 *Technical Support*

It is recommended that you print the HELP manual (at the DOS prompt, type **HELP**) before contacting On Track Computer's technical support line for assistance in using Disk Manager, or if you are having difficulty formatting a hard drive.

IBM is not required to register with On Track to receive support. Their number is (612) 937-2121. Consult the *User's Guide* before you call.

2.1.4 *Back-Up Copies*

Back-up copies may be made but must *not* be distributed to other CEs.  
Additional copies may be obtained through PC OEM Level II support.

2.2 Formatting MFM/RLL Fixed Disk Drives in a 5160 with ST-412 or ST-506 Interfaces

Formatting MFM/RLL OEM fixed disk drives in a 5160 that uses an ST-412 or ST-506 interface is a three-step process that must be performed when a fixed disk or its controller is replaced. This procedure requires a copy of DOS that includes the Debug program (DOS 3.0 or higher is recommended). The three-step process involves:

1. Low level format, used to establish communication between the disk and the controller
2. Partition with FDISK, used to establish a contiguous group of cylinders allocated for the operating system
3. High level format, used to install the operating system on the disk.

Subtopics

2.2.1 Performing Low Level Format Using Debug

2.2.2 Partitioning the Drive

2.2.3 High Level Format

2.2.1 *Performing Low Level Format Using Debug*

1. Insert the DOS diskette in diskette drive A.
2. Power on or press Ctrl-Alt-Del.
3. At the A> prompt, type **DEBUG** and press ENTER. The system should display a "-" (minus sign). This is the Debug prompt.
4. At the "-" prompt, type **G=** and the address of the read-only memory Basic Input/Output System (ROM BIOS) on the controller; press Enter.

Example: **G=C800:5**

**Note:** Address C800:5 will work for most Western Digital controller cards and some other manufacturers. The following are some other common addresses that may be used:

**G=C800:CCC** Frequently used by Adaptec  
**G=C800:6** Frequently used by Omti  
**G=C800:13C** Frequently used by Xebec  
**G=CA00:5** Frequently used on older Seagate controllers.

If none of these addresses work, refer to the controller's installation manual or contact technical support for assistance.

5. Input any hard errors listed on the Drive Final Test Sheet if Debug requests them.

2.2.2 *Partitioning the Drive*

The disk can be partitioned with the FDISK program on the DOS diskette:

1. At the A> prompt, type **FDISK** and press Enter.
2. Follow the menus to create the DOS partition.

### 2.2.3 High Level Format

The Format program on the DOS diskette performs the high level format. If a logical partition on this drive is to be the boot disk for the system, copy the necessary operating system files to that partition.

Example:

1. Format the C drive and copy the operating system files to the C drive so that it becomes the boot volume.
2. Install the customer's DOS diskette in drive A.
3. Boot the system.
4. At the A> prompt, type **FORMAT C:/S**. Press Enter.

2.3 OEM IOE Service Enhanced with "Limited Repair" Option

Subtopics

- 2.3.1 Strategy Overview
- 2.3.2 Repair Parts
- 2.3.3 Call Reporting
- 2.3.4 Service Call Flow
- 2.3.5 Common Functional Checklist
- 2.3.6 CE Training
- 2.3.7 Support

### 2.3.1 Strategy Overview

In order to reduce expenses on OEM IOE (IBM on-site exchange) products, NSD OEM Service Delivery, Rockville, MD, has implemented a "Limited Repair" service strategy. The strategy will be implemented in phases. The initial phase includes all OEM printers for which the current service offering is IBM on-site exchange (IOE). Additional OEM machines will be included in future updates.

Repairs will be *limited* to cleaning, adjusting and parts removal and replacement procedures that can be accomplished *without* removing the primary machine covers. **Use of good basic diagnostic procedures, such as determining the operator's reason for calling AND a complete functional check, are essential to the success of this method of service. Every attempt should be made to repair the machine before replacing it.**

Review of repair actions of OEM printers completed by IBM's repair vendors indicates that a significant number of printer repairs required either effective diagnostics, simple cleaning, minor adjustments, or replacement of simple repair parts. The vast majority of these actual repairs did not require removal of the machines' primary covers.

The "Limited Repair" service option is not intended to replace IOE service. It emphasizes a preference for repair at every opportunity. However, the CE still retains the option to exchange machines when necessary. The intent of this strategy is for CEs to use sound business judgement prior to an element exchange. Machines which are defaced, altered or damaged beyond repair are *not* acceptable for exchange. CEs should use effective diagnostic skills to determine a failure has been isolated to the specific OEM machine prior to exchanging it.

### 2.3.2 Repair Parts

Repair parts such as printheads, printmask/shield, cardholders, and knobs are available under IBM part numbers for many of the OEM printers brands. These models were chosen based on currently installed MA inventories. At field discretion, repair parts for other brands may be obtained locally (that is, from OEM dealers) when available. Minor repair parts such as fuses, screws, clips, springs, and so on, may be substituted from all available sources.

Repair parts purchased locally should be charged on a company charge card. Submit a TEA charging account code 23-607-0753 for recovery of expense.

**Note:** The use of a Newly Reconditioned or New machine as a source of parts is the most expensive choice if the source machine is returned in a less than complete condition. You should **ensure all UPR machines are complete** when returned.

The "OEM Parts Catalog" (F/N SA38-0041-03) contains a listing of IBM part numbers available for this offering. This can be used to order repair parts inventories based on careful analysis of territory or customer requirements.

Branch stocking of repair parts sourced from local dealers is at branch discretion.

2.3.3 *Call Reporting*

Use normal call reporting procedures via portable terminal.

2.3.4 Service Call Flow

A service call flow chart for limited repair follows this information that provides a guide to when Limited Repair efforts should be discontinued and the machine replaced instead.

*2.3.5 Common Functional Checklist*

An "OEM Printer Functional Checklist" for limited repair follows this information that contains a guide to functions or areas to check prior to exchanging a machine. This guide has been compiled from a multitude of OEM printer operator manuals and may prove helpful in isolating a specific cause of failure. This guide is not designed to be all-inclusive and relies instead on innate CE skill or experience.

### 2.3.6 CE Training

Included in this information is a brief discussion of general printer operating principles and a general guide to parts removal and replacement procedures. Due to the basically minor nature of the diagnostics required and the limited scope of repair parts to be replaced, detailed or product specific training is not needed at this time.

*Ensure printer is turned **OFF** and power cord is unplugged prior to servicing or replacing internal parts.*

**Note:** It is assumed the customer's printer was correctly attached to an IBM personal computer and was operating properly prior to the current failure being reported. Accordingly, there will be no discussion regarding set-up procedures, dip switch or configuration settings. Refer to OEM operator's manual if information is needed.

2.3.7 Support

Current Level I and Level II support structure to be used.

*2.4 General Guide to OEM Printer Function Sequences*

Subtopics

- 2.4.1 Power-on-Reset (POR)
- 2.4.2 Index and Paperfeed
- 2.4.3 Print Function
- 2.4.4 Printer Self-testing

#### 2.4.1 Power-on-Reset (POR)

Small printers of a type manufactured to attach to personal computers are usually designed with the assumption that certain conditions must exist before they will operate properly.

Normally, these printers go through a sequence of automatic checking for these conditions during a Power-on-reset (POR) when turned on. If the predetermined conditions are not met, an error light will come on or a beeper will beep.

Usually, automatic checks are made to ensure paper is present and properly loaded to the far left paper guide edge. This covers a paper sensor switch. If not covered, an error is signaled.

When the printer power is switched on, the carrier will automatically be transported to the left margin by the carrier transport mechanism, which may be a leadscrew, cogged belt, toothed shaft or string cords usually powered by a small servo motor. Anything which restricts the carrier from reaching the left margin or slows the carrier will normally cause a POR error condition.

These printers usually have a sensor switch which checks if a ribbon is installed. This switch can sometimes determine if the ribbon is installed improperly. During a POR sequence, as the carrier is being transported to the left margin, the ribbon drive mechanism usually rotates. Any bind in the ribbon, caused by improper installation, or even a defective ribbon drive, may cause an error condition.

Normally, these printers automatically check to ensure any access (top) covers are firmly closed and any attached accessories (for example, tractor-feed) are properly and firmly snapped or latched in place. If a POR failure is encountered, check additional possibilities listed in the diagnostic guide or operator manual if available.

Once a successful POR has occurred, a control panel will usually have a Ready light or *On Line* light solidly lit indicating the printer is ready for operation.

#### 2.4.2 Index and Paperfeed

Most printer platens are rotated top to rear by a small motor driving gears attached to the platen. Generally, the platen is not rotated during a POR sequence. Platen rotation binds as well as the condition of the driving gears can usually be checked by rotating the platen knob.

Paper is normally held tightly against the platen by rollers below the platen. Paperfeed mechanisms (such as, push or pull tractor feeders) are usually driven by the same gears which rotate the platen. Proper installation and correct alignment of these features are necessary to ensure they are properly engaged with the drive gears. Misalignment will additionally cause paper jams and "uphill" or "downhill" printing on the paper. External paperfeed mechanisms are usually available for ordering separately. Part numbers are contained in *OEM Parts Catalog* (F/N SA38-0041-03).

### 2.4.3 Print Function

Small printers normally use a printhead with small diameter steel wires which are pulled via small electro-magnets in the print head. When the electro-magnets are energized, some or all the wires are projected from the printhead against the ribbon in a pattern necessary to create dots in a vertical line. The full character is formed by this vertical line being repeated as the carrier is moved by the transport mechanism. Printing may occur with the carrier going in either direction depending on how far the carrier is from the left or right margin.

These printheads and internal wires are very reliable and usually last many years. OEM manufacturers rate their printheads for between 100 million and 300 million complete characters, and state that if the printhead fails suddenly and nowhere near the projected life expectancy, the trouble almost certainly lies elsewhere.

Printheads and carriers are usually connected to the internal driver boards via a ribbon cable. This ribbon cable carries individual signal voltages which activate the electro-magnets in the printhead. Sometimes, the carrier transport motor is contained in the carrier and in those cases the ribbon cable also carries the voltage to drive the transport motor.

Anything which restricts the smooth motion of the carrier in either direction can usually be sensed by the electronics as a timing problem and an error condition will be signaled.

#### 2.4.4 Printer Self-testing

Each printer has a built-in self-testing procedure which usually includes printing the entire range of available fonts. These self-tests thoroughly exercise the full range of functions for which the printer is capable or configured.

If the printer successfully completes a self-test with no obvious problems or error conditions, the OEM manufacturer usually considers the printer to be functioning properly. If experiencing problems running the self-test, follow the instructions in the OEM Operator Manual exactly.

**Note:** Self-tests require wide paper on all wide carriage printers.

2.5 Common Parts Removal and Replacement Procedures

+--- **Important** -----+  
|  
| Ensure IBM safety guidelines are followed.  
|  
+-----+

Subtopics

- 2.5.1 Platen Knobs
- 2.5.2 Cardholders
- 2.5.3 Printmask (Printshield)
- 2.5.4 Printheads

2.5.1 *Platen Knobs*

Most OEM small printer knobs slip over the end of a shaft which protrudes from the platen. In most cases, the knob is held on by friction fit and can be removed by gently pulling off.

### 2.5.2 Cardholders

Cardholders are not used on all OEM printers. Some brands have cardholders which are molded into the carrier base and are not removable. These are usually easily identified by their opaque black plastic color which is the same as the carrier. Usually, a clear plastic cardholder is removable. Removable cardholders may be mounted to the carrier by a single screw inserted from the top. Recently, removable cardholders are being manufactured to slip over metal tabs, and these can be easily removed by gently lifting up.

2.5.3 *Printmask (Printshield)*

Printmasks prevent ink from being splattered off the ribbon onto the paper. They are not used by all OEM manufacturers. Sometimes they are made from a thin metal foil which slips into a groove on the cardholder. Some are attached to the cardholder at time of manufacture and not removable. Other times, the printmask may be attached directly to the ribbon and are then considered a supply item.

#### 2.5.4 Printheads

**CAUTION:**

Printheads get very hot. Take care when working with or around printheads.

Many OEM manufacturers of small printers consider the printhead to be a supply item and publish the removal and replacement procedures in the Operators Manual.

Printheads for small printers are normally a small self-contained unit and most can be removed without tools. This type printhead has a rigid edge connector which is inserted into the receiving connector of the ribbon cable (the receiving connector is usually secured to the carrier).

Printheads normally do not require adjustment after replacement and are held in place by some type of metal or plastic latch. These latches usually release by lifting up, swinging left or right or spreading apart by hand. Some printheads are held in place with screws inserted from the top. Most have guide pins and do not require adjustment after replacement.

Printheads which *require* adjustment after replacement may be adjusted using the following procedure:

1. Set the replacement printhead on the carrier and install the mounting screws. Leave the mounting screws slightly loose at this time.
2. Place two sheets of paper together and insert them into the printer. Advance the paper until it rests between the printhead and platen.
3. Move the printhead-adjustment lever (operator control) in the direction required to move the printhead closest to the platen.
4. Push and hold the printhead firmly against the paper while tightening the printhead mounting screws. Return the printhead-adjustment lever to a position normally used by the operator. The position will be dependent on the thickness of the forms or paper used. Ensure there are no binds or ink smearing caused by a printhead adjusted too tightly towards the platen.
5. Additional adjustments to the printhead can be made when the printer is tested for print quality.

2.6 OEM Printer Functional Checklist

2.7 *Electrical Power*

Power indicator on?  
Power at wall?  
Line cord attached?  
Fuse/circuit breaker okay?  
On/off switch okay?

2.8 Noise

Carrier transport loose?  
Foreign obstructions?  
Paper bail closed?  
Carrier moves easily?  
Ribbon drive okay?  
Ribbon/printwheel binding?  
Check tractor installation.  
Index moves easily?

2.9 POR Failures

Power off and retry.  
Power on? See Electrical.  
Covers closed?  
Ribbon/printwheel/ink present?  
Ribbon/printwheel/ink correct?  
Ribbon/printwheel jammed?  
Ribbon advancing?  
Paper bail closed?  
Paper low or out?  
Paper far enough to the left?  
Check tractor installation.  
Transport mechanism loose?  
Move carrier. POR and retry.  
Carrier moves easily?  
Carrier rails dirty?  
Carrier homes to the left?  
Check printhead cable connection.  
Printhead hot? Wait 5 minutes, then retry.  
Reseat Personality module.  
Personality module in before POR?  
Software locked? POR and retry.  
DIP switches correct?  
CPU on (sometimes required)?

2.10 Self-test Failures

Power? See Electrical.  
Self-test invoked properly?  
Errors? See Lights.  
Print quality? See Print.  
Printer deselected?

2.11 Lights (and Beepers)

POR and retry. See POR.  
Recent printer change?  
Access covers closed?  
Paper loaded correctly?  
Paper far enough to the left?  
Correct paper path selected?  
Paper low or out?  
Paper bail closed?  
Ribbon/printwheel installation correct?  
Ribbon/printwheel jammed?  
Ribbon out (at end)?  
Buffer full? POR and retry.  
Overvoltage? POR and retry.  
Reseat Personality module.  
Check Carrier transport mechanism.  
Carrier transport binds?  
Carrier rails dirty?  
Carrier moves easily?  
Carrier homes on POR?  
Printhead hot? Wait 5 minutes, then retry.  
Check printhead cable connection.  
Selected font may be unavailable.  
Selected parity mismatched?  
Software locked? POR and retry.  
Index binding?  
Index drive gears okay?  
Tractor installation correct?  
CPU on (sometimes required)?

2.12 Print Quality

Paper bail closed?  
Check copy control lever position.  
Printhead gap lever position okay?  
Out of ink?  
Ribbon/printwheel installation okay?  
Check ribbon age and wear.  
Ribbon turns smoothly?  
Print wheel deformed?  
Tearing paper while printing?  
Paper tight against platen?  
Paper out of specifications?  
Multipart forms too thick?  
Print mask, shield dirty?  
Card Holder dirty?  
Printhead nose dirty?  
Feed rollers dirty?  
Carrier transport loose?  
Carrier motion smooth ?  
Printhead slows down? Wait 5 minutes, then retry.  
Printhead cable connection okay?  
Print head/wheel loose?  
Printhead/wheel defective?  
Index binds?  
Check index drive motion.  
Platen worn (has ridges or grooves)?  
Reseat Personality module.

2.13 Paperfeed

Paper jams?  
Gummed label stuck?  
Cardholder binds?  
Copy control too tight?  
Check ribbon installation.  
Multipart forms too thick?  
Index drive slipping?  
Index drive binding?  
Platen binding?  
Platen knob turns smoothly?  
Platen surface slick (slips)?  
Paper release wrong position?  
Paper bail closed?  
Paper path selection correct?  
Paper loaded correctly?  
Paper low or out?  
Paper far enough to the left?  
Tearing paper while printing?  
Printhead gap set correctly?  
Paper drive pins engaged?  
Drive gears properly engaged?  
Check paperfeeder installation.  
Check paperfeeder alignment.  
Paperfeeder drive engaged?  
Recent printer change?  
Selected bin not available.  
Configuration switch on Personality module?  
Page length select incorrect.

2.14 Operator Panel Response

Power on? See Electrical.  
Paper bail closed?  
Access covers closed?  
Printer deselected?  
On-line indicator on?  
Reseat Personality module.  
Printhead hot? Wait 5 minutes, then retry.  
Carrier homes left on POR?  
POR (resets standard font) and retry.  
Fonts always go in before POR.  
Selected sheetfeed bin available?  
Paper far enough to the left?  
Check sheetfeeder installation.  
Paper low or out?  
Recent printer change?  
Selected mode may not be available.  
Selected baud rate mismatch?  
Paper path selection correct?  
Personality module configuration switch off?  
Paper loaded correctly?  
CPU on (sometimes required)?

2.15 CPU Response

Access cover closed?  
Check ribbon installation.  
Ribbon out? See Lights.  
Paper bail closed?  
Printer deselected?  
WIDTH statement required?  
Page length selection incorrect.  
Always set margins before tabs.  
Wrong character set selected?  
Wrong character pitch selection?  
Paperpath selection correct?  
Selected sheetfeeder not available.  
Check printhead cable connections.  
Printhead cable has breaks?  
Reseat Personality module.  
Printhead slows down? Wait 5 minutes, then retry.  
POR (resets standard font) and retry.  
Fonts always go in before POR.  
Recent printer change?  
Interface cable correct?  
Data cable too long?  
Check interface cable connections.  
Interface cable has breaks?  
Selected baud rate mismatch?  
Switch settings correct?

2.16 Limited Repair Service Call Flow

- Call Received
- Element Ordered (if appropriate)
- Element On-Site (if appropriate)

PICTURE 1

2.17 *Invoking OEM Printer Self-tests*

Each OEM printer is normally capable of running several different self-tests. The selections below use the most common selection sequences. Refer to the operator's manual if another test is preferred.

Wide printers *require* wide paper. Printing on the platen without paper will damage the printhead.

Subtopics

2.17.1 OEM Printer Self-tests

2.17.1 OEM Printer Self-tests

Manufacturer/Models	Hold appropriate buttons, then power on.	
<b>Brother</b>		
HR Series	Select	Power on
M Series	Linefeed	Power on
TwinWriter 5	TOF	Power on
<b>C. Itoh</b>		
8510 SP/SR Series	TOF	Power on
C 310/315 Series	TOF	Power on
D 10-40	Linefeed	Power on
<b>Canon</b>		
A60	Draft	Power on
PJ1080A	Linefeed	Power on
<b>Citizen</b>		
120-D	Linefeed	Power on
MSP Series	Linefeed	Power on
Premier 34	Linefeed	Power on
<b>Data-Products</b>		
ALL Series	See Manual	
<b>Datasouth</b>		
ALL Series	See Manual	
<b>Epson</b>		
EX Series	Formfeed	Power on
FX 100/100+/286/286e	Linefeed	Power on
FX 80/80+/850/86/86e	Linefeed	Power on
FX 85/185	Draft	Power on
LQ 800/1000/1050	Draft	Power on
LQ 1500/2500	Draft	Power on
LQ 850	Linefeed	Power on
LX 800	Draft	Power on
LX 86	Linefeed	Power on
<b>Fujitsu</b>		
DL 3300/3400	Formfeed	Power on
DX Series	Linefeed	Power on

PS/2 OEM Service Information  
OEM Printer Self-tests

SP 320/320-Q	Self Test	Power on
<b>Genicom</b>		
1020/1025	Online = off	Reset Power on
3320/3404/3410	Online = off	Test Power on
<b>760 Series</b>		
<b>Down Arrow</b>		
Power on		
<b>Hewlett Packard</b>		
480 RuggedWriter		
w/ single sheets	Linefeed	Power on
w/ continuous forms	Formfeed	Power on
<b>NEC</b>		
3515/3530	See Manual	
P 5200/5300	See Manual	
8810/8830/8850	Feed	Power on
ELF 3510	See Manual	
ELF 350	Feed	Power on
P 2/5/6/7/9 series	Feed	Power on
SpinWriter 2030/3550	See Manual	
<b>Okidata</b>		
All Series	Linefeed	Power on
<b>Panasonic</b>		
All Series	Linefeed	Power on
<b>Star-Micronics</b>		
All Series	Paperfeed	Power on
<b>Toshiba</b>		
P 321/341/341E/341SL	Eject	Power on
P 351C/351SX	Feed	Power on
P 351/351-1/351-2	Paperfeed	Power on
<b>Texas Instruments</b>		
TI 850/850XL/860XL	Pitch/ Select	Power on
TI 855/865	Module/Select	Power on
TI 875	Linefeed	Power on

PS/2 OEM Service Information  
OEM Printer Self-tests

TI 885	Normal/ Command/ Test/Change	
<b>Xerox</b>		
635 Series	Start	Power on
PCW-1 (D25)	See Manual	
34LQ	On Line	Power on

*3.0 Call Reporting/Non-IBM Products (IOE, IOR and Labor Only Accommodations)*

This section provides instructions and information on call reporting procedures for OEM equipment attached to IBM products. Proper call reporting is essential to eliminate possible BAER exception reports. Utilize the following non-IBM Products Call Reporting Matrix to complete your service reporting activity.

Subtopics

3.1 Non-IBM Products Call Reporting Matrix

3.2 Non-IBM Machine Types and Product Descriptions

3.1 Non-IBM Products Call Reporting Matrix

	IOE	IOR	Labor Only
MACHINE TYPE	(1)	(1)	(5)
SERIAL NUMBER	(4)	(2)	(6)
CONTRACT NUMBER	(3)	N/A	N/A
RID TAG	(7)	N/A	N/A

**Notes:**

1. Utilize the IBM machine type that had been assigned for this non-IBM product.
2. When completing call reporting on IOR products, record the machine type along with the product manufacturer's serial number. When using the manufacturer's serial number, use the low order significant digits, maximum of seven, and omit any special characters which may be included.

Example:	Manufacturer Serial #	Serial # to Record
	745-33001.57/6	3001576

3. If applicable, use Contract Number of the PC Special Bid. Record "PCnnnnn" in the CONTRACT NUMBER Field (5 to 7 characters are valid). The actual Agreement (Contract) Number is obtained from the Area Communications Center (Dispatch). Operational HELP Desks can also assist with this information.
4. When completing call reporting on IOE products, record the machine type associated with the non-IBM Logo product and the serial number of the upstream IBM product that the device is attached to. This upstream IBM product must be covered by an IBM Maintenance Agreement.
5. When completing call reporting for products which are serviced under a Labor Only accommodation, CEs should use machine type 7951 and service code 01.
6. For PC attached non-IBM products, the serial number of the IBM PC system unit should be used. Other attachments must use the manufacturer's serial number as specified in note (4), or those serial numbers generated by the Branch Office. Generated serial number by the Branch must be communicated to the CE via ORIGINS, TIB or ECCO, for time recording purposes.
7. Rid Tags should only be used for IOE service accommodations, where the Customer has expressed this as a requirement. When performing an element exchange, the Rid Tag must contain the same information as found on the original installed product.

3.2 Non-IBM Machine Types and Product Descriptions

IBM ON-SITE EXCHANGE PRODUCTS (IOE)  
 (See Complementary Products for  
 Other Specific Models)

MACHINE PRODUCT DESCRIPTIONS (EXTERNAL)  
 TYPE

- 1503 ---- DISKETTE DRIVES
- 1504 ---- OTHER COMMUNICATION DEVICES
- 1507 ---- HARD DRIVES
- 1508 ---- PRINTER SHARING DEVICES
- 1509 ---- KEYBOARDS
- 1513 ---- DISPLAYS, MONOCHROME
- 1514 ---- PRINTERS, LETTER QUALITY  
 (DAISY WHEEL, INK, ETC.)
- 1515 ---- PRINTERS, NEAR LETTER QUALITY  
 (DOT MATRIX)
- 1516 ---- PLOTTERS
- 1517 ---- DISPLAYS, COLOR
- 1539 ---- MODEMS
- 1545 ---- UNIVERSAL POWER SUPPLIES
- 1546 ---- TAPE DRIVES
- 1547 ---- LASER DEVICES (OPTICAL,  
 LASER DISK, CD)
- 1548 ---- OPTICAL CHARACTER READERS
- 1549 ---- MISC. DEVICES (MOUSE, TABLETS,  
 PEN PADS, JOYSTICKS, ETC.)

-----  
 -----  
 -----  
 -----

OTHER IOE MACHINE TYPES (COMPLEMENTARY PRODUCTS)

MACHINE PRODUCT DESCRIPTIONS (EXTERNAL)  
 TYPE

- 1537 ---- HAYES MODEMS  
 HAYES TRANSET 1000 (128K)  
 HAYES TRANSET 1000 (512K)
- 1538 ---- HEWLETT PACKARD COLOR PLOTTERS  
 HEWLETT PACKARD HP-7470A  
 HEWLETT PACKARD HP-7475A  
 HEWLETT PACKARD HP-7550A
- 1543 ---- HEWLETT PACKARD THINKJET PRINTERS  
 HEWLETT PACKARD HP-2225-C THINKJET
- 1550 ---- NEC PRINTERS  
 NEC 3550  
 NEC 8850  
 NEC P560  
 NEC P560XL  
 NEC P565  
 NEC P565XL
- 1551 ---- EPSON PRINTERS  
 EPSON FX-100  
 EPSON FX-185  
 EPSON FX-100+
- 1552 ---- OKIDATA PRINTERS  
 OKIDATA ML-93A  
 OKIDATA ML-93I
- 1556 ---- AMDEK MONO DISPLAY  
 AMDEK 310A
- 1560 ---- TECHMAR TAPE DRIVES  
 TECHMAR Q60H
- 1561 ---- EXT TECHMAR TAPE DRIVES  
 TECHMAR Q60W20  
 TECHMAR Q60W20AT
- 1575 ---- HAYES MODEMS HAYES  
 SMARTMODEM 300 HAYES  
 SMARTMODEM 1200 HAYES  
 SMARTMODEM 2400
- 1580 ---- AMDEK MONOCHROME DISPLAYS  
 AMDEK 300A (AMBER)  
 AMDEK 300G (GREEN)
- 1586 ---- MONITERM MONOCHROME DISPLAYS  
 MONITERM VY-6155

IBM ON-SITE REPAIR PRODUCTS (IOR)

MACHINE PRODUCT DESCRIPTIONS (EXTERNAL)  
 TYPE

1320 ---- CASH DRAWERS  
2998 ---- HEWLETT PACKARD LASERJET PRINTER  
          HEWLETT PACKARD HP-33440A  
          HEWLETT PACKARD HP-2686A  
          HEWLETT PACKARD HP-2686D

---- ----  
---- ----  
---- ----  
---- ----

Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_