IBM Enhanced 5250 Emulation Program

User's Guide

Version 2.4

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> **Note!** ──
>
> Before using this information and the product it supports, be sure to read the general information under "Notices" on page xv.

Sixth Edition (April 1994)

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To minimize the potential data security risk, you should do the following:

- If you write your own application program, it should be written to require each user to sign on with a security password before the host system will re-establish a session.

- If you use an application program that does not require a security password before re-establishing a session, you should always have the system operator do the following:

  - Cancel the job if either the personal computer or host system failure occurs during the session and the session is lost.
  - Cancel any spool writer job for a printer session, when applicable.

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Preface

This manual explains how to use a personal computer[2] with the Enhanced 5250 Emulation Program (Emulation Program) when attached to a host[3] that supports the 5250 Information Display System.

Note: For information on 5250 Emulation compatibility with nonreferenced personal computer systems, contact your IBM Marketing Representative or your IBM Authorized Dealer, Remarketer, or Distributor or call 1-800-955-5250.

Before using the Emulation Program, you should have some knowledge of your personal computer, the IBM Disk Operating System (DOS), the IBM 5250 Information Display System, and your host system. This manual does not teach you how to use the host functions.

DOS Version 5.0 or later is required for all systems.

The Emulation Program lets you emulate (imitate the functions of) a subset of the IBM 5250 display stations and printers and use the functions of your host. The program supports IBM 3196 monochrome display emulation or IBM 3197 color display emulation and the IBM 5219, 5224, 5225, and 5256 Printer functions. A compatible 5250 emulation adapter and this program enable a personal computer to perform the function of two host displays or one display and one printer at the same time on one host line connection. Access to the personal computer DOS session is also provided via a user-defined hot key.

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2 In this manual, *personal computer* refers to ISA (PC AT,* ISA, or EISA) and Micro Channel* bus personal computers and to personal computers equipped with PCMCIA Type II or Type III slots, including: PS/1,* PS/VP, PS/2,* and personal computers (as defined in "Terminology" on page xxiii).

3 *Host* refers to the IBM AS/400,* the IBM System/36, or the IBM System/38.

For information about changes and additions to the program that were made after this book was published, see the README.DOC file on the program diskette.

To display this file:

1. Insert the program diskette into the A: drive.

2. Change to the A: drive.

3. Enter the following command:

   TYPE README.DOC | MORE

4. To see the next screen of information, press Enter.

Organization of This Manual

The manual is primarily for the person who will be using the personal computer to emulate display stations and printers after the personal computer is connected to a host.

Below is a summary of each chapter and appendix:

- Chapter 1, Quick Start Instructions for the Emulation Program, provides an overview of how to install, configure, and use the Emulation Program. This chapter is for people who are using the basic functions that the Emulation Program provides for communicating with the host.

- Chapter 2, Getting Ready for 5250 Emulation, gives information needed for planning the attachment of the personal computer to a host. This chapter is for the person responsible for planning and installing your personal computer.

- Chapter 3, Detailed Installation and Configuration, gives detailed instructions for installing and configuring the Emulation Program. This chapter also provides information about configuring your adapter, resolving adapter conflicts, using the Emulation Program under OS/2,* and updating session profiles to Version 2.4 of the Emulation Program.

- Chapter 4, Operating the Emulation Program, describes how to load the Emulation Program onto your personal computer and how to use the functions of the program.

- Chapter 5, Using the Display Screens, describes the emulation display.

- Chapter 6, Using the Keyboard, describes how the personal computer keyboards emulate the IBM 5250 keyboards.

- Chapter 7, Emulating an IBM 5219 Printer, describes the emulated control panel for the IBM 5219 and shows how the IBM 5219 Printer is emulated on the personal computer attached printers.

- Chapter 8, Emulating an IBM 5224 Printer, describes the emulated control panels for the IBM 5224 and shows how the IBM 5224 Printer is emulated on the personal computer attached printers.

- Chapter 9, Emulating an IBM 5256 Printer, describes the emulated control panels for the IBM 5256 and shows how the IBM 5256 Printer is emulated on the personal computer printers.

- Chapter 10, Using the Printer Function Table Setup Program, provides information about using the Printer Function Tables and user-defined printers.

- Chapter 11, Advanced Configuration, explains the advanced configuration options.

- Appendix A, Error Codes and Messages, lists error codes and messages with their causes and recovery procedures.

- Appendix B, Problem Determination, describes how to diagnose and correct problems that might occur during installation and operation.

- Appendix C, PCMCIA Setup Considerations, gives detailed information about configuring the 5250 Emulation PCMCIA Adapter.

- Appendix D, Files on the Program Diskette, describes the files on the program diskette.

- Appendix E, Keyboards, contains keyboard reference information, including how major 5250 functions are mapped to personal computer keyboards, which keyboard customization files are provided with the Emulation Program, and how the

enhanced style keyboard is layed out for each of the supported languages.

This manual also contains a glossary and an index.

You should have some knowledge of how to use your personal computer, including its operating system. Therefore, it is important that you read and understand the *Getting Started* and *Guide to Operations* manuals for your personal computer. You might also want to refer to the manual that was provided with your operating system.

The person responsible for running the more technical portion of the configuration program or for modifying the host or local programs should become familiar with the *Enhanced 5250 Emulation Program Version 2.3 Technical Reference* (G570-2222).

Note: Unless specified otherwise, all references to the *Technical Reference* manual that are made in this book refer to the *Enhanced 5250 Emulation Program Version 2.3 Technical Reference*.

The person responsible for installing and configuring the IBM 5250 Emulation Family adapter should read and understand the *Guide to Operations* or *Installation and Test Instructions* manual that was provided with the adapter. Technical Reference manuals are available for each of the IBM 5250 Emulation Family adapters:

For ISA (Industry Standard Architecture) bus personal computers: *IBM Enhanced 5250 Display Station Emulation Adapter Technical Reference* (G570-2225)

For Micro Channel bus personal computers: *IBM 5250 Emulation Adapter/A Technical Reference* (G571-0261)

For PCMCIA bus personal computers: *IBM 5250 Emulation PCMCIA Adapter Technical Reference* (G571-0265)

Related Books

You might find the following related books helpful.

- *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337

- *IBM 5250 Information Display System Functions Reference Manual*, SA21-9247

- *IBM 3196 Display Station User's Guide*, GA18-2482

- *IBM 3197 Model C Color Display Station User's Guide*, GA18-2559

- *IBM 5219 Printer Model D01/D02 Setup Procedures/Operator's Guide*, GA23-1019

- *IBM 5224 Printer Operator's Guide*, GA34-0095

- *IBM 5225 Printer Operator's Guide*, GA34-0054

- *IBM 5256 Printer Operator's Guide*, GA21-9260

- *IBM 5294 Control Unit Operator's Guide and Operating Procedures*, GA21-9370

- *IBM 5394 Remote Control Unit Operator's Guide and Problem Determination Procedures*, GA27-3805

- *Attaching Work Station and Communications Cables*, SA21-9957

The coordinator for your IBM host system should also be able to supply a list of books for the host system. You should refer to this list for any additional books you may require.

Terminology

The following terminology is used throughout this manual:

Term	Meaning
adapter	An adapter that is a member of the IBM 5250 Emulation Family
cable	A cable that attaches the adapter to the host cabling system

Emulation Program The Enhanced 5250 Emulation Program Version 2.4

host IBM System/36, IBM System/38, IBM AS/400

ISA bus Industry Standard Architecture bus: PC AT, ISA, or EISA bus

personal computer IBM Personal Computer, IBM Portable Personal Computer, IBM Personal Computer XT,* IBM Personal Computer XT 286, IBM Personal Computer AT,* personal computers that have PCMCIA Type II or Type III slots, PS/1 personal computers, PS/2 personal computers, PS/VP personal computers, and other IBM compatible personal computers

PS/1 Any model of the IBM Personal System/1* computer

PS/2 Any model of the IBM Personal System/2* computer, including non-Micro Channel and Micro Channel bus computers from the PS/2 family

PS/VP Any model of the IBM PS/ValuePoint* computer

PC Personal computer

***Technical Reference* manual**
Enhanced 5250 Emulation Program Version 2.3 Technical Reference

Note: All references to the IBM 5224 Printer are also valid for the IBM 5225 Printer.

Summary of Changes

The following functions were changed or were added to the Emulation Program:

- A procedure called INSTALL was added to the Emulation Program to replace the previous installation method.

- Chapter 1, "Quick Start Instructions for the Emulation Program," was added to provide an overview of how to install, configure, and start the Emulation Program. The chapter is intended for people who are using the basic functions that the Emulation Program provides for communicating with a host system.

    For ISA bus personal computers: Because of the above installation changes, all users who have existing session profiles from Version 2.12 or later must run the configuration program (CONFIG) to update their existing session profiles to Version 2.4.

    For Micro Channel and PCMCIA bus personal computers: Session profiles before Version 2.3 are not compatible with the 5250 Emulation Adapter/A or the 5250 Emulation PCMCIA Adapter. All users who have existing session profiles from Version 2.3 must run the configuration program (CONFIG) to update their existing session profiles to Version 2.4.

- In addition to support for IBM 3196 monochrome display emulation, the Emulation Program now supports IBM 3197 color display emulation. IBM 5292 Model 2 display emulation (host graphics) is no longer supported.

- The Emulation Program now supports the following additional printers:
    - IBM 2380 Plus Printer
    - IBM 2381 Plus Printer
    - IBM 2390 Plus Printer
    - IBM 2391 Plus Printer
    - IBM 4037 5E Printer
    - IBM 4039 Printer

- IBM 4070 IJ Printer
- IBM 4076 ExecJet* II
- HP LaserJet 4

Note: Printer Function Tables for the above printers are shipped with the Emulation Program.

- The Emulation Program now supports the following host to personal computer code page translations:

Host Code Page	Personal Computer Code Page
037	437
037	850
277	850
278	850
280	850
284	850
285	850
297	850
500	437
500	819
500	850
871	819
871	850
875	869
1026	857

- DOS Shell and other DOS graphics applications are now supported running in the DOS session using a CGA or a VGA monitor.

- The Emulation Program now supports improved keyboard functions in applications, like DisplayWrite/36 and OfficeVision,* that use Alt key combinations to perform functions like centering and bold. For example, pressing Alt+B to turn bold on.

- The Emulation Program now supports Alternate Graphics keyboard characters.

Chapter 1. Quick Start Instructions for the Emulation Program

This chapter contains quick start instructions for installing, configuring, and using the Emulation Program. For more detailed instructions, see Chapter 3, "Detailed Installation and Configuration."

Some knowledge of your personal computer, IBM Disk Operating System (DOS), IBM 5250 Information Display System, and your host system is required. This chapter does not show you how to use the host functions.

Note: If your personal computer is not attached to a host system, refer to Chapter 2, "Getting Ready for 5250 Emulation." Do not attempt to attach your personal computer to a host system without proper authorization and instructions.

Emulation Program Overview

The Emulation Program lets your personal computer emulate 5250 display stations and printers. The adapter and this program allow your personal computer to perform the functions of one or two workstations at the same time on one cable. The workstations can be defined as one display, two displays, or one display and one printer.

You can move between your two emulated sessions and between the host sessions and the personal computer session by pressing a defined hot key sequence.

Each display session or printer session uses a unique workstation address to communicate to the host.

Before you can run the Emulation Program, you must:

- Install and configure your IBM 5250 Emulation Family adapter
- Install and configure the Emulation Program

Note: Before you install the Emulation Program, make a backup copy of the program diskette.

Installing and Configuring Your Adapter

For information about configuring your adapter, see "Configuring the Adapter" on page 3-15. For adapter installation and configuration instructions, see the *Guide to Operations* or *Installation and Test Instructions* manual that was provided with your adapter.

Installing and Configuring the Emulation Program

Before you can use the Emulation Program, you must install and configure it. Configuring the Emulation Program includes specifying the adapter that you are using and providing the information that is needed for your 5250 sessions.

1. To install the Emulation Program, run the installation program (INSTALL) using the instructions in "Quick Start Installation of the Emulation Program" on page 1-4. For more detailed instructions, see Chapter 3, "Detailed Installation and Configuration."

2. To specify the type of adapter that you are using, run the adapter selection program (HWCONFIG). This program automatically starts when the INSTALL program ends. You can also start this program by entering HWCONFIG at the DOS prompt in the emulation directory. For instructions, see "Using the Adapter Selection Program" on page 3-11.

3. To specify information about the 5250 emulation sessions (for example, number of sessions, display or printer emulation, and station addresses), run the session configuration program (CONFIG) using the instructions in "Creating a Basic Session Configuration" on page 1-6. For more detailed instructions, see "Configuring for Emulation" on page 3-25.

For more information about the installation and configuration programs, see Chapter 3, "Detailed Installation and Configuration."

For information about using the Emulation Program with OS/2, see "Using the Emulation Program with OS/2" on page 3-36.

Note: To run the Emulation Program, you might also need to specify or change the configuration of your adapter. For information about adapter configuration, see "Configuring the Adapter" on page 3-15.

What You Need

- Personal computer (as defined in "Terminology" on page xxiii)

- Personal computer attached printer, if emulating a printer session (For a list of supported personal computer printers, see "Printer Session Requirements" on page 2-3.)

- A monochrome or color display (with the appropriate adapter, if necessary) that is designed to the Color Graphics Adapter (CGA), Enhanced Graphics Adapter (EGA), or Video Graphics Array (VGA) standard or better[1]

- One 5.25-inch diskette drive (1.2MB) or one 3.5-inch diskette drive (1.44MB) (and adapter, if required)[1]

- One of the following IBM 5250 Emulation Family adapters:

  - Enhanced 5250 Display Station Emulation Adapter (for IBM PC AT, ISA, and EISA bus personal computers)

  - 5250 Emulation Adapter/A (for Micro Channel bus personal computers)

  - 5250 Emulation PCMCIA Adapter (for personal computers that are equipped with PCMCIA Release 2.0 Type II or III slots)

- 128KB or more memory to load the Emulation Program

- 128KB or more memory to run the Installation Program

- IBM Disk Operating System (DOS) Version 5.0 or later

- Emulation Program diskettes for your adapter[1]

- If using OS/2, OS/2 Version 2.1 or later

---

[1]

For Micro Channel bus personal computers: You need a monitor designed to VGA standard or better, an adapter cable (purchased separately), an Options Diskette, and a 3.5-inch diskette drive (1.44MB).

For PCMCIA bus personal computers: You need a monitor designed to VGA standard or better, an adapter cable (purchased separately), an Enabler/Diagnostic Diskette, and a 3.5-inch diskette drive (1.44MB).

You also need to ask your host system planner for a workstation
address for each of your sessions.

Quick Start Installation of the Emulation Program

1. Insert the program diskette into the A: drive.

2. At the DOS prompt, type **A:** and press Enter.

3. Type **INSTALL** and press Enter. The screen shown in
   Figure 1-1 appears.

```
                  IBM

        ┌─────────────────────────────────────────┐
        │      Enhanced 5250 Emulation Program     │
        │               Version 2.4                │
        │  (c) Copyright IBM Corp. 1994. All rights reserved. │
        │     US Government Users Restricted Rights - │
        │        Use, duplication or disclosure    │
        │         restricted by GSA ADP Schedule   │
        │            Contract with IBM Corp.       │
        └─────────────────────────────────────────┘

   ┌───────────────────────────────────────────────┐
   │ Press [Esc] to quit, any other key to continue ... │
   └───────────────────────────────────────────────┘
```
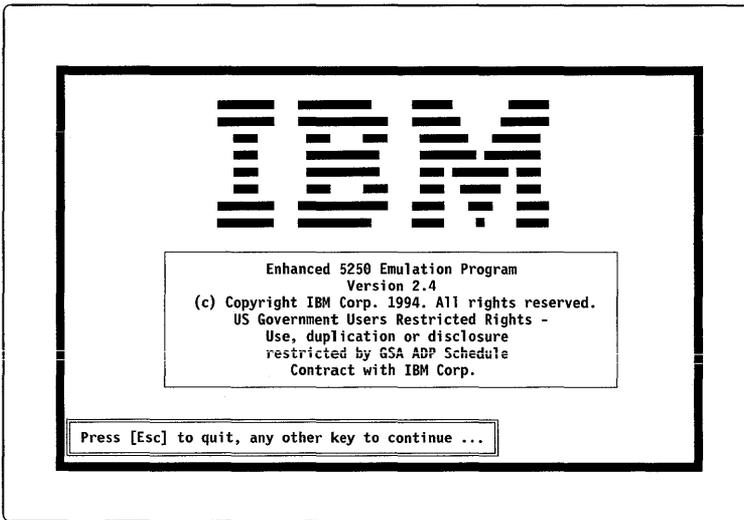
Figure   1-1. Install Logo Screen

The install program guides you through a series of screens that
ask for different option settings.

4. Type the options you want and press Enter.

   Note: The default emulation subdirectory is C:\EM5250. You
   might need to change the drive name for your system. If you are
   upgrading from Version 2.3, you can install into the same
   subdirectory where the 5250 emulation files are currently located.

   At the end of the installation process, the adapter selection
   program (HWCONFIG) automatically starts.

5. From the Adapter Selection screen, shown in Figure 1-2, select
   the adapter that is installed on the personal computer.

```
                        Adapter Selection
                 for the Enhanced 5250 Emulation Program


   -1-    IBM Enhanced 5250 Emulation Adapter
          for IBM PC, ISA, and EISA systems

   -2-    IBM 5250 Emulation Adapter/A
          for IBM Micro Channel systems

   -3-    IBM 5250 Emulation PCMCIA Adapter

 Use the up and down arrow keys to select the 5250 emulation adapter
 installed in your system.  To save your adapter selection, Press F3 and then
 select Option 1 on the exit screen.  For configuration information about
 your adapter press F6.




 ↑↓=Select  F1=Help  F3=Exit  F6=Adapter Configuration
```

Figure 1-2. Adapter Selection Screen

6. Exit the adapter selection program and save the adapter
   configuration. For more information about configuring your
   adapter, see "Configuring the Adapter" on page 3-15.

   Note: If you receive an error message when you start the
   Emulation Program, see "Adapter Conflicts" on page 3-22 for
   information about resolving conflicts between the adapter and
   either memory or other adapters that are installed in your
   personal computer.

   For information about changing the default I/O address, interrupt
   level, or card address, see "Configuring the Enhanced 5250
   Display Station Emulation Adapter" on page 3-16, "Configuring
   the 5250 Emulation Adapter/A" on page 3-22, or "Configuring the
   5250 Emulation PCMCIA Adapter" on page 3-22.

Installation of the Emulation Program is complete. Remove the
program diskette and store it in a safe place.

Creating a Basic Session Configuration

This section takes you through the basic steps of creating a session profile. These steps assume you are emulating a 3196 display and a 5219 printer. You can also emulate 3197 displays, a 5256 printer, or a 5224 printer. For detailed session configuration instructions, see "Running the Session Configuration Program" on page 3-26.

For information about advanced options and features, like automatic screen dimming, see Chapter 11, "Advanced Configuration."

Before you run the session configuration program, ask the host system administrator for a unique workstation address between 0 and 6 for each session (display or printer). You must enter these addresses during the configuration process.

Before doing the following steps, make sure you are in the emulation directory.

1. At the DOS prompt, type **CONFIG** and press Enter. The configuration logo screen, shown in Figure 1-3, appears.


```
                  ====  ====== ===    ====
                  ====  ====== =====  ====
                  ==== ==  ==  == ==   ==
                  ==== ==  ==  ==  ==  ==
                  ==== ======  ==  === ==
                  ==== ======  ==   ====

          +-------------------------------------------------+
          |            Session Configuration               |
          |        Enhanced 5250 Emulation Program          |
          |                 Version 2.40                    |
          | (C) Copyright IBM Corp. 1985, 1994. All rights reserved. |
          +-------------------------------------------------+

          Press ←┘ (Enter) to continue
```
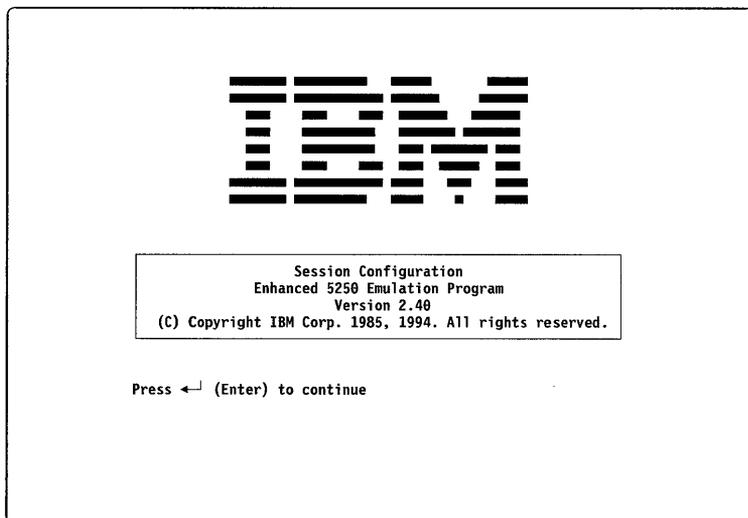
Figure   1-3. Configuration Logo Screen

Read the information screens and press Enter until you get to the Set Number of Sessions screen.

2. From the Set Number of Sessions screen, type **2** and press Enter.

3. From the Language Selection screen, select your language by typing the number that is next to the language you want and pressing Enter. The language that you select determines which keyboard customization file is used and other language-specific information that is reported to the host.

4. From the Keyboard Selection Menu, select the keyboard that is attached to your personal computer. Select the enhanced keyboard for laptop computers. For a list of the keyboard customization files, see Figure E-2 on page E-4.

5. From the Select Host to PC Display Code Page Mapping screen, select the mapping that matches the host and personal computer code pages you are using and press Enter.

6. From the Primary Workstation Address screen, enter the 3196 display device address for session 1; enter the 5219 printer address for session 2.

7. From the Select Session 2 Type screen, type **2** for the 5219 printer and press Enter.

8. From the Attached Printer List screen, select the type of printer that is attached to your personal computer and press Enter.

   Note: If your printer is not in the attached printer list, specify a Printer Function Table (PFT) for a table-driven printer. For a list of PFTs, see "Printer Function Table Files" on page D-2.

9. From the Select Host to Printer Code Page Mapping screen, select the mapping that matches the host and printer code pages that you are using and press Enter.

10. From the Advanced Options Menu screen, select Save data profile (1) and press Enter.

11. From the Save Profile Data screen, press Enter. DP5250.DAT is the default file name for the profile.

12. From the Advanced Options Menu, select Quit (2) and press Enter.

You have completed the basic session configuration.

Starting the Emulation Program

To start the Emulation Program:

1. Make sure you are in the emulation directory.
2. Type **DP5250** and press Enter. A pre-signon screen appears.
3. Press any key to continue.

When the personal computer comes online with the host, an alarm sounds and the pre-signon screen is replaced with a host screen.

Note: You can run the Emulation Program in an OS/2 Version 2.1 DOS session. For information about using the Emulation Program with OS/2, see "Using the Emulation Program with OS/2" on page 3-36.

Using an Emulated Session

This section provides basic information about using the Emulation Program. For more detailed information, see later chapters in this manual.

Hot Key Sequence

To toggle between the host sessions and the DOS session, press the hot key sequence: Alt+Esc

Status Line

Line 25 of the display session screen shows the status of the host and the personal computer. The status line has the following basic indicators:

rr-cc Cursor Location, where *rr* is the row number and *cc* is the column number

SA   System Available

MW   Message Waiting

KS   Keyboard Shift

IM   Insert Mode

II	Input Inhibited
S*n*	Session Number, where *n* is the number of the session
KB	Keystroke Buffering

Note: When the indicator is displayed in reverse video, the indicator is on.

Keyboard Definition

The key definitions for an emulated session are not exactly the same as marked on the keyboard. For illustrations of the supported keyboard layouts for the enhanced style keyboard, see "Keyboard Layouts" on page E-5.

Ending the Emulation Program

Warning: Do not end the Emulation Program while running an application program in the DOS environment.

To end the Emulation Program and remove it from memory:

1. Sign off from the host.

2. When a host signon screen appears, press Ctrl+Alt+Del. This ends the Emulation Program, releases the memory it used, and returns you to the DOS prompt.

For information about ending the Emulation Program when you are using OS/2, see "Ending the Emulation Program under OS/2" on page 3-38.

Chapter 2. Getting Ready for 5250 Emulation

This chapter is for the person who plans for your host system and for the attachment of the personal computer to the host system. Other parts of the manual provide information about installing and using the Emulation Program.

Warning: Do not attempt to attach your personal computer to a host system without proper authorization and instructions.

Host Hardware and Software Requirements

The host computer can be one of the following:

- IBM System/36
- IBM System/38
- IBM AS/400

The personal computer can be connected to a host computer through one of the following remote workstation control units:

- IBM 5294 Remote Workstation Control Unit
- IBM 5394 Remote Workstation Control Unit
- IBM 5494 Remote Workstation Control Unit

Appropriate cables and connectors are also required. For information about connecting workstations, see "Arranging the Workstations" on page 2-8.

The following additional software products might be required:

- If your host system is an IBM System/36 (5360 System Unit or 5362 System Unit), you must use Release 5 Modification Level 1 or later of the System Support Program (5727-SS1).

- If your host system is an IBM System/36 (5364 System Unit), you must use Release 5 Modification Level 1 or later of the System Support Program (5727-SS6).

- If your host system is an IBM System/38, you must use Release 8 or later of the Control Program Facility (5714-SS1) with Program Change 'C' (PC'C').

- If your host system is an IBM AS/400, you must use Release 1 or later of the Operating System/400* Program (5728-SS1).

Personal Computer Hardware and Software Requirements

The minimum requirements for your personal computer are:

- One of the following IBM 5250 Emulation Family adapters:

  - Enhanced 5250 Display Station Emulation Adapter (for IBM PC AT, ISA, and EISA bus personal computers)

  - 5250 Emulation Adapter/A (for Micro Channel bus personal computers)

  - 5250 Emulation PCMCIA Adapter (for personal computers that are equipped with PCMCIA Release 2.0 Type II or III slots)

  Note: For information about the hardware requirements for your IBM 5250 Emulation Family adapter, see the *Installation and Test Instructions* or the *Guide to Operations* that was provided with your adapter.

- IBM Disk Operating System (DOS) Version 5.0 or later

- If using OS/2, OS/2 Version 2.1 or later

- One 5.25-inch 1.2MB diskette drive or one 3.5-inch 1.44MB diskette drive

- Enough memory to run the Emulation Program and your application programs. For information about memory requirements, see "Memory Requirements" on page 2-4.

For more information about session requirements, see "Display Session Requirements" on page 2-3 and "Printer Session Requirements" on page 2-3.

Display Session Requirements

For a display session, you need a monochrome or color display (with the appropriate adapter, if necessary) that is designed to the CGA, EGA, or VGA standard or better.

Printer Session Requirements

If you are using a printer session, one of the following is required:

- IBM 2380 Personal Printer
- IBM 2380 Plus Personal Printer
- IBM 2381 Personal Printer
- IBM 2381 Plus Personal Printer
- IBM 2390 Personal Printer
- IBM 2390 Plus Personal Printer
- IBM 2391 Personal Printer
- IBM 2391 Plus Personal Printer
- IBM 3812 Pageprinter
- IBM 4016 ExecJet II Printer
- IBM 4019 Laser Printer
- IBM 4029 Laser Printer
- IBM 4037 5E Printer
- IBM 4039 Laser Printer
- IBM 4070 IJ Printer
- IBM 4072 ExecJet Printer
- IBM 4201 Proprinter*
- IBM 4202 Proprinter XL
- IBM 4207 Proprinter X24
- IBM 4208 Proprinter XL24
- IBM 4212 Proprinter 24P
- IBM 4226 Printer
- IBM 5152-1 Matrix Printer
- IBM 5152-2 Graphics Printer
- IBM 5182 Color Printer
- IBM 5201 Quietwriter*
- IBM 5202 Quietwriter III
- IBM 5204 Quickwriter*

- IBM 5216 Wheelprinter[1]
- HP LaserJet Printer Series II Printer
- HP LaserJet Printer Series III Printer
- HP LaserJet Printer Series IV Printer
- User-defined printer

Note: To support user-defined printers, additional memory is required. For more information about user-defined printers, see Chapter 10, "Using the Printer Function Table Setup Program."

Memory Requirements

To ensure that your Emulation Program and application programs can run at the same time, plan for the memory requirements of your personal computer.

The maximum amount of memory that you need is 128K. The amount of memory that you need to do each of the following is:

- To load the Enhanced 5250 Emulation Program, at least 128KB of memory is required.

- To run the configuration program, at least 128KB of memory is required

- To run the installation program, at least 128KB of memory is required.

- To configure one or two display sessions, at least 40KB of memory is required.

- To configure one display session and one printer session, at least 76KB of memory is required.

Memory requirements for DOS vary with the version used and are in addition to any other personal computer memory requirements. For the memory requirements of the DOS version and the application programs that you plan to use, see to the manuals provided with the DOS and application software.

---

[1] You must install a parallel or serial attachment interface on the 5216 printer before connecting it to the personal computer.

For more information about memory requirements, see "Printer Session Requirements" on page 2-3 and "Planning for Using Program Applications" on page 2-16.

Attaching to the Host

Attaching your personal computer to the host requires careful planning. This planning includes making decisions about how and where to connect your personal computer. The person who is responsible for the physical planning of the host should be involved in planning the connection of your personal computer, the installation of the adapter, and the installation of the Emulation Program.

When attaching your personal computer to a host, you need to consider the number of workstations and how to cable them.

Workstations

Each personal computer must have a workstation address for each session that it uses. Each address used by a display session or a printer session is counted as one of the allowed workstations on a line:

- On a local workstation line, you can connect a maximum of seven workstations in series.

- On an IBM 5294 Remote Control Unit, you can connect a maximum of eight workstations or personal computers.

- On an IBM 5394 Remote Control Unit, you can connect a maximum of 16 workstations or personal computers.

- On an IBM 5494 Remote Control Unit, you can connect a maximum of 28 workstations or personal computers.

For information about addressing workstations, see "Addressing Workstations" on page 2-9.

Cabling

For information about device arrangement, see "Arranging the Workstations" on page 2-8.

Using Twinaxial Cabling

When using twinaxial cabling, the following rules apply:

- When attaching a workstation to the workstation line, the minimum distance between two Integrated Cable Assemblies is 1 meter (3.3 feet).

- Any workstation line can have a maximum of 11 junctions. Each display, printer, personal computer, cable splice, or station protector is a junction.

- If the last workstation on a line (other than a personal computer) does not have the Cable Thru feature, it must remain the last workstation on that line.

- The maximum cabling distance between the host and the last workstation or personal computer on a twinaxial cable is 1525 meters (5000 feet).

Using Unshielded Twisted Pair Cabling

When using unshielded twisted pair cabling, the following rules apply:

- The maximum distance between the host and the 5299 or any workstation is 1000 feet.

- The maximum distance between the 5299 and any workstation is 900 feet.

When twinaxial cabling is used between the host and the 5299, the following rules apply:

- The maximum distance between the host and the 5299 or any workstation is 2000 feet.

- The maximum distance between the 5299 and any workstation is 900 feet.

Using the IBM Cabling System

When using the IBM Cabling System (ICS), the maximum "equivalent" distance between the host and the last workstation on the ICS cable is 5000 feet.

To calculate the "equivalent" distance, use the formula: $a+2b+1.5c$ where:

a Is the actual length of type 1 or type 2 cable

b Is the actual length of type 8 cable

c Is the actual length of type 6 or type 9 cable

Configuring the Host for the Emulation Program

When you configure the host for the Emulation Program, enter the following device types:

Figure 2-1. Device Codes

Type of Emulation	Device Type	Keyboard Type
Display	3196	Enhanced
Display	3197	Enhanced
Printer	Any combination of 5219, 5224, 5225, or 5256	Not applicable

Note: When you convert session profiles from Version 2.12 or later of the Emulation Program for use with Version 2.4, any 5292 display sessions are changed to 3197 display sessions. You might need to adjust the workstation address and the host device description for these sessions. For more information about converting session profiles, see "Converting 2.12 or Later Profiles to 2.4 Level" on page 3-38.

In the S/36 environment: You must configure your text display with an enhanced keyboard. Select "change device characteristics" on your configuration screen to select the enhanced keyboard for your display device description.

If you are upgrading from Version 2.3 or earlier of the Emulation Program, you must reconfigure your display device description for an enhanced keyboard.

Arranging the Workstations

To determine the device arrangement that meets your needs, look at a cabling diagram for your host.

For local attachment, the twinaxial cables that connect the devices to the host are shown in Figure 2-2.
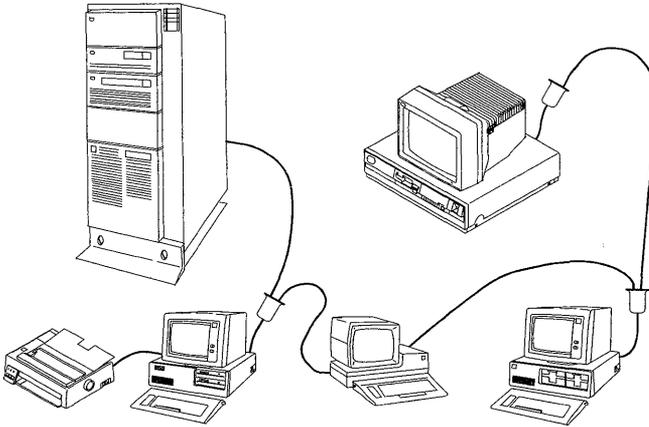
Figure 2-2. Local Attachment of Workstations

For remote attachment, the personal computer connects to the host through a communications link. For a 5294, the twinaxial cables that connect the devices are shown in Figure 2-3.
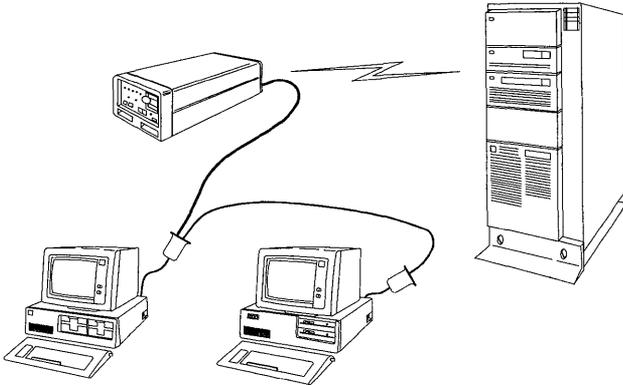
Figure 2-3. Remote Attachment of Workstations

For more information about arranging devices and assigning addresses on your host, see the installation or device configuration manual for the host.

Addressing Workstations

A workstation device can be either a display or a printer. The host does not allow displays and printers to share the same address. Each address must be defined as either a display or a printer.

The session configuration program assigns a single address for the primary (first display) session, but you can add up to six other addresses from the Advanced Display Emulation Options screen. For information about creating a workstation address list, see "Workstation Address List" on page 11-6. The first address should be a unique address for the primary display session of each device on the line.

The session configuration program lets you enter a list of addresses (that is, an address search list) for the second session. The Emulation Program listens to the line and searches the list for the first address that is not being used by another workstation. The addresses on the list for the personal computers on a line should be rotated to reduce the chance of an address conflict. For examples of how to rotate addresses, see "Example 1" on page 2-12 and "Example 2" on page 2-13.

To assign two display sessions or a display session and a printer session to each personal computer, you would need three unique addresses. By sharing the address for the second session of each personal computer, you can have six personal computers on each line. This is done with the address search list for the second session.

The second session of the Emulation Program can have up to six addresses in a search list. If the program has a list of addresses assigned to it and the program attempts to come up, it might use the address assigned to some other 5250 Information Display System compatible device. To prevent this, each device on the line should be assigned a unique address for its first session—an address that is only responded to by that device. By doing this, each device always has access to at least one session on the host.

You can use two session profiles. Both profiles would use the first session as a display session. The first profile would use an address list for a display for its second session. (For an example, see "Example 1" on page 2-12.) The second profile would use an address list for a printer for its second session. (For an example, see "Example 2" on page 2-13.) The addresses for the second session can be shared with other Enhanced Emulation Programs on the line.

See "Data Security" on page xvi for data security information concerning address lists.

Notes:

1. The Emulation Program selects the first available address in the list you provide.

2. When configuring your Emulation Program, do not mix display and printer addresses in the same address list.

3. If two workstations attempt to use the same address at the same time, the host does not communicate with either of them.

Example 1

This example shows four attached personal computers. Station addresses 0 through 5 are configured as displays on the host. Address 6 is configured as a printer. This example is discussed in "Addressing Workstations" on page 2-9.

Workstation/Session	Address(es)
personal computer #1	
first display	0
second display	4, 5
printer	6
personal computer #2	
first display	1
second display	5, 4
printer	6
personal computer #3	
first display	2
second display	4, 5
printer	6
personal computer #4	
first display	3
second display	5, 4
printer	6

Example 2

This example shows three personal computers and a 3196 display attached. Station addresses 0 through 4 are configured as displays on the host. Addresses 5 and 6 are configured as printers. This example is discussed in "Addressing Workstations" on page 2-9.

Note: A personal computer cannot use the address assigned to the 3196 display.

Workstation/Session	Address(es)
personal computer #1	
first display	0
second display	4
printer	5, 6
personal computer #2	
first display	1
second display	4
printer	6, 5
personal computer #3	
first display	2
second display	4
printer	5, 6
display unit	
3196	3

Emulation Adapter

If the memory segments, I/O port spaces, or interrupt level of your emulation adapter conflicts with other installed adapter cards, you can change the memory segments, I/O port address, or interrupt level that the emulation adapter uses.

For detailed information about installing and configuring an IBM 5250 Emulation Family adapter, follow the directions in the *Guide to Operations* or the *Installation and Test Instructions* provided with the adapter. For information about the adapter configuration programs, see "Configuring the Adapter" on page 3-15.

For ISA bus personal computers: When you receive the Enhanced 5250 Display Station Emulation Adapter from the factory, the I/O address switches are set at the default address of hexadecimal 2718-271F. (Switches 1 and 6 set ON, and all others set OFF. To verify the settings, see the *Installation and Test Instructions* or the *Guide to Operations* manual that was provided with your adapter.) I/O addresses 2718 through 271F are used with the default setting.

If you change the setting of the switches on the adapter card, you must run the hardware configuration program (HWCONFIG) to update the I/O address in the hardware configuration profile. For more information about changing the hardware configuration, see "Configuring the Enhanced 5250 Display Station Emulation Adapter" on page 3-16.

For Micro Channel bus personal computers: Use the Set Configuration option on the reference diskette to change the configuration.

For PCMCIA bus personal computers: *You must first install the necessary software from the Enabler/Diagnostic Diskette that was provided with the adapter.* Use the SETUP program on the Enabler/Diagnostic Diskette to install the software. After you install the PCMCIA software, run the CFG5250 program to change the configuration of the adapter.

It is recommended that you use the PCMCIA Card Services and Socket Services configuration option. For additional information about setting the configuration, see Appendix C, "PCMCIA Setup Considerations" or the *Installation and Test Instructions* manual that was provided with your adapter.

Planning for Implementation

Planning for Using DOS

The Emulation Program can run under the Disk Operating System (DOS), Version 5.0 or later.

If your personal computer does not support interrupt sharing, make sure that the interrupt level for the emulation adapter is not used elsewhere in your system.

Planning for Using the DOS Shell Option

If you are using the DOS Shell option, the following guidelines should be followed for emulation:

- The Emulation Program must be started before the DOS Shell.

- The DOS Shell must be ended before ending the Emulation Program. Otherwise, malfunctions might occur.

- Supported mouse drivers are:
    - IBM PS/2 Mouse Program Version 1.10 or higher
    - Microsoft** Mouse Driver Version 8.0 or higher
    - Any mouse driver that is compatible with the drivers listed above

- When using an IBM PS/2 Mouse attached to an IBM PS/2 Model 30 286, the mouse must be attached before turning on the personal computer. The DOSSHELL.BAT file must include the driver PCIBMDRV.MOS. The mouse program (MOUSE.COM) must be executed before loading the Emulation Program. This should be taken into consideration when setting up your AUTOEXEC.BAT file.

- If an IBM PS/2 Mouse is not attached to the IBM PS/2 Model 30 286, you must remove the PCIBMDRV.MOS driver from the DOSSHELL.BAT file.

Planning for Using OS/2

If you are using the Emulation Program in an OS/2 DOS session:

- Version 2.1 of OS/2 is required.

- You cannot use the DOS session while running the Emulation Program. Entering any DOS command except EXIT (to end the Emulation Program) can cause unpredictable results.

Note: Interrupt sharing is not supported when using the Emulation Program under OS/2.

Planning for Using Program Applications

The Emulation Program works with most DOS applications. However, some programs, such as one that overlays the Emulation Program, are not compatible.

For more information about planning for memory requirements, see "Memory Requirements" on page 2-4.

Understanding the Session Profile

The session profile contains the parameters that your personal computer needs to communicate with the host and to operate the Emulation Program:

- Display station emulation parameters
- Workstation session parameters
- Personal computer hardware parameters
- Printer parameters

The Emulation Program will not start until a session profile exists. If you do not have a session profile, make one by running the configuration program (CONFIG.EXE) that is provided on the program diskette. The configuration program provides menus to help you make selections.

Note: When you convert session profiles from Version 2.12 or later of the Emulation Program for use with Version 2.4, any 5292 display sessions are changed to 3197 display sessions. You might need to adjust the workstation address and the host device description for these sessions. For more information about converting session

profiles, see "Converting 2.12 or Later Profiles to 2.4 Level" on page 3-38.

The configuration program saves the session profile on the disk. The session profile is used to configure your personal computer when the Emulation Program is loaded.

For brief instructions for running the configuration program, see "Creating a Basic Session Configuration" on page 1-6. For more detailed instructions, see "Configuring for Emulation" on page 3-25.

Using Signon Passwords

You might need a password to sign on to your host system. If you need a password, see the person who provides access to the host system.

Chapter 3. Detailed Installation and Configuration

This chapter provides information about:

- Installing and configuring the Emulation Program

- Configuring your IBM 5250 Emulation Family adapter

- Resolving adapter conflicts, including how the IBM 5250 Emulation Family adapters use memory

- Using the Emulation Program with OS/2

- Converting Version 2.12 or later session profiles to Version 2.4

Note: If your personal computer is not attached to a host system, refer to Chapter 2, "Getting Ready for 5250 Emulation." Do not attempt to attach your personal computer to a host system without proper authorization and instructions.

Emulation Program Overview

The Emulation Program lets your personal computer emulate 5250 display stations and printers. The adapter and this program allow your personal computer to perform the functions of one or two workstations at the same time on one cable. The workstations can be defined as one display, two displays, or one display and one printer.

You can move between your two emulated sessions and between the host sessions and the personal computer session by pressing a defined hot key sequence.

Each display session or printer session uses a unique workstation address to communicate to the host.

Before you can run the Emulation Program, you must:

- Install and configure your IBM 5250 Emulation Family adapter
- Install and configure the Emulation Program

3-1

Installing and Configuring Your Adapter

For information about configuring your adapter, see "Configuring the Adapter" on page 3-15. For adapter installation and configuration instructions, see the *Guide to Operations* or *Installation and Test Instructions* manual that was provided with your adapter.

Installing and Configuring the Emulation Program

Before you can use the Emulation Program, you must install and configure it. Configuring the Emulation Program includes specifying the adapter that you are using and providing the information that is needed for your 5250 sessions.

For a description of the installation and configuration programs, see Figure 3-1.

Figure 3-1 (Page 1 of 2). Emulation Program Installation and Configuration Programs
Installation Program
Program: INSTALL
Source: IBM Enhanced 5250 Emulation Program Diskette
Purpose: Installs the IBM Enhanced 5250 Emulation Programs from the diskettes to your personal computer's hard disk.
Adapter Selection Program
Program: HWCONFIG
Source: Installed on your personal computer by the INSTALL program, which is described above
Purpose: Specifies the type of adapter that is to be used for 5250 Emulation. The adapters that you can use with the Emulation Program are the Enhanced 5250 Display Station Emulation Adapter, the 5250 Emulation Adapter/A, and the 5250 Emulation PCMCIA Adapter.
Note: The INSTALL program automatically starts this program. You can also start the program by entering HWCONFIG at the DOS prompt of the emulation directory.

Session Configuration Program

Program:	CONFIG
Source:	Installed on your personal computer by the INSTALL program, which is described above
Purpose:	Specifies 5250 Emulation Session information, such as the number of sessions, the type of emulation, and the station address used by each session

To install the Emulation Program, follow the directions in "Installation Program." For quick start instructions, see Chapter 1.

To specify which adapter the Emulation Program is to use, follow the instructions in "Using the Adapter Selection Program" on page 3-11.

To configure the Emulation Program for session emulation, follow the directions in "Configuring for Emulation" on page 3-25. For quick start directions, see "Creating a Basic Session Configuration" on page 1-6.

Note: Before running the Emulation Program, you might also need to specify or change the configuration of your adapter. For information about adapter configuration, see "Configuring the Adapter" on page 3-15.

Installation Program

The INSTALL program, which is provided for installing the Emulation Program:

- Copies the files for basic emulation
- Copies the files for keyboard support
- Copies the files for using Printer Function Tables
- Copies the Sample Emulation Program Utilities

Each screen of the installation program includes questions for you to answer and information about how to answer the questions.

Note: The installation program requires at least 128KB of memory.

In addition to the files that the INSTALL program copies from the Enhanced 5250 Emulation Program diskettes, the 5250 Emulation Adapter/A and the 5250 Emulation PCMCIA Adapter require the installation of configuration files that are provided with the adapters.

For 5250 Emulation Adapter/A: The 5250 Emulation Adapter/A requires configuration files that are provided with your adapter on the Option Diskette.

To install the necessary files onto your personal computer, use your System Reference diskette and select Copy an option diskette. For more information about configuring the adapter, see the *Installation and Test Instructions* manual that was provided with your adapter.

For 5250 Emulation PCMCIA Adapter: The 5250 Emulation PCMCIA Adapter requires configuration files that are provided with your adapter on the Enabler/Diagnostic Diskette. To install the necessary files onto your personal computer, run the SETUP program before running the installation program. For more information about configuring the adapter, see Appendix C, "PCMCIA Setup Considerations," or the *Installation and Test Instructions* manual that was provided with your adapter.

There is a README.DOC file on the installation diskette that contains additional information about using the Emulation Program. To print the README.DOC file, place the installation diskette into drive A, turn on your printer, and type:
COPY A:README.DOC LPT1

Installing the Emulation Program

To install the emulation files:

1. Insert the program diskette into the A: drive.

   Note: Use a backup copy of the program diskette. For information about making backup diskettes using the DISKCOPY command, see the *IBM Disk Operating System User's Guide and Reference*.

2. Type **A:INSTALL**

   The title screen, shown in Figure 3-2, appears.


```
                    Enhanced 5250 Emulation Program
                             Version 2.4
               (c) Copyright IBM Corp. 1994. All rights reserved.
                    US Government Users Restricted Rights -
                       Use, duplication or disclosure
                        restricted by GSA ADP Schedule
                          Contract with IBM Corp.


    Press [Esc] to quit, any other key to continue ...
```
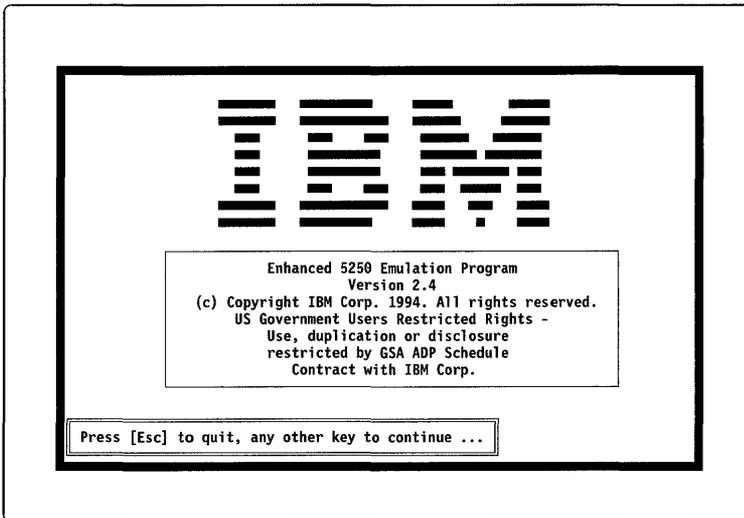
Figure 3-2. Installation Title Screen

3. Press any key, and the Welcome to the Enhanced 5250 Emulation Program screen appears.

4. Press any key to continue to the screen describing the two installation options. Please read this information and press any key to advance to the Installation Options Selection screen, shown in Figure 3-3.

```
                    INSTALLATION OPTIONS SELECTION

     Select the desired installation option by using the arrow keys.
     Blinking text indicates the selected option. Press the Enter key
     to continue.




                  Install Enhanced 5250 Emulation V2.4.
                  Install additional drivers.
```
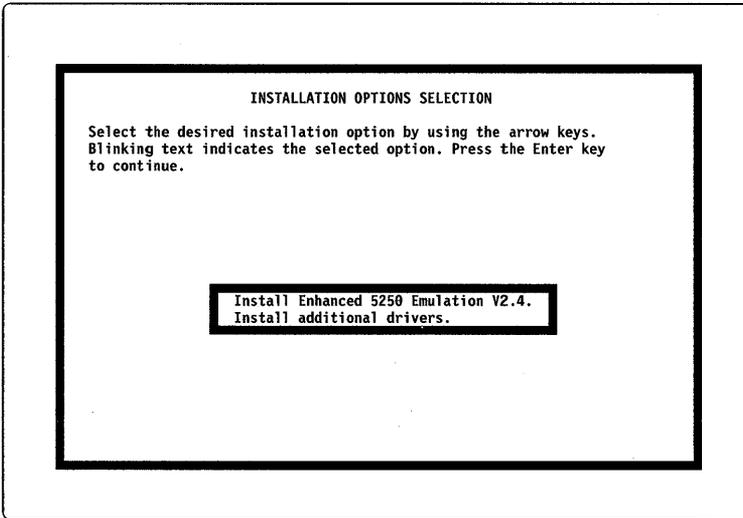
Figure 3-3. Installation Options Selection

5. Select the installation option that you want. If you are installing Version 2.4 for the first time, select the first option, "Install Enhanced 5250 Emulation V2.4." This option installs all the files necessary for emulation. The second option is provided in case you want to add additional keyboard support. When the selection is complete, press Enter to continue.

6. The Drive Selection screen, shown in Figure 3-4, appears next. This screen asks which drive you want to install the Emulation Program on. It lists only the hard drives that it detects in your personal computer. Use the arrow keys to scroll up and down in the box. When you get to the drive you want, press Enter to continue.

```
                           DRIVE SELECTION

      Select the drive you would like to install
      Enhanced 5250 Emulation to by using the arrow keys to
      scroll up and down in the box. Blinking text indicates
      the selected drive. Press the Enter key to continue.




                        ▌ Drive C: ▌
```
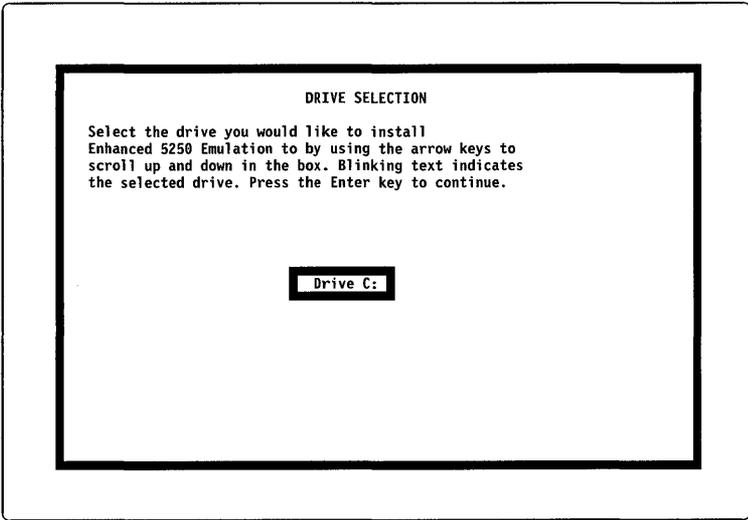
Figure   3-4. Drive Selection Screen

7. The Subdirectory Selection screen, shown in Figure 3-5,
   appears. Type the name of the subdirectory in which you want
   to install the files and press Enter to continue. If the directory
   does not already exist, the installation program creates it.

   Note: The default emulation subdirectory is \EM5250. You
   might need to change the drive name for your system. If you are
   upgrading from Version 2.3, you can install into the same
   subdirectory where the 5250 emulation files are currently located.

```
                        SUBDIRECTORY SELECTION

       If you would like 5250 for DOS to install in a
       subdirectory other than the default directory, type it in
       now. Press the Enter key to continue.




           ═══════The default is C:\ EM5250═══════
            \EM5250
```
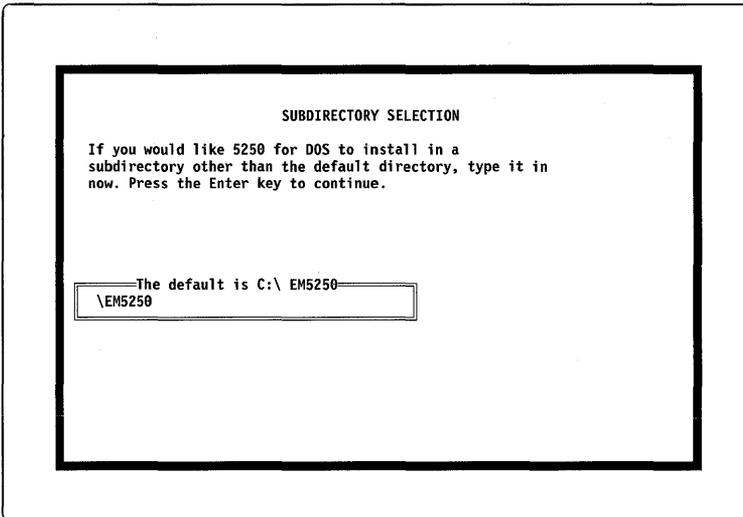
Figure   3-5. Subdirectory Selection Screen

8. The National Language Keyboards Information screen, shown in Figure 3-6, appears. This screen lists the keyboards that the Emulation Program supports. Press any key to display the National Language Keyboard Selection screen. Scroll to the languages that you want and press the space bar to select them. When finished, press Enter to continue. The keyboard customization files that are associated with each selected country are installed.

```
                  NATIONAL LANGUAGE KEYBOARDS INFORMATION

         Enhanced 5250 Emulation version 2.4 supports a number of
         different National Language keyboards.  This is a list of
         the supported countries.

              US                        Italian
              Belgian                   Latin American
              Brazilian                 Norwegian
              Canadian French           Portuguese
              Danish                    Spanish
              Dutch                     Swedish/Finnish
              French                    Swiss-French
              German                    Swiss-German
              Greek                     Turkish
              Icelandic                 UK

         You may install as many as you like by using the spacebar
         to select or deselect each keyboard on the next screen.

          Press [Esc] to quit, any other key to continue ...
```

Figure   3-6. National Language Keyboards Information Screen

9. Before the Emulation Program is installed, the Sample Memory Map screen, shown in Figure 3-7, appears. This screen shows how the adapter uses memory.

```
                    SAMPLE MEMORY MAP

                                  The 5250 Adapter usually
    EXTENDED MEMORY                resides between:

                    1024K(FFFFh)   CC00h - DF00h
  UPPER MEMORY AREA
       Rom Bios      DF00h         In this sample map,
    **5250 Adapter**               other devices use
     3270 Adapter    CC00h         the Upper Memory
      VGA/EGA                      area.
                    640K(A000h)
    CONVENTIONAL                   The configuration
      MEMORY                       program executed after
                                   the installation will
  TSR, DEVICE DRIVERS              let you choose which
                                   memory block the
       DOS                         5250 Adapter uses.
                    0K

  Press [Esc] to quit, any other key to continue ...
```

Figure   3-7. Sample Memory Map Screen

The 5250 adapter requires an 8KB section of memory space. This memory space is typically from x'CC00' to x'CDFF' or x'DC00' to x'DDFF'. Depending on your personal computer, the adapter might be able to fit into other memory locations, such as x'EC00' to x'EDFF'. For memory locations that you can use for the IBM 5250 Emulation Family adapters, see Figure 3-16 on page 3-23.

For the 5250 Emulation PCMCIA Adapter: You might need to reserve more than 8KB of space because of Card and Socket Services requirements. For more information about memory requirements for the 5250 Emulation PCMCIA Adapter, see the *Installation and Test Instructions* manual that was provided with your adapter.

After you read the Sample Memory Map screen, press any key to continue.

10. The System Considerations screen appears. Please read this information carefully.

   If you are using a memory manager program, like EMM386, it is highly recommended that you add a memory exclusion parameter to the end of the EMM386 line in the CONFIG.SYS file. If you configure your adapter for the x'CC00' to x'CDFF' range, your EMM386 line might look like this:

   ```
   DEVICE=C:\DOS\EMM386 X=CC00-CDFF
   ```

   After you read the System Considerations screen, press any key to continue.

11. The installation program pauses before installing the program files. Press any key to start installing the program files.

   When installation program ends, the adapter selection program (HWCONFIG) automatically starts.

12. Configure the Emulation Program for your adapter using the instructions in "Selecting the Adapter."

Selecting the Adapter

For all the IBM 5250 Emulation Family adapters, you must run the adapter selection program (HWCONFIG) to identify to the Emulation Program the adapter that you are using.

Using the Adapter Selection Program

The adapter selection program begins automatically when the installation program ends. You can also start the adapter selection program without running the installation program.

Warning: Do not run the adapter selection program while the Emulation Program is using your adapter.

To start the adapter selection program without running the installation program:

1. Change to the emulation directory. For example, if you installed the Emulation Program in the default directory (EM5250) on the C: drive, you would type **CD C:\EM5250** and press Enter to continue.

2. Type **HWCONFIG** and press Enter to continue.

The HWCONFIG program starts, and the Notice screen, shown in Figure 3-8, appears.

```
                        Adapter Selection
                 for the Enhanced 5250 Emulation Program


                           -- Notice --

     Do not run this selection program if 5250 emulation software is currently
     using your adapter. If 5250 emulation software is not currently using the
     adapter, this configuration program may safely continue.

     The 5250 emulation adapter installed in your system must be specified and
     saved before you can use the Enhanced 5250 Emulation Program.






                    Copyright (c)   IBM Corporation  1994

     F3=Exit  Enter=Continue
```

Figure 3-8. Adapter Selection Notice Screen

Do one:

- If you are running the Emulation Program:

    1. End the Emulation Program.
    2. Restart the HWCONFIG program.

- To continue the HWCONFIG program, press Enter to continue.
  The Adapter Selection screen, shown in Figure 3-9, appears.

```
                              Adapter Selection
                     for the Enhanced 5250 Emulation Program


        -1-    IBM Enhanced 5250 Emulation Adapter
               for IBM PC, ISA, and EISA systems

        -2-    IBM 5250 Emulation Adapter/A
               for IBM Micro Channel systems

        -3-    IBM 5250 Emulation PCMCIA Adapter

        Use the up and down arrow keys to select the 5250 emulation adapter
        installed in your system.  To save your adapter selection, Press F3 and then
        select Option 1 on the exit screen.  For configuration information about
        your adapter press F6.




        ↑↓=Select  F1=Help  F3=Exit  F6=Adapter Configuration
```

Figure 3-9. Adapter Selection Screen

To identify the adapter that you are using to the Emulation Program:

1. From the Adapter Selection screen, shown in Figure 3-9 on page 3-13, use the arrow keys to select the adapter.

2. Press F3 to exit the HWCONFIG program. The Exit Options screen, shown in Figure 3-10, appears.

```
                             Adapter Selection
                     for the Enhanced 5250 Emulation Program


    -1-     IBM Enhanced 5250 Emulation Adapter
            for IBM PC, ISA, and EISA systems

    -2-     IBM 5250 Emulation Adapter/A
            for IBM ┌─────────────────────────────────────────────────┐
                    │                   Exit Options                  │
    -3-     IBM 5250│                                                 │
                    │   -1-  Save selections then exit.               │
  Use the up and dow│                                                 │
  installed in your │   -2-  Exit without saving selections.          │
  select Option 1 on│                                                 │
  your adapter press│                                                 │
                    │   Select your exit option and then press Enter. │
                    │                                                 │
                    │                                                 │
  ↑↓=Select  F1=Help│ ↑↓=Select  Enter  Esc=Previous Screen           │
                    └─────────────────────────────────────────────────┘
```

Figure 3-10. Exit Options Screen

3. Use the arrow keys to select Save selections then exit (1) and press Enter.

   Note: If you do not want to save the changes you made, select Exit without saving selections (2) and press Enter.

Note: If you receive an error message when you start the Emulation Program, see "Adapter Conflicts" on page 3-22 for information about resolving conflicts between the adapter and memory or other adapters that are installed in your personal computer.

Configuring the Adapter

In addition to configuring the Emulation Program for the adapter that you are using and for the 5250 session information, you might need to specify or change your adapter configuration.

How you configure your adapter depends on which adapter you are using. The programs for configuring the IBM 5250 Emulation Family adapters are described in Figure 3-11.

Figure 3-11 (Page 1 of 2). Adapter Configuration Programs
Enhanced 5250 Display Station Emulation Adapter (for PC/AT, ISA, and EISA bus personal computers)
Program: HWCONFIG
Source: Installed on your personal computer by the INSTALL program for the IBM Enhanced 5250 Emulation Program.
Description: The HWCONFIG program can be used to specify the interrupt level, memory mapped segment, and I/O port address used by the IBM Enhanced 5250 Emulation Program.

Figure 3-11 (Page 2 of 2). Adapter Configuration Programs
5250 Emulation Adapter/A (for Micro Channel bus personal computers)
Program: Set Configuration Option on the reference diskette
Source: The configuration files for the 5250 Emulation Adapter/A are on the Option Diskette that was provided with your adapter.
Description: To change the interrupt level, the memory mapped segment, and the I/O port address used by the emulation adapter, follow the instructions that were provided with your adapter in the *Installation and Test Instructions* manual.
5250 Emulation PCMCIA Adapter (for PCMCIA bus personal computers)
Program: CFG5250
Source: This program is installed on your system by the SETUP program on the Enabler/Diagnostic Diskette that was provided with your adapter.
Description: This program is used to specify or change the configuration of your PCMCIA adapter. For more information, see the *Installation and Test Instructions* manual that was provided with your adapter or Appendix C, "PCMCIA Setup Considerations."

Configuring the Enhanced 5250 Display Station Emulation Adapter

The adapter uses the following default settings:

Interrupt level   5
I/O port address   2718-271F
Memory segment   CC00-CDFF, DC00-DDFF, or EC00-EDFF

Only change the default adapter selection settings when other hardware that is installed on your personal computer conflicts with the emulation adapter. Use the adapter selection program (HWCONFIG) to change the default I/O address, interrupt level, and

card address for the Enhanced 5250 Display Station Emulation
Adapter.

If you change the default adapter selection settings, you must
change the switches on the adapter to match the new configuration
settings. For information about setting the I/O address switches, see
the *Guide to Operations* or *Installation and Test Instructions* manual
that was provided with your adapter.

Warning: Do not run the HWCONFIG program while the Emulation
Program is using your adapter. For information about starting the
HWCONFIG program, see "Using the Adapter Selection Program" on
page 3-11.

To examine or change the settings for the adapter:

1. If you are running the Emulation Program:

    a. End the Emulation Program.
    b. Restart the HWCONFIG program.

2. Start the HWCONFIG program by doing the following:

    a. Change to the emulation directory. For example, if you
       installed the Emulation Program in the default directory
       (EM5250) on the C: drive, you would type **CD C:\EM5250**
       and press Enter to continue.

    b. Type **HWCONFIG** and press Enter to continue. The Notices
       screen appears.

3. To continue the HWCONFIG program, press Enter. The Adapter
   Selection screen, shown in Figure 3-12, appears.

```
                            Adapter Selection
                    for the Enhanced 5250 Emulation Program


    -1-    IBM Enhanced 5250 Emulation Adapter
           for IBM PC, ISA, and EISA systems

    -2-    IBM 5250 Emulation Adapter/A
           for IBM Micro Channel systems

    -3-    IBM 5250 Emulation PCMCIA Adapter

Use the up and down arrow keys to select the 5250 emulation adapter
installed in your system.  To save your adapter selection, Press F3 and then
select Option 1 on the exit screen.  For configuration information about
your adapter press F6.




↑↓=Select  F1=Help  F3=Exit  F6=Adapter Configuration
```

Figure   3-12. Adapter Selection Screen

4. Use the arrow keys to select the IBM Enhanced 5250 Emulation option and press F6 to continue. The Enhanced 5250 Emulation Adapter Configuration screen, shown in Figure 3-13, appears.

```
                              Adapter Selection
                     for the Enhanced 5250 Emulation Program

                         Enhanced 5250 Adapter Configuration


          Interrupt      5

          I/O Port       2718-271F

          Memory         Automatic

     Us  Select which parameter to change and then press F6.
     in
     se
     yo




     ↑↓  ↑↓=Select  F1=Help  F3=Exit  F6=Change  Esc=Previous Screen
```
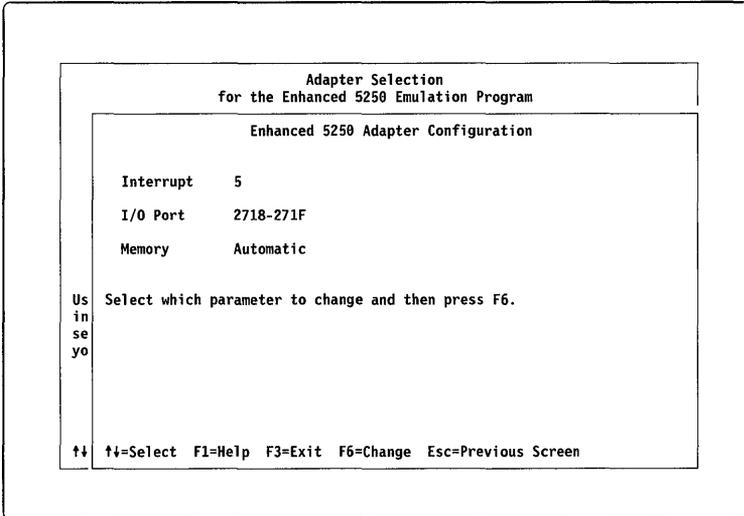
Figure 3-13. Enhanced 5250 Adapter Configuration Screen

5. Use the arrow keys to select the option you want to change and then press F6 to continue.

6. Follow the instructions that appear on the screen. After you make your selection, press Enter to continue.

For example, if you wanted to change the interrupt level from 5 to 4, you would select 4 and then press Enter to continue, as shown in Figure 3-14.

```
                              Adapter Selection
                    for the Enhanced 5250 Emulation Program

                       Enhanced 5250 Adapter Configuration

          Interru                        Interrupt

          I/O Por   Select your interrupt choice and then press Enter.   The
                    default interrupt choice is 5.
          Memory
                                             3
                                             4
    Us    Select wh                          5
    in                                       6
    se                                       7
    yo



    ↑↓   ↑↓=Select  ↑↓=Select   Enter   Esc=Cancel
```

Figure 3-14. Adapter Configuration Screen

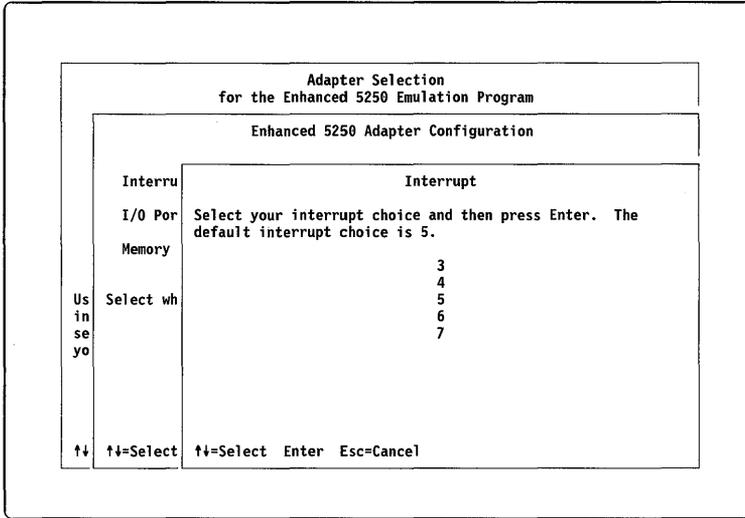7. When you are finished changing the configuration for your emulation adapter, press F3 to exit the HWCONFIG program. The Exit Options screen, shown in Figure 3-15, appears.
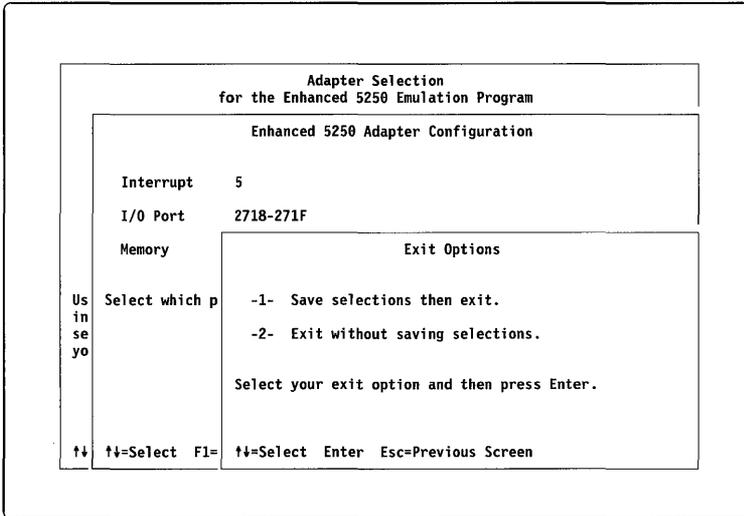
```
                         Adapter Selection
                  for the Enhanced 5250 Emulation Program

                     Enhanced 5250 Adapter Configuration


          Interrupt    5

          I/O Port     2718-271F

          Memory                       Exit Options

     Us  Select which p    -1-  Save selections then exit.
     in
     se                     -2-  Exit without saving selections.
     yo
                           Select your exit option and then press Enter.


     ↑↓  ↑↓=Select  F1=  ↑↓=Select  Enter  Esc=Previous Screen
```

Figure 3-15. Exit Options Screen

8. Use the arrow keys to select Save selections then exit (1) and press Enter to continue.

   Notes:

   a. If you do not want to save the changes you made, select Exit without saving selections (2).

   b. If you receive an error message when you start the Emulation Program, use the HWCONFIG program to resolve any conflicts between the adapter and memory or other adapters that are installed in your personal computer. For information about resolving memory conflicts, see "Memory Usage" on page 3-23.

For more information about configuring your adapter, see the *Guide to Operations* or the *Installation and Test Instructions* manual that was provided with your adapter.

Configuring the 5250 Emulation Adapter/A

Only change the default adapter selection settings when other hardware that is installed on your personal computer conflicts with the emulation adapter. To configure the 5250 Emulation Adapter/A, use the Set Configuration Option on the reference diskette for your personal computer and the adapter configuration files on the Option Diskette that was provided with your adapter.

To change the I/O address, interrupt level, and card address that the adapter uses, follow the instructions in the *Installation and Test Instructions* manual that was provided with your adapter.

For information about resolving memory conflicts, see "Memory Usage" on page 3-23.

Configuring the 5250 Emulation PCMCIA Adapter

Only change the default adapter selection settings when other hardware that is installed on your personal computer conflicts with the emulation adapter. To configure the 5250 Emulation PCMCIA Adapter, use the CFG5250 program (that was installed from the Enabler/Diagnostic Diskette when you installed and configured the adapter).

Memory allocation can be complex for PCMCIA computers. For information about configuring the 5250 Emulation PCMCIA Adapter, see Appendix C, "PCMCIA Setup Considerations," or the *Installation and Test Instructions* manual that was provided with your adapter.

For information about resolving memory conflicts, see "Memory Usage" on page 3-23.

Adapter Conflicts

Usually when there is an adapter conflict, an error message appears when you start the Emulation Program (DP5250). To resolve an adapter conflict, use the adapter configuration procedure for your adapter to change the I/O port addresses, the memory mapped

segment space, or the interrupt level that your emulation adapter uses.

For more adapter configuration information, see "Configuring the Enhanced 5250 Display Station Emulation Adapter" on page 3-16, "Configuring the 5250 Emulation Adapter/A" on page 3-22, or "Configuring the 5250 Emulation PCMCIA Adapter" on page 3-22.

Memory Usage

The most common type of adapter conflict involves memory usage. The memory allocation map for each personal computer is unique. You must find the segment on your computer that allows the adapter to coexist with your personal computer.

Figure 3-16. Memory Segments		
Enhanced 5250 Display Station Emulation Adapter	**5250 Emulation Adapter/A**	**5250 Emulation PCMCIA Adapter**
CC00-CDFF DC00-DDFF EC00-EDFF (See note.) AC00-ADFF (See note.) BC00-BDFF (See note.)	C000-C1FF C400-C5FF C800-C9FF ⋮ DC00-DDFF	C000-C1FF C400-C5FF C800-C9FF ⋮ DC00-DDFF
Note: Segments EC00-EDFF, AC00-ADFF, and BC00-BDFF are usually not recommended, but they can be used on some personal computers.		

Figure 3-16 shows the memory segments that your 5250 emulation adapter can use. If one of the memory segments for your system is available, use that segment. To change the memory segment, reconfigure the adapter.

For information about the adapter configuration programs, see "Configuring the Adapter" on page 3-15. For more information about configuring your adapter, see "Configuring the Enhanced 5250 Display Station Emulation Adapter" on page 3-16, "Configuring the 5250 Emulation Adapter/A" on page 3-22, or "Configuring the 5250 Emulation PCMCIA Adapter" on page 3-22.

If your personal computer uses an expanded memory manager (for example, EMM386, QEMM, or 386MAX), you must exclude the segment that you assign to the emulation adapter from the expanded memory manager. Use your expanded memory manager to exclude the segment.

For example, if you were using EMM386, you would add a statement similar to the one below to your CONFIG.SYS file:

```
DEVICE=C:\WINDOWS\EMM386.EXE x=CC00-CDFF
```

Memory allocation can be affected by:

- LOADHIGH device statements
- Number of files and buffers
- FCBs
- DEVICEHIGH device statements
- DOS=HIGH options
- Optional parameters on the expanded memory manager statements (for example, for EMM386, RAM, AUTO, EMS, NOEMS, FRAMES, and so forth)

When correcting a memory conflict, you might need to adjust some of these parameters.

Configuring for Emulation

You must run the session configuration program (CONFIG.EXE) before using the Emulation Program the first time. You can run the CONFIG.EXE program before the adapter is installed and before the personal computer is connected to the host.

Note: When you ran the INSTALL program, the CONFIG.EXE program was copied onto your personal computer. The SCR5250.TXT and HLP5250.TXT files must be in the same directory as the CONFIG.EXE program.

The CONFIG.EXE program generates a session profile (DP5250.DAT) or changes an existing session profile. The session profile identifies key attributes of the emulated 5250 Display Station that allow the Emulation Program to use the adapter and to communicate with the host. If a Version 2.4 session profile (a file with a .DAT extension) is not in the current directory, the Emulation Program will not start. For information about converting a session profile from an earlier version of the Emulation Program, see "Converting 2.12 or Later Profiles to 2.4 Level" on page 3-38.

When you run the CONFIG.EXE program, it shows the available options and prompts you for responses that are required for a complete and usable configuration. You can use this program to create a new profile (for example, to change printers or the number of sessions) or to change an existing profile. After the basic configuration is completed, you can quit, save the profile, or continue with the advanced options.

Using the advanced options requires some technical knowledge. For information about these advanced options, see Chapter 11, "Advanced Configuration."

Note: To view the correct display parameters for the IBM Portable Personal Computer, you must use the Advanced Options Menu.

For information about using the Emulation Program under OS/2, see "Using the Emulation Program with OS/2" on page 3-36.

Configuration Checklist

Use the following checklist to plan or to record configuration information. This checklist is not intended to replace the help text in the configuration program.

Number of Sessions (1 or 2):   _____

Language Used: _____

Name of Keyboard Customization File: _____

Type of PC Printer (optional):   _____

Host Assigned Workstation Addresses:

Primary display address   _____

Secondary workstation address   _____

Session Type for Second Session (optional):

5224/25 Printer   _____

5256 Printer   _____

5219 Printer   _____

Display   _____

Name of Session Profile (optional):

DP5250.DAT   _____

myfile.DAT   _____

Running the Session Configuration Program

To use the session configuration program, follow the instructions in this section and type the responses for each screen. For additional information about the responses you need to make, use the help text for the configuration program.

Make sure you are in the emulation directory before following these steps.

1. At the DOS prompt, type: **CONFIG**

   If you are changing a session profile, type:

   CONFIG *myfile*.**DAT**

   where *myfile* is DP5250.DAT or your session profile. The configuration logo screen, shown in Figure 3-17 appears. Press Enter to continue.
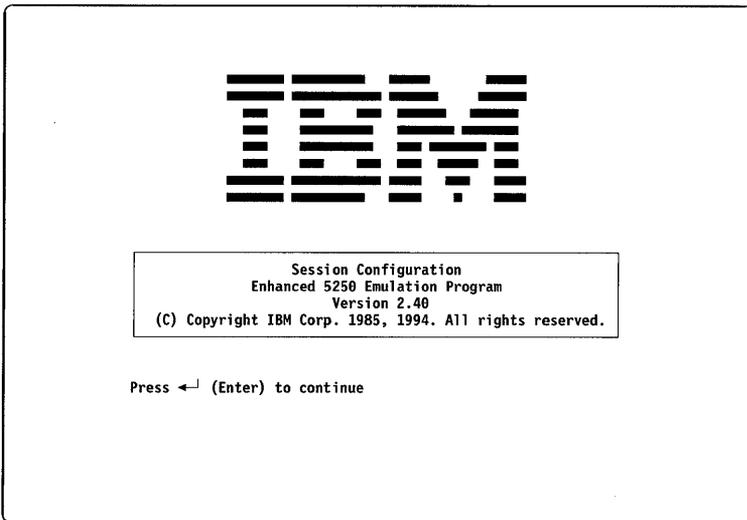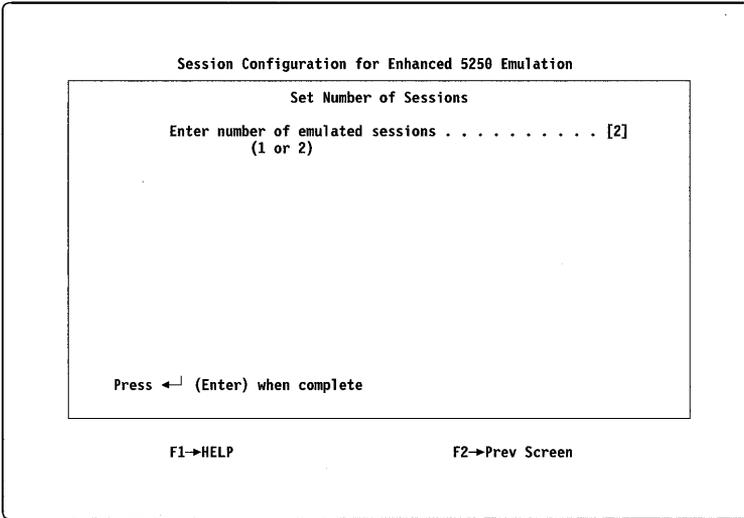


```
                    Session Configuration
                Enhanced 5250 Emulation Program
                        Version 2.40
      (C) Copyright IBM Corp. 1985, 1994. All rights reserved.


   Press ←┘ (Enter) to continue
```

Figure 3-17. Configuration Logo Screen

2. From the Set Number of Sessions screen, shown in Figure 3-18, select the number of sessions.

```
              Session Configuration for Enhanced 5250 Emulation
    ┌────────────────────────────────────────────────────────────────┐
    │                     Set Number of Sessions                       │
    │         Enter number of emulated sessions . . . . . . . . . . [2] │
    │                (1 or 2)                                          │
    │                                                                  │
    │                                                                  │
    │                                                                  │
    │                                                                  │
    │                                                                  │
    │                                                                  │
    │      Press ←┘ (Enter) when complete                             │
    │                                                                  │
    └────────────────────────────────────────────────────────────────┘

           F1→HELP                          F2→Prev Screen
```

Figure 3-18. Set Number of Sessions Screen

3. From the Language Selection Menu, shown in Figure 3-19, select your language. This selection is important because it determines which keyboard customization file to use and other language-specific information that is reported to the host.
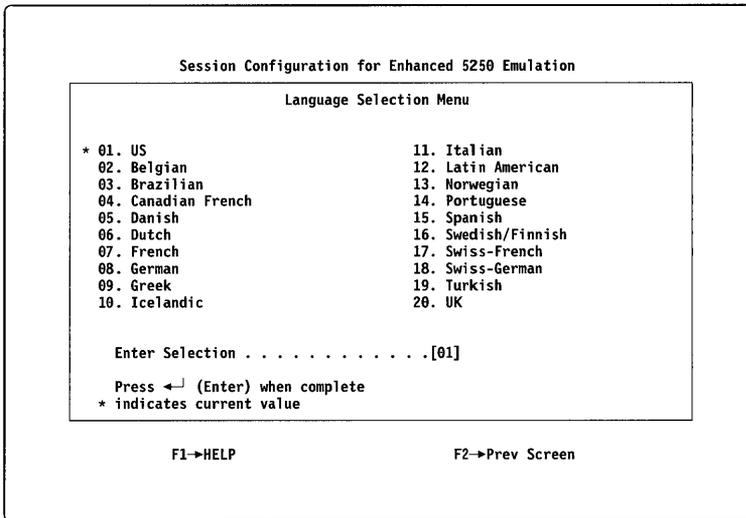
```
                Session Configuration for Enhanced 5250 Emulation

                          Language Selection Menu

  * 01. US                          11. Italian
    02. Belgian                     12. Latin American
    03. Brazilian                   13. Norwegian
    04. Canadian French             14. Portuguese
    05. Danish                      15. Spanish
    06. Dutch                       16. Swedish/Finnish
    07. French                      17. Swiss-French
    08. German                      18. Swiss-German
    09. Greek                       19. Turkish
    10. Icelandic                   20. UK


    Enter Selection . . . . . . . . . . .[01]

    Press ←┘ (Enter) when complete
  * indicates current value


          F1→HELP                          F2→Prev Screen
```

Figure   3-19. Language Selection Menu

4. From the Keyboard Selection Menu, shown in Figure 3-20, select the type of keyboard attached to your personal computer. The combination of language and keyboard selections determines which keyboard customization file to activate. For a list of the keyboard customization files, see Figure E-2 on page E-4.

If you have modified a keyboard customization file, select option 04 and enter the file name of your modified keyboard customization file. The currently active keyboard customization file is displayed.

```
                    Session Configuration for Enhanced 5250 Emulation

                            Keyboard Selection Menu

                    * 01. Enhanced Style Keyboard
                      02. AT Style Keyboard
                      03. PC-XT Style Keyboard
                      04. Select user created profile
                          [                                    ]

             Active keyboard profile:
             US-----E.PRO



             Enter Selection . . . . . . . . . . . .[01]

             Press ←  (Enter) when complete
           * indicates current value


                  F1→HELP                        F2→Prev Screen
```
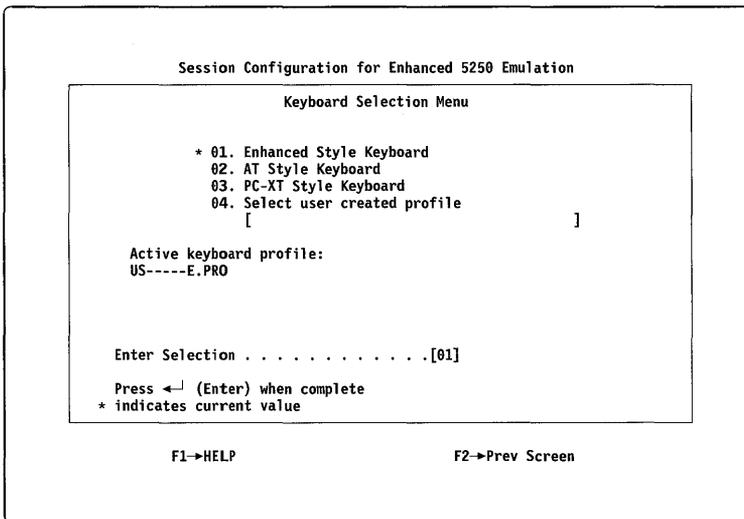
Figure   3-20. Keyboard Selection Menu

5. From the screen shown in Figure 3-21, select the Host to PC display code page mapping. Because the Host uses an EBCDIC code page and the personal computer uses an ASCII code page, a table must be used to map the EBCDIC characters to ASCII characters.

A code page is a set of displayable characters that is assigned to the 256 code points in the code page. The default mapping for the configuration program is EBCDIC code page 037 to personal computer code page 437. You must use the same code page as configured in your DOS session.

Select the mapping that matches your host and personal computer code pages and press Enter to continue. If you use PC Support/36 or PC Support/38, you must use personal computer code page 437.

```
              Session Configuration for Enhanced 5250 Emulation

                  Select Host to PC Display Code Page Mapping

            Host      Personal            Host      Personal
            Code      Computer            Code      Computer
            Page      Code Page           Page      Code Page
            ----      ----                ----      ----
    * 01. 037   -►  437             09. 297   -►   850
      02. 037   -►  850             10. 500   -►   437
      03. 273   -►  850             11. 500   -►   819
      04. 277   -►  850             12. 500   -►   850
      05. 278   -►  850             13. 871   -►   819
      06. 280   -►  850             14. 871   -►   850
      07. 284   -►  850             15. 875   -►   869
      08. 285   -►  850             16. 1026  -►   857

                Enter option for Code Page. . . . [01]

          Press ◄─┘ (Enter) when complete
        * indicates current value


            F1-►HELP                        F2-►Prev Screen
```

Figure 3-21. Select Host to PC Display Code Page Mapping Screen

6. From the Primary Workstation Address screen, shown in
   Figure 3-22, specify the workstation addresses assigned to your
   workstation.

```
                Session Configuration for Enhanced 5250 Emulation
                         Primary Workstation Address

                         Session 1 . . . . . . .[0]

                         Session 2 . . . . . . .[1]

                         Enter a value from 0 to 6.






        Press ←┘ (Enter) when complete



              F1→HELP                        F2→Prev Screen
```
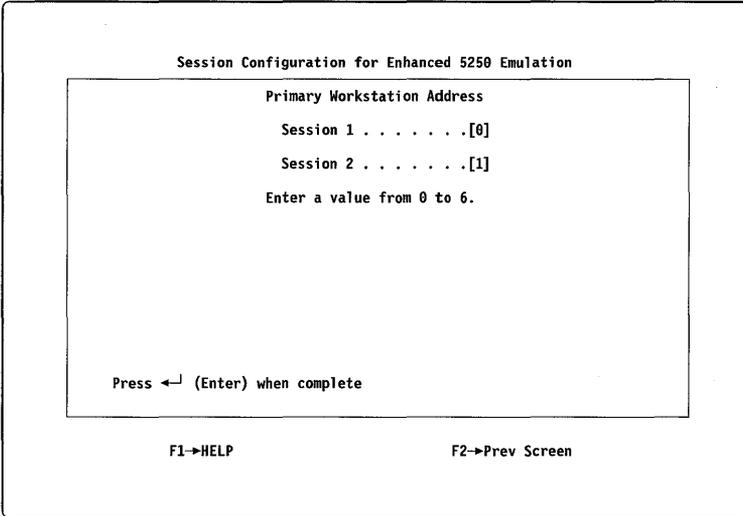
Figure 3-22. Primary Workstation Address Screen

7. If you specified 2 sessions, select a printer or display for session 2 from the Select Session 2 Type screen, shown in Figure 3-23.

```
          Session Configuration for Enhanced 5250 Emulation
  ┌─────────────────────────────────────────────────────────────┐
  │                      Select Session 2 Type                   │
  │                                                              │
  │                  Session 1 is a display session.             │
  │                                                              │
  │     * 1. 5256 printer emulation                              │
  │       2. 5219 printer emulation                              │
  │       3. 5224/5225 printer emulation                         │
  │       4. Display emulation                                   │
  │                                                              │
  │                  Session 2 . . . . . . . .[1]                │
  │                                                              │
  │                                                              │
  │                                                              │
  │                                                              │
  │       Press ◄┘ (Enter) when complete                        │
  │     * indicates current value                                │
  └─────────────────────────────────────────────────────────────┘

           F1→HELP                        F2→Prev Screen
```
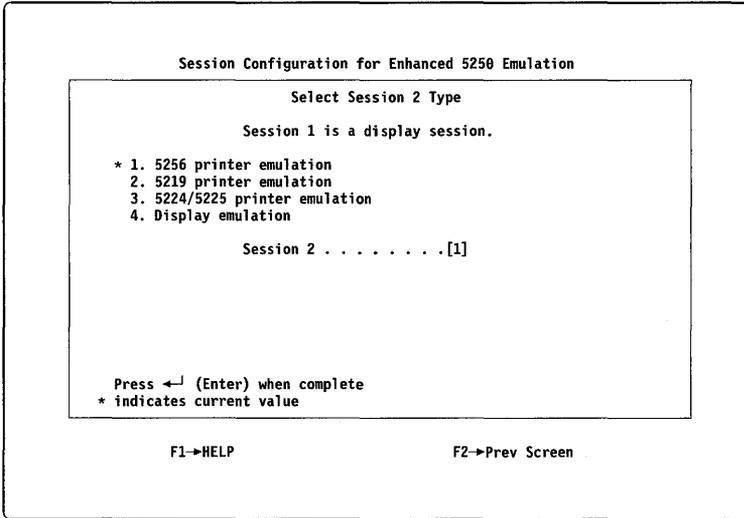
Figure 3-23. Select Session 2 Type Screen

8. If you specified session 2 as a printer, select the type of printer
   attached to your personal computer from the Attached Printer
   List screen, shown in Figure 3-24. If your printer is not listed,
   enter a Printer Function Table (PFT) file name for your printer.
   Press F1 to see a list of PFT file names.

   For information on the Printer Function Setup program, see
   Chapter 10, "Using the Printer Function Table Setup Program."

```
              Session Configuration for Enhanced 5250 Emulation
         ┌─────────────────────────────────────────────────────────┐
         │                   Attached Printer List                  │
         │                                                          │
         │   * 1. IBM PC Graphics Printer                           │
         │     2. IBM PC Matrix Printer                             │
         │     3. IBM Proprinter                                    │
         │     4. IBM Wheelprinter Printer (Model 5216)             │
         │     5. IBM Color Printer (Model 5182)                    │
         │     6. IBM Quietwriter Printer (Model 5201)              │
         │     7. Table driven (user-defined) printer               │
         │ [                                                      ] │
         │                                                          │
         │         Enter Selection . . . . . . . . . . .[1]         │
         │                                                          │
         │                                                          │
         │                                                          │
         │         Press ←┘ (Enter) when complete                  │
         │       * indicates current value                          │
         └─────────────────────────────────────────────────────────┘

                F1→HELP                        F2→Prev Screen
```
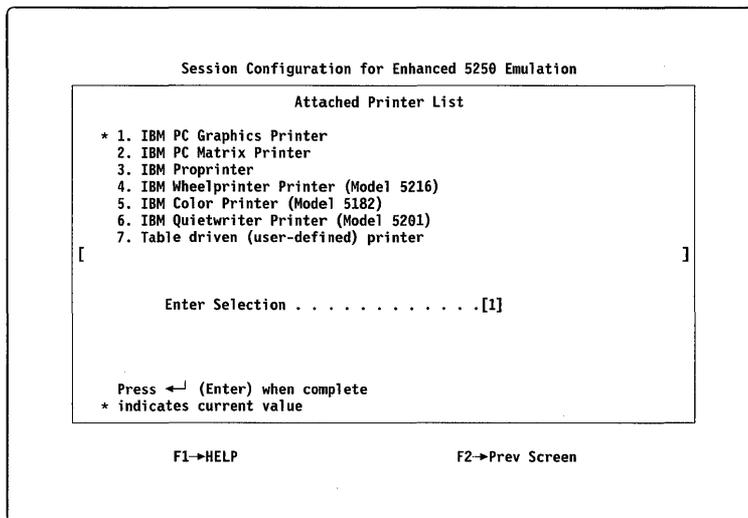
Figure   3-24. Attached Printer List Screen

9. If you specified session 2 as a printer, select the host to printer code page mapping from the screen shown in Figure 3-25. Because the host uses an EBCDIC code page and personal computer-attached printers use ASCII code pages, a table must be used to map the EBCDIC characters to ASCII characters. Select the mapping that matches your host and printer code page values and press Enter to continue.

```
                Session Configuration for Enhanced 5250 Emulation

                      Select Host to Printer Code Page Mapping

              Host     Printer              Host     Printer
              Code     Code                 Code     Code
              Page     Page                 Page     Page
              ----     ----                 ----     ----
          * 01. 037   -►  437           09. 297   -►  850
            02. 037   -►  850           10. 500   -►  437
            03. 273   -►  850           11. 500   -►  819
            04. 277   -►  850           12. 500   -►  850
            05. 278   -►  850           13. 871   -►  819
            06. 280   -►  850           14. 871   -►  850
            07. 284   -►  850           15. 875   -►  869
            08. 285   -►  850           16. 1026  -►  857

                 Enter option for Code Page. . . . [01]

              Press ◄┘ (Enter) when complete
          * indicates current value


              F1-►HELP                        F2-►Prev Screen
```

Figure 3-25. Select Host to Printer Code Page Mapping Screen

10. Save your updates by selecting option 1 at the Advanced Display Emulation Options screen. Write down the file name that you used (for example, DP5250.DAT).

11. If you want to work with the advanced options, do one:

- For additional display options, select option 3, Select Display Emulation Options.

- For additional printer options, select option 4, Select Printer Emulation Options.

For more information about the advanced options, see Chapter 11, "Advanced Configuration."

12. To exit the Emulation Program, select option 2.

You are now ready to start the Emulation Program. Go to Chapter 4, "Operating the Emulation Program."

Using the Emulation Program with OS/2

You can use the Emulation Program in an OS/2 Version 2.1 DOS session. Interrupt sharing is not supported when using the Emulation Program under OS/2.

Installing under OS/2

To install the Emulation Program under OS/2, you must run the INSTALL program from a full-screen DOS session.

Note: You must run the CONFIG program from a full screen DOS session.

To set up under OS/2 Version 2.1:

1. From the Command Prompts folder, choose either DOS Full Screen or DOS Window, depending on how you want to run the Emulation Program.

2. Using the right mouse button, click on the icon.

3. Using the left mouse button, click on OPEN.

4. Choose Settings.

5. Select the Session tab and choose DOS Settings.

6. Select KBD_CTRL_BYPASS. Select Alt+Esc.

7. Select the Window tab. Set the radio button for Create New Window.

8. Choose Save and close the window.

Running under OS/2

Warning: Do **not** use the DOS session while running the Emulation Program with OS/2. Entering any DOS command except EXIT (to end the Emulation Program) can cause unpredictable results.

To run under OS/2 Version 2.1:

1. Start a DOS session using the DOS icon that you set up for use with the Emulation Program.

2. Change to the directory where the Emulation Program was installed.

3. Type **DP5250** and press Enter to continue.

Ending the Emulation Program under OS/2

To end the Emulation Program, do one:

- Hot key to the DOS prompt in your 5250 emulation DOS session and type **EXIT**

- From the Task list, click on the DOS session with the right mouse button and select Close.

Converting 2.12 or Later Profiles to 2.4 Level

If you have session profiles from Version 2.12 or later of the Emulation Program, you can update them for use with Version 2.4. To update the session profiles, run CONFIG.EXE using your existing session profile as input. For example, if your Version 2.3 session profile is named MYPROF.DAT, you would type the following command at the DOS prompt and press Enter: `CONFIG MYPROF.DAT`

When the profile is saved, it is updated to the format required for Version 2.4 of the Emulation Program:

- The name of the keyboard customization file that is in the session profile is changed to the name of the closest valid keyboard customization file for Version 2.4. Figure 3-26 shows the old and new keyboard customization file names, where *xxxxxx* in the new file name indicates which supported language the keyboard uses. For a list of the keyboard customization files that are supplied with the Emulation Program, see Figure E-2 on page E-4.

Figure 3-26. Changes to the Keyboard Customization File Names	
Old File Name	**New File Name**
KB5250	*xxxxxx*-P.PRO
KBA5250	*xxxxxx*-A.PRO
KBPC	*xxxxxx*-P.PRO
KBAPC	*xxxxxx*-A.PRO
KBEPC	*xxxxxx*-E.PRO
CUSTOM	*xxxxxx*-E.PRO

- If a 5292 session is defined in the session profile, it is changed to a 3197 session. You might have to ask the host system operator to change the workstation address or the host device description.

All other values in the session profile remain unchanged.

Keyboard customization files from Version 2.12 or later are *not* compatible with Version 2.4. If you made changes to a keyboard profile, you must edit the new keyboard customization file and make the changes again. For instructions on defining a keyboard, see "Changing the Keyboard Customization File" on page 6-8.

Printer Description Table (PDT) data sets are not compatible with Version 2.4. Run the PFTSETUP program to create profiles for any user-defined printers. For information about printer function tables, see Chapter 10, "Using the Printer Function Table Setup Program."

Chapter 4. Operating the Emulation Program

You cannot run the Emulation Program if your adapter is not installed. For installation directions, see the *Guide to Operations* or *Installation and Test Instructions* manual for your adapter.

Make sure all devices attached to the personal computer are turned on before loading the Emulation Program.

There are two Emulation Programs, DP5250.COM and PRT5250. DP5250.COM provides the display session capabilities and the functionality for emulation. PRT5250 provides the printer session capabilities and is loaded by DP5250.COM only if a printer session is configured. Only DP5250.COM needs to be run.

Loading the Programs

Before you can begin, you must create an emulation session profile by using the CONFIG.EXE program that is provided on the Emulation Program diskette.

The process of loading programs on a personal computer is not limited to one method. The sequence in which the programs are loaded is critical.

The Emulation Program may be loaded either step by step (see "Loading Options from the DOS Prompt") or may be loaded automatically (see "Automatically Loading Programs" on page 4-3).

Loading Options from the DOS Prompt

When loading a program from the DOS prompt, values can be provided (as parameters) with the command that invokes the program. These values may specify a session profile and a keyboard customization file. The parameters must follow the program name with one space between the program name and the first parameter.

To start emulation with the default session profile (DP5250.DAT), type **DP5250** from within the directory containing the Emulation Program and press Enter.

To specify a different **session profile**, type:

`DP5250 I=`*myfile*`.DAT`

This loads profile tables from a file named ***myfile*.DAT** located in the current directory. If a session profile is not specified, DP5250.DAT is loaded as the profile. See "Configuring for Emulation" on page 3-25 for more information about session profiles.

Note: You must have a session profile or the Emulation Program will not run.

If an error occurs during the reading or opening of a session profile, a File Not Found error message is displayed. For information about this message, see File Not Found on page A-3.

If a problem occurs after opening the profile, the Unusable Initialization Data error message is displayed. For information about this message, see Unusable Initialization Data on page A-3.

To specify a **keyboard customization file**, specify the keyboard customization file when you start the Emulation Program. For example, to use the US enhanced keyboard customization file, type:

`DP5250 K=US-----E.PRO`

The keyboard customization file name is normally provided by the session profile. By specifying a different file name on the command line, you can use a different keyboard customization file than the one contained in the session profile.

You can specify both a session profile and a keyboard customization file on the same command line. For example:

`DP5250 I=`*myfile*`.DAT K=US-----E.PRO`

To specify a **printer function table (PFT)** different from the one specified in your session profile, type:

`DP5250 P=`*`printable.`*`PFT`

The PFT file describes the characteristics of an otherwise unsupported printer to the Emulation Program. If you did not specify a table-driven (user-defined) printer during configuration, the Emulation Program ignores any PFT file that you specify when starting the session profile.

If you do not specify a file name for the PFT file, the file name in the session profile is used.

Note: The Emulation Program is designed to have only one copy of the program in memory at a time. An error message is displayed if you attempt to load a second copy. (The first copy of the program is still functional.)

Automatically Loading Programs

If you use an AUTOEXEC.BAT file to load your Emulation Program, it is assumed that DOS, COMMAND.COM, and the Emulation Program are loaded in the same directory or that a path was established for DOS to find the files. (See "Loading the Programs" on page 4-1 if you are not using an AUTOEXEC.BAT file.)

Adding DP5250 to your AUTOEXEC.BAT file automatically loads the Emulation Program. Program parameters can be added to the command line as part of the AUTOEXEC.BAT file. "Loading Options from the DOS Prompt" on page 4-1 gives examples of how to use parameters.

Program parameters can appear in any combination. Spaces are required between parameters, but are not allowed between characters within parameters. When two conflicting parameters are typed, the last parameter in a left-to-right scan is used. Invalid program parameters are identified in an error message.

If another parameter follows a program name, then blanks are required. For example, a blank (or space) must be used between `DP5250` and `I=`*`myfile.`*`DAT`, like this: `DP5250 I=`*`myfile.`*`DAT`

DOS commands can be specified on separate lines in an AUTOEXEC.BAT file, as shown in the following example:

```
SET ENB5250=[D:][path]  (For PCMCIA systems only.  See Note 2.)
CD\EM5250
DP5250 I=myfile.DAT
pc application program name
```

This sequence sets the ENB5250 environment variable, loads the Emulation Program, and brings the host online without further operator involvement. The application program is then automatically loaded.

Notes:

1. This AUTOEXEC.BAT file assumes that the automatic hot key option was selected during session configuration (CONFIG.EXE).

2. **For PCMCIA personal computers** only, you must set the environment variable, ENB5250=[D:] [PATH], so that the PCMCIA card configuration files can be found. It is recommended that you add this command in the AUTOEXEC.BAT file.

Starting the Emulation Program

If you have not specified bypass of the pre-signon screen, a screen similar to that shown in Figure 4-1 should appear after:

- DOS is loaded.
- DP5250.DAT is loaded.
- The emulation adapter is found.
- The emulation adapter passes a memory test.
- The station addresses are tested for availability.

If you have not specified bypass of the pre-signon screen and it does not appear, refer to Appendix B, Problem Determination.

```
Enhanced 5250 Emulation Program
EC02.40 mm/dd/yy
Copyright IBM 1985, 1994
K=US-----E.PRO
1) 3196 Display at station address = y
2) 5256 Printer at station address = z

Press any key to continue
```
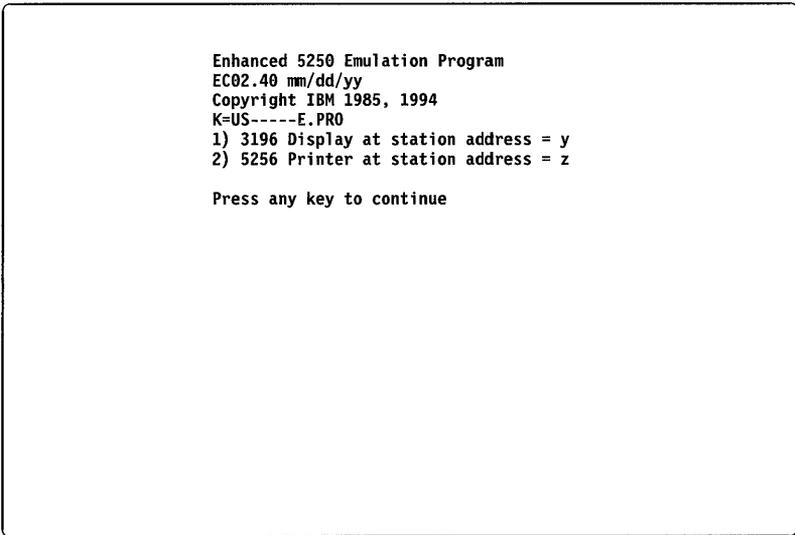
Figure 4-1. Pre-Signon Screen

Although the pre-signon screen is displayed, your personal computer is not yet online with the host. The pre-signon screen identifies the program and the engineering change level, and it displays the copyright notice.

The numbers at the start of the fifth and sixth lines of the pre-signon screen are the session numbers, and *y* and *z* at the end of the fifth and sixth lines are the workstation addresses for those sessions.

Line four is the keyboard customization file that was chosen during configuration.

When you press a key, DP5250 (the Emulation Program) attempts to communicate with the host using the addresses in the session profile. The workstation addresses being attempted are displayed in a message while the activity is in progress. After the personal computer comes online with the host, an alarm sounds and the pre-signon screen is replaced with a host screen. The keyboard is now in emulation mode and is defined by the keyboard customization file. The status is on line 25 of the display screen. Refer to "Understanding the Status Indicators" on page 5-3 for an explanation of the status line indicators.

If the adapter is operational, the host signon screen appears. Otherwise, an error message appears on the pre-signon screen. Refer to Appendix A, Error Codes and Messages, for further information.

At this point, the keyboard only responds as defined by the keyboard customization file that was selected during session configuration. The examples in this chapter assume that the keyboard used is an enhanced-style keyboard.

Notes:

1. If the address is already being used by another workstation, the message Station Address Already In Use is displayed.

2. If a workstation that is not capable of searching for an address is turned on and its address is already in use, the device that is using this address has its session interrupted and the workstation starting up is unable to establish its session (address contention).

3. If the Emulation Program is loaded on two or more personal computers using the same workstation address within an 8-second period, the host (or controller) may stop talking to both devices. If this occurs, reload the Emulation Program on the first personal computer, wait at least 8 seconds, then load the Emulation Program on the second personal computer using a different workstation address.

If an error is detected by the host during online operation, it is displayed as a 4-digit error code on the left end of line 25. Refer to "Four-Digit Terminal Error Codes" on page A-13 for descriptions of the error codes. Errors not defined in Appendix A may be found in Appendix B, Problem Determination.

When you have successfully loaded DP5250, your personal computer emulates a display and, if two sessions were chosen during configuration, either a second display or printer.

To support S/36 computers and controllers using the auto-configuration feature, the Emulation Program must be loaded and brought online before the host or controller is turned on. You must ensure that every personal computer on the workstation line has a unique workstation address for every emulation session. Then, when the System Not Available for Station Ax message is displayed, select the Ignore option.

The AS/400 auto-configuration feature allows you to start emulation anytime the AS/400 computer is running. Sessions are automatically configured at the host.

For information about how each key and key sequence on the emulated keyboard works, refer to Chapter 6, Using the Keyboard.

To use the functions of the host, you must sign on to the host. Check with the person with the appropriate host system authority for your signon requirements (password).

If contact is established with the host, the System Available indicator comes on and either the cursor is displayed in the upper left corner of the display screen or a signon screen appears.

If contact is not made with the host, the System Available indicator is off and the cursor is displayed in the upper right corner of the display screen.

Printing the Screen during Emulation Mode

Printing on a Host System Printer
When the Shift+Print Screen keys are pressed, a print request is sent to the host and your screen is printed or spooled by the host.

Printing on a Personal Computer Printer
When the Print Screen key is pressed, your host screen is printed on your personal computer printer. EBCDIC codes below hex 20 are not translated. The codes below hex 20 are sent to the printer *as is*. Codes above 20 are translated using information provided in the *Technical Reference* manual. See the instructions for your printer to determine the action taken.

Note: If printer emulation is running and is using the same physical printer as the personal computer, you must suspend the printer session from the emulated printer operator panel before the personal computer print screen function works. (See "5219 Printer Emulation Display" on page 7-5, for 5219 emulation; "5256 Printer Emulation Display" on page 9-4, for 5256 emulation; or "5224 Printer Emulation Display" on page 8-5, for 5224 emulation.)

Leaving Emulation Mode
You can leave an emulation session by using the software reset sequence (DOS systems only) or by using the hot key sequence (default is Alt+Esc).

Using the Software Reset Sequence
Warning:

- **Do not use the software reset to end an OS/2 session.**

- If you are running an application on the personal computer, do not use the software reset sequence (Ctrl, Alt, and Del keys simultaneously) to leave an emulation session until you have ended your DOS application. An error occurs causing the personal computer to stop running. When this occurs, you must reload DOS and any other programs you want to have running.

The software reset sequence takes the display station offline from the host and returns the personal computer to the DOS prompt. To the host, this is the same as turning off a 5250 display.

To end emulation on a DOS-only personal computer:

- Sign off the host.

- When a host **signon screen** appears, press Ctrl+Alt+Del. This returns you to DOS. The personal computer is offline. If you use the hot key sequence to enter personal computer mode instead of using the software reset sequence, memory space used by the Emulation Program may not be available for other application programs.

Note: If you are running in a DOS session under OS/2, you can end the Emulation Program by doing one:

- Hot key to the DOS prompt and type **EXIT**

- From the Task list, click on the DOS session using the right mouse button and then select Close.

See "Loading the Programs" on page 4-1 and "Starting the Emulation Program" on page 4-5 if you want to reload the Emulation Program.

Using the Hot Key Sequence

Warning: Do **not** use the DOS session while running the Emulation Program with OS/2. Entering any DOS command except EXIT (to end the Emulation Program) can cause unpredictable results.

After the Emulation Program is loaded, the hot key sequence allows you to change sessions. By customizing the hot key sequence, it is possible to go directly to a particular session. (For information about customizing how keys are mapped, see "Changing the Keyboard Customization File" on page 6-8.)

To leave emulation mode or to change emulation sessions, enter the hot key sequence. The emulated workstation remains online and the Emulation Program continues to run; however, the personal computer no longer displays the same session.

To leave personal computer mode, enter the hot key sequence. The current program is *suspended* until you hot key back to that mode.

Notes:

1. It is possible that your personal computer program may not allow itself to be interrupted. If this is true, let it run to completion before hot keying to an emulation session.

2. You can read the information from a session screen and save it to disk. You may change the session that is selected to save screens. For more information about this and other sample programs, see "Example Emulation Program Utilities" on page D-3.

3. Any host-issued commands that cause the personal computer to beep while the Emulation Program is online with the host continue to cause the unit to beep when it is in personal computer mode. This allows you to be aware of a host message or other event when you are not in emulation mode.

Chapter 5. Using the Display Screens

The 25-line display in emulation mode displays 24 lines of data. Line 25 is the status line and displays the status of the host and the personal computer.
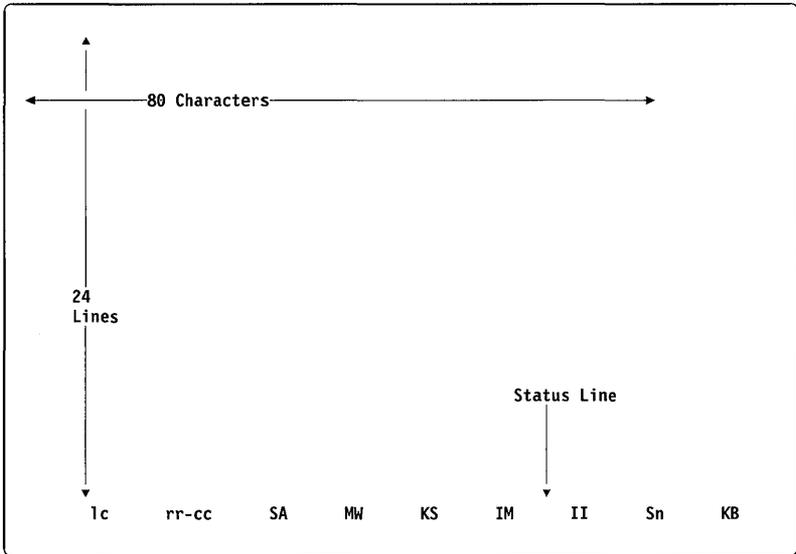
Figure 5-1. Emulated 5250 Display Screen

Selecting the Cursor Style

The cursor always blinks on the personal computer. The cursor's attributes can be changed between a blinking rectangle and a blinking underscore. Press Alt+F9 to toggle the cursor between a blinking rectangle and a blinking underscore.

Note: A fast-cursor option is available by pressing the Alt key with a cursor movement key.

Autodim Feature

The Autodim feature automatically dims the screen after a specified length of time if no keystrokes are entered and no host-generated screen updates occur. During configuration, the Advanced Display Emulation Options Menu allows you to enable Autodim and specify the length of time.

Changing Screen Colors

You can change the foreground and background colors from the default green and black settings.

To customize the screen colors, use the Customize Screen Colors and Attributes menu option under Advanced Display Options. For information about changing screen colors and attributes, see "Screen Colors and Attributes" on page 11-4.

Understanding the Status Indicators

Status indicators are located on the status line (line 25) of the display screen when in emulation mode.

```
        Status Line
            |
            |
    lc    rr-cc    SA    MW    KS    IM    II    Sn    K
```
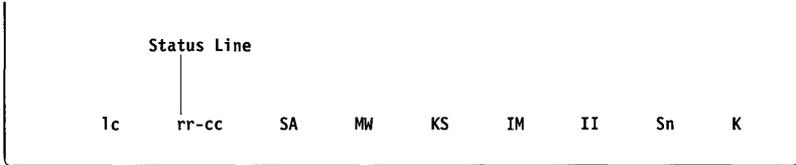
Figure   5-2. Status Indicators

The status indicators shown as capital letters appear either ON or OFF. The indicators are ON when a square block appears around the indicator. (The indicators are in reverse image.)

Notes:

1. When operating in 40-column mode, MW, KS, and IM indicators are not shown.

2. Some of the indicators (such as the A*x* indicator) are not normally seen on the status line.

The status indicators and their meanings are shown on the following pages.

Line Check Error (lc)

lc   The line check error shows the number of unrecognizable types of data that are received by the personal computer. The count appears as a decimal number in columns 1 and 2 on the status line.

Note: This field is usually blank (no indicator appears). If a value appears in this field, see Appendix B, Problem Determination.

Cursor Location (rr-cc)

The status line of the personal computer, when in emulation mode, describes the location of the cursor. Figure 5-3 shows where this information appears.

The cursor location is displayed on the status line as two 2-digit numbers separated by a dash (the first two digits represent the row that the cursor is in, and the second two digits represent the column).
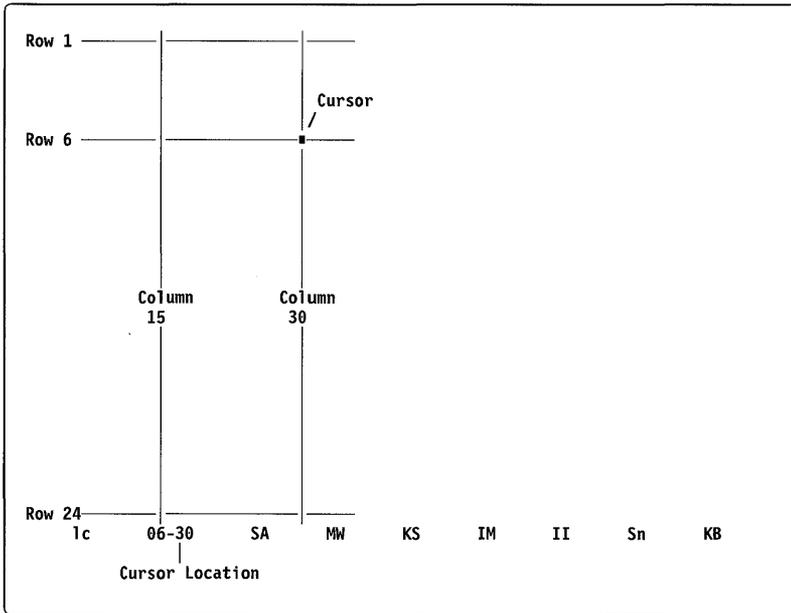
Figure 5-3. Cursor Location on Screen

For example, the cursor in the illustration is in row **6** and column **30**. This would be displayed on your status line as **06-30**.

System Available (SA)

SA The controller (5294 or 5394), the host, or both are operating and are available to the personal computer.

SA The controller, the host, or both are not available to the personal computer.

Message Waiting (MW)

MW The host has one or more messages for you. (You might hear a beep when the Message Waiting indicator first turns on.)

MW The host does not have a message waiting for you.

Keyboard Shift (KS)

KS The keyboard is in shifted mode.

The KS indicator does not show when the keyboard is in Caps Lock or Num Lock mode. These modes are shown by lights on the IBM Personal Computer AT keyboard and the Enhanced keyboard. They are not shown on keyboards used by other IBM personal computers or the IBM Space Saving Keyboard.

KS The keyboard is in nonshifted mode.

Insert Mode (IM)

IM Characters can be inserted into an existing field without destroying existing data.

IM Characters cannot be inserted into an existing field without destroying data.

Input Inhibited (II)

II Keyboard input is not being accepted by the host or the controller.

II Keyboard input is being accepted by the host or the controller.

If the session was configured for keystroke buffering and the II (Input Inhibited) indicator is on, keystrokes are saved and not sent to the host. When II is on, the only keystrokes sent to the host are Shift,

emulated Error Reset, emulated Attention, emulated System Request, and emulated Help.

If keystrokes are saved, you may clear them by pressing the **I Reset Key** sequence. See "Special Key Sequences" on page 6-4 for information about the I Reset Key sequence.

The II indicator is turned on by the host system or by the controller while it is processing your requests. The II indicator is also turned on by error conditions.

The emulated Error Reset key may be used to turn the II indicator off, if it was turned on by an error condition.

Session Number (Sn)

Sn   The session number appears as an S followed by the number of the currently displayed session, for example **S1**.

Keystroke Buffering (KB)

KB   Keystrokes are saved. When the input inhibited condition is cleared, they are sent to the host. If keystrokes are saved, you may clear them by pressing the **I Reset Key** sequence. See "Special Key Sequences" on page 6-4 for information about the I Reset Key sequence.

KB   No keystrokes are being saved.

Note: The Keystroke Buffering indicator only appears during the sessions that you configured for buffering. (For information about running the configuration program to change keyboard buffering, see "Buffer Keystrokes" on page 11-2.)

Workstation Address (Ax)

Ax   The workstation address is displayed to the right of the session number, in the location normally used to show keystroke buffering (KB). Pressing the **WS Addr Key** sequence causes the address to appear. Pressing the **WS Addr Key** sequence again returns the KB indicator (which is blank when keyboard buffering is not active) to the status line.

See "Special Key Sequences" on page 6-4 for information about the WS Addr Key sequence.

Display Highlighting

See the *Technical Reference* manual for a detailed description of the types of highlighting available for personal computer displays (compared with the 5250 displays) as used in the Emulation Program.

Monochrome Displays

The Emulation Program with the Monochrome Display Adapter can display characters that are normal intensity, high intensity, blinking, reverse image, or underscored. It does not provide characters that are in reverse image with underscore (it displays normal image with underscore) or reverse image with high intensity (it displays reverse image with normal intensity).

Note: The highlighting for the Monochrome Display may be changed by using the configuration program. For information about changing screen attributes, see "Screen Colors and Attributes" on page 11-4.

The Emulation Program does not support column separators in the same way as a 5250 Display Station. During the configuration program, you can select a personal computer character to be the column separator. You can also specify whether the character should appear when the field contains only a null character or when the field contains either a blank or null character.

If you do not select a character as the column separator, a rectangle (▐) appears in the separator position when it contains a null character.

The IBM 8507 Monochrome Monitor requires display attributes to be changed by the configuration program (CONFIG). Otherwise, the screen appears dim when emulation is loaded. The display option can be changed at the Advanced Display Emulation Options Menu during configuration. Refer to "Screen Colors and Attributes" on page 11-4, for more information. To prevent dimming on the 8507, change the following screen attributes:

Enter **0F** for attribute 20.
Enter **70** for attribute 21.
Enter **7F** for attribute 22.
Enter **0F** for attribute 30.

Color Displays and Portable Displays

Characters are displayed in normal intensity, high intensity, blinking, and reverse image when using the Emulation Program.

The underscore is host program dependent. If the host program uses hex 00 in the data area of an underscored field, an underscore is simulated. If the host uses hex 40 (blank) in the data area, the underscore cannot be simulated. (The character appears without an underscore.)

Notes:

1. The highlighting for a color display may be changed by using the configuration program. For information about changing screen attributes, see "Screen Colors and Attributes" on page 11-4.

2. A display that uses the Color Graphics Adapter, but is identified as a single-color display or an IBM Portable Personal Computer display during configuration, may not have its attribute table changed.

The Emulation Program does not support column separators in the same way as a 5250 Display Station. During the configuration program, you can select a personal computer character to be the column separator. You can also specify whether the character should appear when the field contains only a null character or when the field contains either a blank or null character.

If you do not select a character as the column separator, a rectangle (▮) appears in the separator position when it contains a null character.

If you are using the IBM Portable Personal Computer or a single-color monitor with a Color Graphics Adapter, you can set the correct display mode for the emulation sessions by using the CONFIG.EXE program as follows:

1. Select the Advanced Display Emulation Options on the Advanced Options Menu.

2. Select Monitor Types for Color Graphics Adapter option.

3. Indicate your monitor type.

4. Return to the Advanced Display Emulation Options Menu.

5. Save the profile data.

The Emulation Program sets the display attributes and mode based on the profile data.

Chapter 6. Using the Keyboard

When the personal computer emulates an IBM 5250 Display Station, the key assignments are not exactly the same as on a 5250 keyboard. You can use any of the keyboard customization files that are supplied with the Emulation Program, or you can create your own. The profiles that are supplied with the program support the enhanced, PC/AT, and PC/XT*-style keyboards. See Figure E-2 on page E-4 for a list of supplied keyboard customization files.

The key assignments are located as close to the *normal* key position as practical for each keyboard style. Figure E-1 on page E-1 shows how the 5250 functions are mapped to the enhanced, PC/XT, and PC/AT-style keyboards.

You can use one of the supplied keyboard customization files or define your own keyboard customization file. For information about changing keyboard customization files, see "Changing the Keyboard Customization File" on page 6-8. For more detailed information about defining a keyboard, see the *Technical Reference*.

Most keyboards for portable computers (laptops, notebooks, and so forth) support all the functions that are available on the IBM Enhanced Keyboard. However, to perform some of the functions, you have to use a combination of keys. For example, some keyboards do not have the right Ctrl key, which is used to enter data on the 5250 keyboard, but you can use a combination of keys (usually Fn+Ctrl) to simulate pressing the right Ctrl key. For information about how your keyboard is mapped, refer to the documentation for your computer.

If an error is found in a keyboard customization file when the program is started, an error message is displayed and control is returned to DOS.

6-1

Figure 6-1 lists examples of the keyboard customization file required for each personal computer keyboard. The dashes in the file names are required because they are part of the keyboard customization file naming convention. For a list of keyboard customization files that are provided with the Emulation Program, see "Keyboard Customization Files" on page E-3.

Figure 6-1. Keyboard Customization Files		
Personal Computer Keyboard	**Keyboard Style**	**Example**
IBM PC, PC/XT, Portable PC	PC/XT style	US-----P.PRO
IBM PC/AT	PC/AT style	US-----A.PRO
IBM Enhanced, IBM Space Saving	Enhanced style	US-----E.PRO
IBM ThinkPad*	Enhanced style	US-----E.PRO

You can also create your own keyboard customization file by using a text editor to change one of the provided keyboard customization files. For information about creating your own keyboard customization file, see "Changing the Keyboard Customization File" on page 6-8.

Keyboard Modes

The keyboard mode controls the characters or functions desired when pressing a given key. The keyboard is used in four different modes:

- Alternate mode (Alt key)
- Shifted mode
  - Shift key held affects all keys
  - Caps Lock state affects only alphabetic keys
  - Num Lock state affects only numeric pad keys
  - Shift Lock state affects alphabetic and special character keys
- Nonshifted mode

For example, on the enhanced style keyboard:

Keys	Function
Alt+Prtsc	System Request
Shift+Prtsc	Host print screen
Prtsc	PC print screen

For illustrations of the supported keyboard layouts for enhanced style keyboards, see "Keyboard Layouts" on page E-5.

Nonshifted Mode

The nonshifted mode is the normal mode of a keyboard. As with a typewriter, when the Shift key is not pressed, the caps lock and shift lock functions are not active. In this mode, pressing the **a** key displays an **a**.

Shifted Mode

The shifted mode is the mode of a keyboard when the Shift key is held down or when an emulated shift lock function is active. As with a typewriter, when the Shift key is pressed or the shift lock is active, pressing the **a** key displays an **A**.

Caps Lock State

In the caps lock state, only the alphabetic characters enter uppercase characters. This state remains in effect during all emulated sessions and when in PC DOS mode. The indicator that is on the IBM Personal Computer AT Keyboard and IBM Enhanced Keyboard is on when the caps lock state is in effect.

Shift Lock State

In the shift lock state, the entire keyboard enters uppercase alphabetic characters and the shifted characters on special character keys.

Num Lock State

The function or character assigned to the shifted state on the numeric keyboard is performed. This state remains in effect during all emulated sessions and when in PC DOS mode. The indicator on the following keyboards is on when the Num Lock state is in effect:

- IBM Enhanced Keyboard
- IBM Personal Computer AT Keyboard

Alternate Mode

The alternate mode is the mode of a keyboard when the Alt key is held down. Like the Shift key, the Alt key provides another *level of shift* for the keyboard.

Special Key Sequences

Hot Key Sequence

The hot key sequence is used to change sessions. Each time the emulated hot key sequence is pressed, the session is changed to the requested session or to the next session in the defined rotation. An example of that rotation is shown in Figure 6-2. Each time the emulated hot key sequence is pressed, the display shows the next session. The default hot key sequence is Alt+Esc. By using keyboard customization, it is possible to go directly to a desired session. For information about changing the default hot key sequence, see "Changing the Keyboard Customization File" on page 6-8. For detailed information about changing the hot key sequence, see the *Technical Reference* manual.

```
  ┌─FIRST SESSION──►(Hot Key)──SECOND SESSION─┐
  │                                           │
  ▲                                           ▼
  │                                           │
  └────(Hot Key)◄────PC MODE◄──────(Hot Key)──┘
```
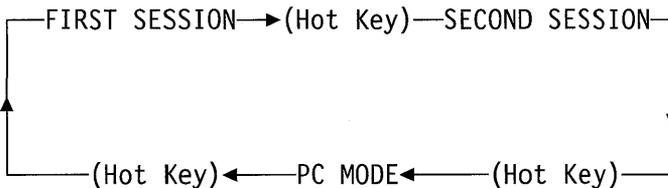
Figure 6-2. Hot Key Session Rotation

Notes:

1. Occasionally, when the emulated hot key sequence is entered, the request may not be accepted. Enter the sequence again until your request is accepted.

2. After a hot key, all keys used in the hot key sequence must be released before another hot key can be attempted.

3. You should be aware that any key sequence you assign in a keyboard customization file to hot key from the DOS session is not available for use in a DOS application program. The hot key sequence is detected by the Emulation Program and the keys are not passed on to the DOS application.

4. It is possible that your PC DOS application may not allow itself to be interrupted. If this is true, you should let it run to completion before hot keying to an emulation session.

Immediate Reset Key Sequence

The Immediate Reset (I Reset) key sequence is used to clear the keystroke buffer and to stop the playback of any defined key sequences. I Reset also clears any Shift Lock or Insert mode states that are in effect. To enter the I Reset Key sequence, press and hold the Alt key and then press the Scroll Lock key.

Workstation Address Key Sequence

The Workstation Address (WS Addr) key sequence is used to display the 5250 workstation address for the current emulated session. To enter the WS Addr key sequence, press and hold the Alt key and then press the Ctrl key. The address is displayed to the right of the session number, in the location normally used to show keystroke buffering (KB). Entering the WS Addr key sequence again returns the KB indicator to the status line. The KB indicator may be blank if keyboard buffering is not active.

Using the Shift Lock Functions

Using the Shift Lock Key

On some national language keyboards, the Caps Lock key is
replaced with a Shift Lock key. When you press the Shift Lock key,
the uppercase alphabetic characters (A through Z) and the special
characters (like the @ symbol) are entered, but the function keys
continue to use the functions assigned to the nonshifted mode. See
"Entering the Keyboard Functions" on page 6-7 for additional
information.

Using the Caps Lock and Num Lock Keys

When operating with the personal computer style keyboards, the
Caps Lock and the Num Lock keys operate the same as in PC DOS
mode. Pressing the keys in any of the sessions, including the DOS
session, sets the state in all sessions. The states of the Caps Lock
and Num Lock keys are shown on the Personal Computer AT
keyboard and the Enhanced Keyboard. Neither Caps Lock nor
Num Lock may be used in a playback sequence.

When in Caps Lock, the uppercase characters (A through Z) and the
lowercase special characters (like the number 2) are entered, and
the function keys continue to use the functions assigned to the
nonshifted mode. Caps Lock does not cause the KS indicator to
come on. The Caps Lock function can only be assigned to the Caps
Lock key.

When in Num Lock, the characters or functions assigned to the
shifted mode of the numeric pad are entered. Num Lock does not
cause the KS indicator to come on. The Num Lock function can only
be assigned to the Num Lock key.

See "Entering the Keyboard Functions" on page 6-7 for more
information.

Entering the Keyboard Functions

When a key is pressed in the shifted mode, the character or function defined to the "s-" (shifted) mode of the key is entered. When a key is pressed in the alternate mode, the character or function defined to the "a-" (alternate) mode of the key is entered.

For example, if you made the following definitions in the keyboard customization file:

```
def 1 = '1'
def s-1 = '!'
def Ctrl = [attn]
def s-Ctrl = [sys req]
```

when the keyboard is in the shifted mode (Shift key held down or keyboard in emulated shift lock state) and the **1** key is pressed, the **!** is entered because ! is a defined character.

Keys defined to perform functions when in the shifted state perform those functions only when the Shift key is held down or the key is on the numeric pad and the keyboard is in the Num Lock state. For example, with the above key definitions, when Ctrl (the emulated Attn key) is pressed, the attention function is requested of the host system when the keyboard is in the nonshifted state. To use the system request function, you may press Ctrl (the emulated Sys Req key) while a Shift key is held down.

When a personal computer style keyboard is in the caps lock state, an **a** is entered as an **A**, however a **1** is entered as a **1** because these are the personal computer defined characters.

Keys defined to perform functions when in the shifted state must have the Shift key held down, even when the keyboard is in caps lock state. For example, with the above key definitions, when Ctrl (the emulated Attn key) is pressed, the attention function is requested of the host system whether or not you are in caps lock state. To use the system request function, you must press Ctrl (the emulated Sys Req key) while a Shift key is held down.

Keystroke Buffer

If keystroke buffering is configured for a session and the Input Inhibited (II) indicator is on, keystrokes (up to 32) are stored and then sent to the host when the Input Inhibited indicator is off. If more than 32 keys are pressed, an alarm is sounded for each key and the keystroke is discarded. As the buffer space is freed, when keystrokes are sent to the host, additional keystrokes may be buffered.

See "Keystroke Buffering (KB)" on page 5-6 for a description of the Keystroke Buffer indicator.

If keystrokes are stored and you want to cancel them, do one of the following:

- Press and release the emulated Error Reset key.

- Press and hold the I Reset Key sequence. This method also stops any playback sequence that is in progress.

The stored keystrokes are removed from the keystroke buffer, an emulated Error Reset is sent to the host, and Shift Lock and Insert states are cleared.

Note: While running 3270 emulation on the IBM host, the Input Inhibited indicator may be cleared when the system is not ready to accept keystrokes. Clearing Input Inhibited may cause buffered keystrokes to be discarded. Care should be taken when buffering keystrokes for use during 3270 emulation.

Changing the Keyboard Customization File

You can change character and function assignments by changing the keyboard customization files. For example, if you wanted to change the hot key sequence that you use to switch between the DOS and 5250 sessions, you would change the keyboard customization file.

You must customize your keyboard customization file before starting the Emulation Program. When you start the Emulation Program, the keyboard customization file takes effect.

The keyboard customization files are ASCII text files that you can edit using any ASCII editor, like EDIT that comes with DOS. Each definition in the keyboard customization file must be entered on one line. The syntax of the DEFINE command is:

DEF *mode keyname* = *function*
or
DEF *mode keyname* = *text*

Where:

mode   Specifies whether only the key is pressed or the key is pressed with the Shift key or the Alt key. The values for *mode* are:

      (blank)   For non-shifted mode (only the key is pressed)
      s-   For shifted mode (the key and Shift are pressed)
      a-   For alternate mode (the key and Alt are pressed)

keyname   The name of one of the personal computer keys. For the *keyname*, you can use any character on your keyboard or any key name that is listed in Figure 6-3 on page 6-10. For example, def a = b

function   The name of one of the host functions. For a list of host function names, see Figure 6-4 on page 6-11.

text   A string of characters that is enclosed in quotation marks. You can use single (') or double (") quotation marks around the string. For more information about using *text*, see "Assigning Text to a Key" on page 6-11.

For example, if you wanted to be able to print the current host screen by pressing the Shift and F1 keys, you would put the following definition in your keyboard customization file:

```
def s-f1=[printhost]
```

Or, if you wanted to be able to switch between the DOS and 5250 sessions by pressing Alt+t, you would put the following definition in your keyboard customization file to add the hot key sequence:

```
def a-t=[hotkey]
```

Notes:

1. You can define more than one hot key sequence.

2. For additional information about customizing your keyboard, see the *Technical Reference* manual.

Figure   6-3. Personal Computer Key Names

alt	alt2	backspace
capslock	ctrl	ctrl2
delete	down	end
enter	esc	f1
f2	f3	f4
f5	f6	f7
f8	f9	f10
f11	f12	home
insert	left	numlock
pad*	pad+	pad-
pad.	pad/	pad0
pad1	pad2	pad3
pad4	pad5	pad6
pad7	pad8	pad9
padenter	pause	pgdn
pgup	prtsc	right
scrollock	space	sysreq
tab	up	

Figure 6-4. Host Function Names

alt	altgr	attn
backspace	backtab	capslock
clear	cmd1	cmd2
cmd3	cmd4	cmd5
cmd6	cmd7	cmd8
cmd9	cmd10	cmd11
cmd12	cmd13	cmd14
cmd15	cmd16	cmd17
cmd18	cmd19	cmd20
cmd21	cmd22	cmd23
cmd24	cursor	delete
down	dup	enter
eraseinput	field+	field-
fieldexit	help	hex
home	hotkey	hotkey1
hotkey2	hotkeyd	insert
inserttoggle	left	newline
numlock	pad.	pad0
pad1	pad2	pad3
pad4	pad5	pad6
pad7	pad8	pad9
printhost	printpc	reset
right	rolldown	rollup
shiftlock	shifttoggle	space
sysreq	tab	testreq
up		

Assigning Text to a Key

The keyboard customization file allows you to assign a string of characters and functions to the alternate mode of a key. You can define up to a total of 510 characters to one or more keys. For example, if you wanted to enter *Have a nice day* every time you pressed Alt+h, you would add the following definition to your keyboard customization file:

```
def a-h = 'Have a nice day'
```

If the string that you are assigning to a key contains quotation marks, begin and end the string with a different type of quotation mark. For example:

```
def a-s="Bob's name"
```

If a key does not have a string assigned to its alternate mode, the keystroke buffer is cleared when you press Alt with that key. No additional action occurs.

Notes:

1. You can only assign multiple keystroke sequences during keyboard customization.

2. You should not assign strings, such as security code strings, that you do not want displayed. Strings that are assigned to the alternate mode of keys can be played back in a displayable field.

3. While running 3270 emulation on the IBM host, the Input Inhibited indicator might be cleared when the system is not ready to accept keystrokes. Clearing Input Inhibited can cause playback sequence keys to be discarded. Be careful when defining playback sequences for use during 3270 emulation.

4. For more information about customizing your keyboard, see "Changing the Keyboard Customization File" on page 6-8. For more detailed information, see the *Technical Reference* manual.

Chapter 7. Emulating an IBM 5219 Printer

The personal computer printers listed in Figure 7-1 are capable of emulating the 5219 printer when used with a supplied PFT. If the supplied PFT for your printer is listed as Internal, select your printer from the Attached Printer List screen during session configuration.

Figure 7-1 (Page 1 of 2). PC Printers That Can Emulate 5219 Printers	
Personal Computer Printer	**Supplied PFT**
IBM Personal Printer Series (IBM 2380, IBM 2380 Plus, IBM 2381, IBM 2381 Plus, IBM 2390, IBM 2390 Plus, IBM 2391, and IBM 2391 Plus)	IBM2390.PFT
IBM 3812 Pageprinter	IBM3812.PFT
IBM 4019 and 4029 Laser Printers	IBM4019.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4039 Laser Printer	PCL5.PFT[2]
IBM 4037 5E Printer	IBM4019.PFT
IBM 4070 IJ Printer	IBM4208.PFT
IBM 4072 ExecJet Printer	IBM4072.PFT
IBM 4076 ExecJet II Printer	IBM4207.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4202 Proprinter XL	IBM4202.PFT
IBM 4207 Proprinter X24	IBM4208.PFT
IBM 4208 Proprinter XL24	IBM4208.PFT
IBM 4212 Proprinter 24P	IBM4212.PFT

---

[1] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[2] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

7-1

Figure 7-1 (Page 2 of 2). PC Printers That Can Emulate 5219 Printers	
Personal Computer Printer	**Supplied PFT**
IBM 4226 Printer	IBM4226.PFT
IBM 5182 Color Printer	Internal
IBM 5201 Quietwriter	Internal
IBM 5202 Quietwriter III	IBM5202.PFT
IBM 5204 Quickwriter	IBM5204.PFT
IBM 5216 Wheelprinter	Internal
HP LaserJet Printer Series II and III	HPLASER2.PFT[3]
HP LaserJet 4	PCL5.PFT[4]
User-defined printer	Internal

Introducing 5219 Emulation

One of the above printers can be used to emulate the IBM 5219 Printer when the second session of the Emulation Program is configured for 5219 printer emulation. Any printer capable of emulating a 5219 may be attached. However, functions not available on the 5219 are not supported, even though the attached printer may support them.

For example, a 3812 emulating the 5219 is different from a 3812 directly attached to the host. This means that 3812 functions, such as the Set Text Orientation command, are not supported.

---

[3] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[4] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

Notes:

1. The keyboard customization file in effect for the display emulation session is also in effect for printer emulation.

2. Printer emulation continues when in personal computer mode. If the printer is used in personal computer mode, printer emulation must be suspended before leaving the printer emulation session.

The 5219 printer emulation uses information from the session profile. See "Configuring for Emulation" on page 3-25 for further information. Refer to the *Technical Reference* manual for descriptions of commands that control the 5219.

The personal computer display screens emulate the IBM 5219 printer operator panel while in IBM 5219 printer emulation mode.

Using the HP LaserJet and IBM 4039 Printers

The HP LaserJet printers and IBM 4039 printers use an IBM-supplied Printer Function Table (PFT). When using this PFT:

- Superscript and subscript only work with a line density of 6 lines per inch.

- Proportional space fonts do not print correctly when text is underlined or overstriked.

- Justification is not supported when using proportional spaced fonts.

- Tabs are not supported when using proportional spaced fonts.

- Mid-line type style changes do not print correctly when either of the type styles is typographic.

- Bold print and set text orientation (rotate page) are not supported.

Setting Up the Printer

The Emulation Program sets up the attached personal computer printer according to options chosen during configuration. You can specify the type of paper feed the printer can use, paper width, form feed, and font change without user intervention. (See "Advanced Printer Options" on page 11-8 for more information.)

Each defined printer session requires a separate printer. You are responsible for ensuring that the physical paper handling equipment matches what was specified during configuration.

Automatic Cut Sheet Feed Handling Device

An IBM 5219 Printer initializes the paper feed technique of the Set Print SetUp (SPSU) control to whatever paper feed hardware is electrically connected to the 5219 Printer. 5219 emulation initializes the paper feed technique to the first paper feed type specified in the host print job.

Refer to the printer operator's guide when physically setting up the cut sheet feed handling device.

If an IBM 5216 Wheelprinter is attached, the Paper Feed Toggle switch must be set for the desired sheet feed method.

Serial Printer Limitations

If you will be using a serial printer, you should be aware of the following limitations:

- No other communications adapters (SDLC, BSCA, and so forth) can be used concurrently in the personal computer.

- Only one Asynchronous Communications Adapter may be in use in the personal computer.

- The printer emulation code cannot detect the difference between "Printer Off Line" or "Paper End" conditions in the serial printer. If either condition occurs, printer emulation shows "Printer Off Line." The printer Emulation Program tries to send data to the printer until all the data is successfully transmitted.

- Baud rate is limited to a maximum of 4800 when running on the IBM Personal Computer, the IBM Portable Personal Computer, or the IBM Personal Computer XT. It is your responsibility to make sure this rate is not exceeded.

  If, during initialization, the printer Emulation Program detects that this limitation is exceeded, 4800 baud is used instead of the selected baud rate and unexpected results might occur.

5219 Printer Emulation Display

The options and indicators are shown in Figure 7-2.
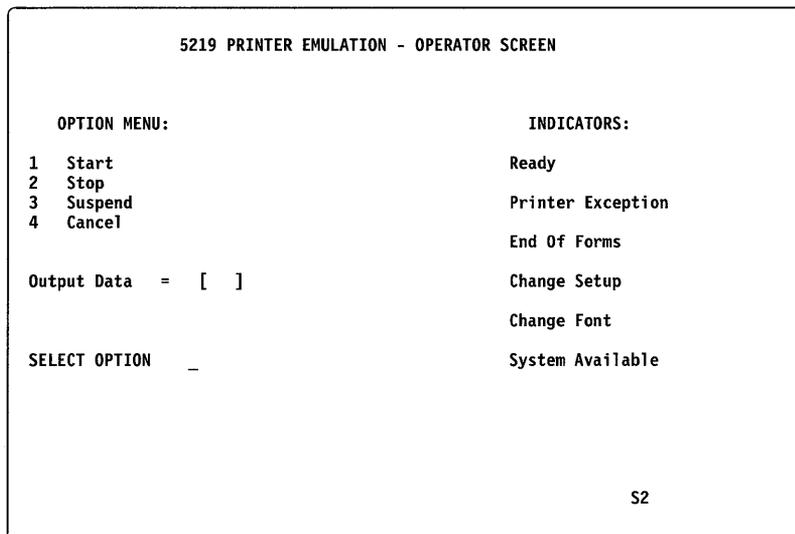
```
                    5219 PRINTER EMULATION - OPERATOR SCREEN


        OPTION MENU:                              INDICATORS:

    1   Start                                     Ready
    2   Stop
    3   Suspend                                   Printer Exception
    4   Cancel
                                                  End Of Forms

    Output Data   =   [   ]                       Change Setup

                                                  Change Font

    SELECT OPTION     _                           System Available




                                                      S2
```

Figure 7-2. 5219 Printer Emulation—Operator Screen

Using the Emulated Printer Options

The 5219 Printer Emulation—Operator Screen emulates the Start, Stop, and Cancel switches on the printer operator panel and uses the following options:

- Start
- Stop

- Suspend
- Cancel

To select an option, type the associated number and then press Enter.

Note: Before turning off your personal computer, you must sign off from your printer session.

Start Option
Selecting the Start option while the Ready indicator is on carries out no function because its intended function is to make the printer Emulation Program ready to print.

If the Ready indicator is OFF when the Start option is selected, the result depends on the condition of the printer Emulation Program, as shown in Figure 7-3.

Figure 7-3. Start Option	
Condition	**Result**
Emulation Program is loaded and no error conditions exist.	Turns the Ready indicator on.
Printer Emulation Program was stopped by the Stop option.	Turns the Ready indicator on and allows printing to continue.
Printer Emulation Program was stopped by the Suspend option.	Turns the Ready indicator on, returns printer control to the printer Emulation Program, restores the printer to the state it was in at the time the Suspend option was selected, and allows printing to continue. The current print line becomes the logical top of the page.

Stop Option

Selecting the Stop option while the Ready indicator is on causes the Ready indicator to be turned off. The printer continues printing until its buffer is empty. The printer Emulation Program does not process any further data or commands from the host until the Start option is selected.

This option is intended to temporarily stop printing to allow adjustments to the printer, such as changing paper.

Suspend Option

Selecting the Suspend option while the Ready indicator is on causes the Ready indicator to be turned off and all information in the printer's print buffer to be printed. No further host data or commands are processed by the printer Emulation Program.

In addition, the current status of the emulated 5219 printer is saved, the forms advance to the first print line of a new page, the personal computer is initialized to its power-on state, and all operator panel options, except Start, are disabled. This option allows you to free the printer from the host and make it available to the personal computer. Use the hot key sequence to go to personal computer mode.

After the hot key sequence, you can move the forms to any desired position and use the printer for any personal computer printing. When finished, you should position the forms to the first print line of a new page.

The Suspend option is accepted regardless of the state of the Ready indicator.

Note: This option is necessary only if the personal computer application program uses the same printer device name (LPT1, LPT2, and so on) as the Emulation Program (selected via the configuration program). If the application program is using a different printer, then the Emulation Program can print at the same time as the application program without being suspended.

Cancel Option

Selecting the Cancel option causes the host to be notified of the cancel request.

This option is accepted regardless of the state of the Ready indicator.

Output Data Field

The output data field provides you with control and diagnostic information. See Figure A-1 on page A-7 for a description of the codes.

Status Indicators

The operator panel emulates the following status indicators:

- Ready
- Printer Exception
- Forms
- Change Setup
- Change Font
- System Available

When an emulated indicator is on, it appears in reverse image on the options screen.

Ready Indicator

The Ready indicator is turned on by selecting the Start option or by receiving a Set Mode command from the host when the printer is online. Whenever the indicator is on, the printer Emulation Program is ready to process host data and the printer is ready to receive the data.

The Ready indicator is turned off by one of the following:

- Change font request
- Change setup request
- Reset command from the host
- End of forms condition

- Printer exception
- Data transfer error

You can turn it off by selecting the Stop or Suspend option.

Printer Exception Indicator
The Printer Exception indicator turns on when a data stream exception is detected. The 2-digit code that appears in the output data field defines the exception. See Figure A-1 on page A-7 for a description of the codes.

Forms Indicator
The Forms indicator is turned on when either an automatic sheet feed drawer is empty or the printer is out of continuous forms.

See the appropriate printer operator's guide for paper handling procedures. The printer Emulation Program must be made ready by selecting the Start option to continue printing.

Change Setup Indicator
The Change Setup indicator is turned on when a request is received to change the paper feed method. The 2-digit code that appears in the output data field describes the paper feed mechanism requested. See Figure A-1 on page A-7 for a description of the codes. See the operator's guide for your printer to change the paper feed hardware.

Change Font Indicator
The Change Font indicator is turned on when a request is received to change the font. The 2-digit code that appears in the output data field describes the requested font. See Figure A-1 on page A-7 for a description of the codes.

Note: This indicator is not used with a printer that can change fonts without user intervention (specified when you configure advanced printer options).

System Available Indicator

The System Available indicator is turned on whenever a printer command, other than a Reset command, is received from the host.

This indicator is turned off when communication with the host stops.

Printer Session Number (Sn)

The printer session number appears on line 25 as Sn (where n is the number of the session).

Workstation Address (Ax)

The printer workstation address is displayed on the emulated control panel. Pressing the WS Addr key sequence again removes the address from the emulated control panel.

User-Defined Printer

The Emulation Program allows you to make a non-supported printer class known to the program. To do this, you create a printer function table that the Emulation Program uses to convert controls into the escape sequences, controls, and graphics understood by the printer.

For information about creating printer function tables, see Chapter 10, "Using the Printer Function Table Setup Program."

Chapter 8. Emulating an IBM 5224 Printer

Note: All the information in this chapter about the 5224 printer applies to the 5225 printer.

The personal computer printers listed in Figure 8-1 are capable of emulating the 5224 printer when used with a supplied PFT. If the supplied PFT for your printer is listed as Internal, select your printer from the Attached Printer List screen during session configuration.

Figure 8-1 (Page 1 of 2). PC Printers That Can Emulate 5224 Printers	
Personal Computer Printer	**Supplied PFT**
IBM Personal Printer Series (IBM 2380, IBM 2380 Plus, IBM 2381, IBM 2381 Plus, IBM 2390, IBM 2390 Plus, IBM 2391, and IBM 2391 Plus)	IBM2390.PFT
IBM 3812 Pageprinter	IBM3812.PFT
IBM 4019 and 4029 Laser Printers	IBM4019.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4039 Laser Printer	PCL5.PFT[2]
IBM 4037 5E Printer	IBM4019.PFT
IBM 4070 IJ Printer	IBM4208.PFT
IBM 4072 ExecJet Printer	IBM4072.PFT
IBM 4076 ExecJet II Printer	IBM4207.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4201 Proprinter	Internal
IBM 4202 Proprinter XL	IBM4202.PFT

---

[1] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[2] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

Figure 8-1 (Page 2 of 2). PC Printers That Can Emulate 5224 Printers	
Personal Computer Printer	**Supplied PFT**
IBM 4207 Proprinter X24	IBM4208.PFT
IBM 4208 Proprinter XL24	IBM4208.PFT
IBM 4212 Proprinter 24P	IBM4212.PFT
IBM 4226 Printer	IBM4226.PFT
IBM 5152 Matrix Printer (Model 001)	Internal
IBM 5152 Graphics Printer (Model 002)	Internal
IBM 5182 Color Printer	Internal
IBM 5201 Quietwriter	Internal
IBM 5202 Quietwriter III	IBM5202.PFT
IBM 5204 Quickwriter	IBM5204.PFT
IBM 5216 Wheelprinter	Internal
HP LaserJet Printer Series II and III	HPLASER2.PFT[3]
HP LaserJet Printer 4	PCL5.PFT[4]
User-defined printer	Internal

Introducing 5224 Emulation

One of the above printers can be used to emulate the IBM 5224 Matrix Printer when the second session of the Emulation Program is configured for 5224 printer emulation. Any PC attached printer capable of emulating a 5224 may be attached. However, functions not available on the 5224 are not supported, even though the attached printer may support them.

For example, a 3812 emulating the 5224 is different from a 3812 directly attached to the host. This means that 3812 functions, such

---

[3] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[4] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

as bold printing and the Set Text Orientation (landscape) command, are not supported.

Notes:

1. The keyboard customization file in effect for the display emulation session is also in effect for printer emulation.

2. Printer emulation continues when in personal computer mode unless the printer session is suspended before entering that mode.

3. Transparent mode or Buffer Print is not supported with the Emulation Program.

4. Load Alternate Character (LAC) is not supported with the Emulation Program. This means that the System/36 5224 Advanced Printer Function licensed program is not supported.

The 5224 printer emulation uses a session profile. (See "Configuring for Emulation" on page 3-25 for further information.)

In printer emulation mode, the personal computer display screen emulates the operator panel on an IBM 5224 printer. See the *Technical Reference* for commands to control the 5224 printer.

Serial Printer Limitations

If you will be using a serial printer, you should be aware of the following limitations:

- No other communications adapters (SDLC, BSCA, and so on) may be used concurrently in the personal computer.

- Only one Asynchronous Communications Adapter may be in use in the personal computer.

- The printer emulation code cannot detect the difference between "Printer Off Line" or "Paper End" conditions in the serial printer. If either condition occurs, printer emulation shows Printer Off Line. The printer Emulation Program tries to send data to the printer until all the data is successfully transmitted.

- Baud rate is limited to a maximum of 4800 when running on the IBM Personal Computer, the IBM Portable Personal Computer, or the IBM Personal Computer XT. It is your responsibility to make sure this rate is not exceeded.

  If, during initialization, the printer Emulation Program detects that this limitation is exceeded, 4800 baud is used instead of the selected baud rate and unexpected results might occur.

Setting Up the Printer

The Emulation Program sets up the attached personal computer printer according to options chosen during configuration. LPI, CPI, paper width, form feed, and font changes without user intervention can be specified. (See "Advanced Printer Options" on page 11-8 for more information.)

Each defined printer session requires a separate printer.

5224 Printer Emulation Display
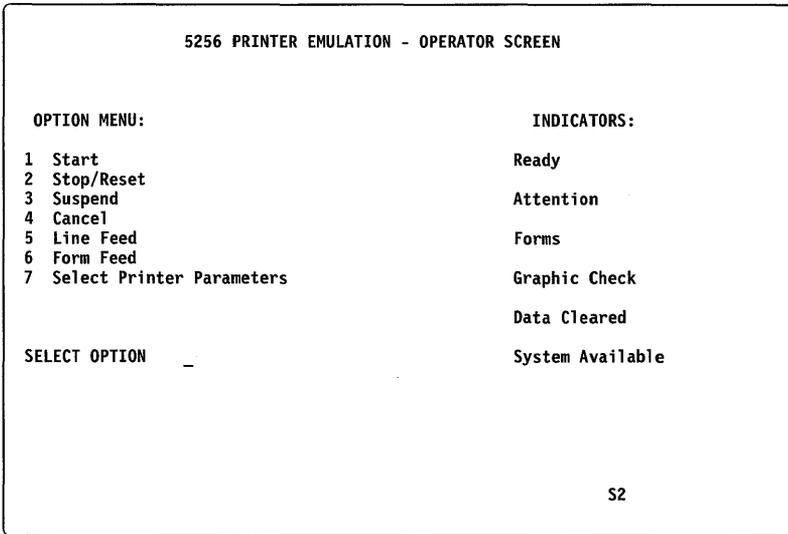
The options and indicators are shown in Figure 8-2.
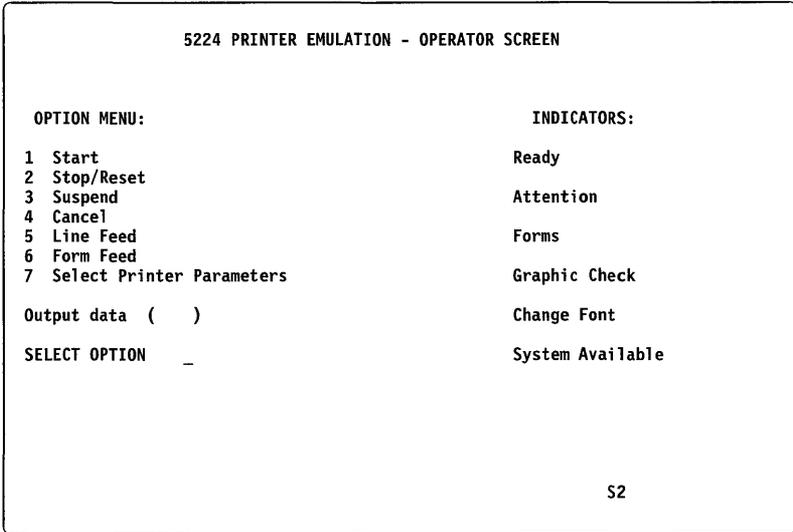
```
                    5224 PRINTER EMULATION - OPERATOR SCREEN


   OPTION MENU:                                   INDICATORS:
   1  Start                                       Ready
   2  Stop/Reset
   3  Suspend                                     Attention
   4  Cancel
   5  Line Feed                                   Forms
   6  Form Feed
   7  Select Printer Parameters                   Graphic Check

   Output data  (   )                             Change Font

   SELECT OPTION      _                           System Available




                                                              S2
```

Figure 8-2. 5224 Printer Emulation—Operator Screen

Using the Emulated Printer Options

The 5224 Printer Emulation—Operator Screen emulates the operator panel on the printer and uses the following options:

- Start
- Stop/Reset
- Suspend
- Cancel
- Line Feed
- Form Feed
- Select Printer Parameters

To select an option, type the associated number and then press Enter.

Start Option

Selecting the Start option while the Ready indicator is on carries out no function because its intended function is to make the printer ready to print.

If the Ready indicator is off when the Start option is selected, the result depends on the condition of the printer emulation routine, as shown in Figure 8-3.

Figure 8-3. Start Option	
Condition	**Result**
Emulation Program is loaded and no error conditions exist.	Turns the Ready indicator on.
Printer Emulation Program was halted by the Stop/Reset option, or the Stop/Reset option was used to reset an error condition.	Turns the Ready indicator on and continues printing.
Printer Emulation Program was halted by the Suspend option.	Turns the Ready indicator on, returns personal computer printer control to 5224 printer emulation, restores the printer to the state it was in at the time the Suspend option was selected, and continues printing. The current print line becomes the logical top of page.

Stop/Reset Option

Selecting the Stop/Reset option while the Ready indicator is on causes the Ready indicator to be turned off. The printer continues printing until its buffer is empty. The Emulation Program does not process any further commands from the host until the Start option is selected.

If this option is selected when the Ready indicator is off, it functions as a Reset key.

This option is intended to temporarily stop printing and allow adjustments to the printer, such as changing paper.

Suspend Option

Selecting the Suspend option while the Ready indicator is on causes the Ready indicator to be turned off and all information in the printer's print buffer to be printed. The Emulation Program does not process any further data or commands from the host.

In addition:

- The current status of the emulated 5224 printer is saved.
- The forms advance to the first print line of a new page.
- The printer enters its initialized state (Ready and Online).
- All operator panel options, except Start, are disabled.

This option allows you to free the printer from the host and make it available to the personal computer. Use the hot key sequence to go to personal computer mode.

After the hot key sequence, you can move the forms to any position and use the printer for any personal computer printing. When finished, you should position the forms to the first print line of a new page.

The Suspend option is accepted regardless of the state of the Ready indicator.

Note: This option is necessary only if the application program uses the same printer device name (LPT1, LPT2, and so on) as the Emulation Program (selected using the configuration program). If the application program is using a different printer, then the Emulation Program can print at the same time as the application program without being suspended.

Cancel Option

Selecting the Cancel option causes the host to be notified of the cancel request.

Line Feed Option

Selecting the Line Feed option when the Ready indicator is off advances the forms to the next print line.

The Line Feed option is ignored when the Ready indicator is on.

Form Feed Option

Selecting the Form Feed option when the Ready indicator is off advances the forms to the first print line of the next form.

The Form Feed option is ignored when the Ready indicator is on.

Note: The operation of this option depends on previous commands to the printer. That is, the form length assigned by the host program must be the same as the actual length of the form.

Printer Parameters

The printer parameters appear as shown in Figure 8-4. If the host sends an LPI or CPI command to the printer, it overrides the parameter you selected.

```
              5224 PRINTER EMULATION - PRINTER PARAMETERS


      SELECT LINES PER INCH (LPI)

         1  6 LPI     [ACTIVE]
         2  8 LPI


      SELECT CHARACTERS PER INCH (CPI)

         3  Normal (10 CPI)
         4  Compressed (15 CPI)      [ACTIVE]


         5  Return to Operator Panel

      SELECT OPTION     _

       OPERATOR MESSAGE FIELD                           S2
```

Figure 8-4. Emulated IBM 5224 Printer Parameters

Lines Per Inch (LPI)

6 LPI Option
Selecting 6 LPI (lines per inch) causes the printer to print six lines of text per inch of page length.

8 LPI Option
Selecting 8 LPI (lines per inch) causes the printer to print eight lines of text per inch of page length.

Note: The current line spacing option is shown with the word ACTIVE appearing next to the option selected.

Characters Per Inch (CPI)

10 CPI Option
Selecting 10 CPI (characters per inch) causes the printer to print 10 characters per inch. If the attached printer has an 8-inch paper width and more than 80 characters are formatted for a line, the extra characters are printed on the following line.

15 CPI Option
Selecting 15 CPI causes the printer to print 15 characters per inch (compressed print). When the attached printer has an 8-inch paper width, this option allows 132 characters to be printed on a line.

Note: The current character spacing option is shown with the word ACTIVE appearing next to the options selected.

Output Data Field
The Output Data field provides control and diagnostic information to operators. See Figure A-1 on page A-7 for a description of the codes.

Status Indicators
The emulated operator panel emulates the following status indicators:

- Ready
- Attention
- Forms

- Graphics Check
- Change Font
- System Available

When an emulated indicator is on, it appears in reverse image on the options screen.

Ready Indicator

The Ready indicator is turned on by selecting the Start option. Whenever the indicator is on, the printer Emulation Program is ready to send data to the printer.

The Ready indicator is turned off by an end of forms condition, a Reset command from the host, a printer error (printer in a not ready state), a graphics check error, or an attention message from the host. You can turn it off by selecting the Stop/Reset or the Suspend option.

Attention Indicator

The Attention indicator turns on when your attention is required by the host. The indicator can be turned on by a personal computer printer condition that turns the Ready indicator off and turns the Forms or Graphics Check indicator on.

Selecting the Stop/Reset option turns this indicator off.

Forms Indicator

The Forms (out of paper) and Attention indicators notify you that the printer is out of paper. Select the Stop/Reset option to turn the Forms and Attention indicator off. After a new supply of paper is loaded and the printer is made ready, select the Start option to resume printing.

Graphics Check Indicator

The Graphics Check indicator is on when an unprintable character is detected in the print buffer and the Set Graphics Error Action command stop option was set previously. (The line containing the unprintable character is printed with a substitute character in place of the unprintable character.)

The Ready indicator is turned off and the Attention indicator is turned on when the Graphics Check indicator is turned on.

Selecting the Stop/Reset option turns the Graphics Check indicator off.

Change Font Indicator

The Change Font indicator is turned on when a request is received to change the font. The 2-digit code that appears in the output data field describes the requested font. See Appendix A, Error Codes and Messages, for the description of the codes.

Note: This indicator is not used with a printer that can change fonts without user intervention (specified when you configure advanced printer options).

System Available Indicator

The System Available indicator is turned on whenever a printer command, other than a Reset command, is received by the printer Emulation Program.

This indicator is turned off when communication with the host stops.

Printer Session Number (Sn)

The printer session number appears on line 25 as Sn (where n is the number of the session).

Station Address Number (Ax)

The printer workstation address is displayed on the emulated control panel. Pressing the WS Addr key sequence (Alt+Ctrl) again removes the address from the emulated control panel.

User-Defined Printer

The Emulation Program allows you to make a non-supported printer class known to the program. To do this, you create a printer function table that the Emulation Program uses to convert controls into the escape sequences, controls, and graphics understood by the printer.

For information about creating printer function tables, see Chapter 10, "Using the Printer Function Table Setup Program."

Chapter 9. Emulating an IBM 5256 Printer

The personal computer printers listed in Figure 9-1 are capable of emulating the 5256 printer when used with a supplied PFT. If the supplied PFT for your printer is listed as Internal, select your printer from the Attached Printer List screen during session configuration.

Figure 9-1 (Page 1 of 2). PC Printers That Can Emulate 5256 Printers	
Personal Computer Printer	**Supplied PFT**
IBM Personal Printer Series IBM 2380, IBM 2380 Plus, IBM 2381, IBM 2381 Plus, IBM 2390, IBM 2390 Plus, IBM 2391, and IBM 2391 Plus	IBM2390.PFT
IBM 3812 Pageprinter	IBM3812.PFT
IBM 4019 and 4029 Laser Printers	IBM4019.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4039 Laser Printer	PCL5.PFT[2]
IBM 4037 5E Printer	IBM4019.PFT
IBM 4070 IJ Printer	IBM4208.PFT
IBM 4072 ExecJet Printer	IBM4072.PFT
IBM 4076 ExecJet II Printer	IBM4207.PFT (for PPDS) HPLASER2.PFT (for PCL)[1]
IBM 4201 Proprinter	Internal
IBM 4202 Proprinter XL	IBM4202.PFT
IBM 4207 Proprinter X24	IBM4208.PFT
IBM 4208 Proprinter XL24	IBM4208.PFT

---

[1] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[2] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

Figure 9-1 (Page 2 of 2). PC Printers That Can Emulate 5256 Printers	
Personal Computer Printer	**Supplied PFT**
IBM 4212 Proprinter 24P	IBM4212.PFT
IBM 4226 Printer	IBM4226.PFT
IBM 5152 Matrix Printer (Model 001)	Internal
IBM 5152 Graphics Printer (Model 002)	Internal
IBM 5182 Color Printer	Internal
IBM 5201 Quietwriter	Internal
IBM 5202 Quietwriter III	IBM5202.PFT
IBM 5204 Quickwriter	IBM5204.PFT
IBM 5216 Wheelprinter	Internal
HP LaserJet Printer Series II and III	HPLASER2.PFT[3]
HP LaserJet 4	PCL5.PFT[4]
User-defined printer	Internal

Introducing 5256 Emulation

One of the above printers can be used to emulate the IBM 5256 Matrix Printer when the second session of the Emulation Program is configured for 5256 printer emulation. Any printer capable of emulating a 5256 may be attached. However, functions not available on the 5256 are not supported, even though the attached printer may support them.

For example, a 3812 emulating the 5256 is different from a 3812 directly attached to the host. This means that 3812 functions, such as bold printing and the Set Text Orientation command, are not supported.

---

[3] The HPLASER2.PFT requires the Roman 8 symbol set to be in your printer.

[4] The PCL5.PFT requires the PC-850 symbol set to be in your printer.

Notes:

1. The keyboard customization file that is in effect for the display emulation session is also in effect for printer emulation.

2. Printer emulation continues when in personal computer mode unless the printer session is suspended before entering that mode.

3. Transparent mode or Buffer Print is not supported with the Emulation Program.

The IBM 5256 Printer Emulation uses a session profile. (See "Configuring for Emulation" on page 3-25 for further information.)

In printer emulation mode, the personal computer display screen emulates the operator panel on an IBM 5256 printer.

Serial Printer Limitations

If you will be using a serial printer, you should be aware of the following limitations:

- No other communications adapters (SDLC, BSCA, and so on) may be used concurrently in the personal computer.

- Only one Asynchronous Communications Adapter may be used in the personal computer.

- The printer emulation code cannot detect the difference between "Printer Off Line" or "Paper End" conditions in the serial printer. If either condition occurs, printer emulation shows Printer Off Line. The printer Emulation Program tries to send data to the printer until all the data is successfully transmitted.

- Baud rate is limited to a maximum of 4800 when running on the IBM Personal Computer, the IBM Portable Personal Computer, or the IBM Personal Computer XT. It is your responsibility to make sure this rate is not exceeded.

    If, during initialization, the printer Emulation Program detects that this limitation is exceeded, 4800 baud is used instead of the selected baud rate and unexpected results might occur.

Setting Up the Printer

The Emulation Program sets up the attached personal computer printer according to options chosen during configuration. LPI, CPI, paper width, form feed, and font changes without user intervention can be specified. (See "Advanced Printer Options" on page 11-8 for more information.)

Each defined printer session requires a separate printer.

5256 Printer Emulation Display

The options and indicators are shown in Figure 9-2.

```
                  5256 PRINTER EMULATION - OPERATOR SCREEN


   OPTION MENU:                                    INDICATORS:

   1  Start                                        Ready
   2  Stop/Reset
   3  Suspend                                      Attention
   4  Cancel
   5  Line Feed                                    Forms
   6  Form Feed
   7  Select Printer Parameters                    Graphic Check

                                                   Data Cleared

   SELECT OPTION     _                             System Available




                                                        S2
```

Figure   9-2. IBM 5256 Matrix Printer Options

Using the Emulated Printer Options

The 5256 Printer Emulation—Operator Screen emulates the operator panel on the printer and uses the following options:

- Start
- Stop/Reset
- Suspend
- Cancel
- Line Feed
- Form Feed
- Select Printer Parameters

To select an option, type the associated number and then press Enter.

Start Option

Selecting the Start option while the Ready indicator is on carries out no function because its intended function is to make the printer ready to print.

If the Ready indicator is off when the Start option is selected, the result depends on the condition of the printer emulation routine, as shown in Figure 9-3.

Figure 9-3 (Page 1 of 2). Start Option	
Condition	**Result**
Emulation Program is loaded and no error conditions exist.	Turns the Ready indicator on.
Printer Emulation Program was halted by the Stop/Reset option, or the Stop/Reset option was used to reset an error condition.	Turns the Ready indicator on and continues printing.

Figure 9-3 (Page 2 of 2). Start Option	
Condition	**Result**
Printer Emulation Program was halted by the Suspend option.	Turns the Ready indicator on, returns personal computer printer control to 5256 printer emulation, restores the printer to the state it was in at the time the Suspend option was selected, and continues printing. The current print line becomes the logical top of page.

Stop/Reset Option

Selecting the Stop/Reset option while the Ready indicator is on causes the Ready indicator to be turned off. The printer continues printing until its buffer is empty. The Emulation Program does not process any further commands from the host until the Start option is selected.

If this option is selected when the Ready indicator is off, it functions as a Reset key.

This option is intended to temporarily stop printing and allow adjustments to the printer, such as changing paper.

Suspend Option

Selecting the Suspend option while the Ready indicator is on causes the Ready indicator to be turned off and all information in the printer's print buffer to be printed. The Emulation Program does not process any further data or commands from the host.

In addition:

- The current status of the emulated 5256 printer is saved.
- The forms advance to the first print line of a new page.
- The printer enters its initialized state (Ready and Online).
- All operator panel options, except Start, are disabled.

This option allows you to free the printer from the host and make it available to the personal computer. Use the hot key sequence to go to personal computer mode.

After the hot key sequence, you can move the forms to any position and use the printer for any personal computer printing. When finished, you should position the forms to the first print line of a new page.

The Suspend option is accepted regardless of the state of the Ready indicator.

To return the printer to host control, select the Start option and press Enter.

Note: This option is necessary only if the application program uses the same printer device name (LPT1, LPT2, and so on) as the Emulation Program (selected using the configuration program). If the application program is using a different printer, then the Emulation Program can print at the same time as the application program without being suspended.

Cancel Option
Selecting the Cancel option causes the host to be notified of the cancel request.

Line Feed Option
Selecting the Line Feed option when the Ready indicator is off advances the forms to the next print line.

The Line Feed option is ignored when the Ready indicator is on.

Form Feed Option
Selecting the Form Feed option when the Ready indicator is off advances the forms to the first print line of the next form.

The Form Feed option is ignored when the Ready indicator is on.

Note: The operation of this option depends on previous commands to the printer. That is, the form length assigned by the host program must be the same as the actual length of the form.

Printer Parameters

The printer parameters appear as shown in Figure 9-4. If the host sends an LPI or CPI command to the printer, it overrides the parameters you selected.

```
               5256 PRINTER EMULATION - PRINTER PARAMETERS


   SELECT LINES PER INCH (LPI)

      1  6 LPI      [ACTIVE]
      2  8 LPI


   SELECT CHARACTERS PER INCH (CPI)

      3  Normal (10 CPI)
      4  Compressed (15 CPI)      [ACTIVE]


      5  Return to Operator Panel

   SELECT OPTION      _

    OPERATOR MESSAGE FIELD                              S2
```
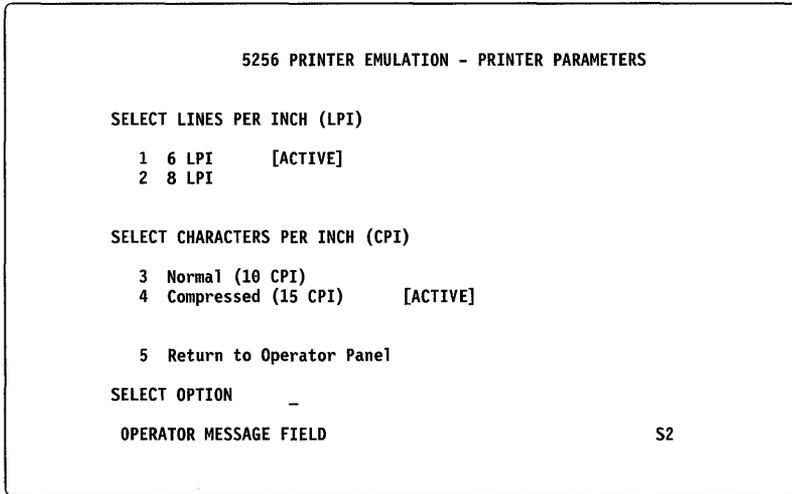
Figure 9-4. Emulated IBM 5256 Matrix Printer Parameters

Lines Per Inch (LPI)

6 LPI Option
Selecting 6 LPI (lines per inch) causes the printer to print six lines of text per inch of page length.

8 LPI Option
Selecting 8 LPI (lines per inch) causes the printer to print eight lines of text per inch of page length.

Note: The current line spacing option is shown with the word ACTIVE appearing next to the option selected.

Characters Per Inch (CPI)

10 CPI Option
Selecting 10 CPI (characters per inch) causes the printer to print 10 characters per inch. If the attached printer has an 8-inch paper width and more than 80 characters are formatted for a line, the extra characters are printed on the following line.

15 CPI Option
Selecting 15 CPI causes the printer to print 15 characters per inch (compressed print). When the attached printer has an 8-inch paper width, this option allows 132 characters to be printed on a line.

Note: The current character spacing option is shown with the word ACTIVE appearing next to the options selected.

Status Indicators
The emulated operator panel emulates the following status indicators:

- Ready
- Attention
- Forms
- Graphics Check
- Data Cleared
- System Available

When an emulated indicator is on, it appears in reverse image on the options screen.

Ready Indicator
The Ready indicator is turned on by selecting the Start option. Whenever the indicator is on, the printer Emulation Program is ready to send data to the printer.

The Ready indicator is turned off by the following:

- End of forms condition
- Reset command from the host
- Printer error (printer in a not ready state)
- Graphics check error
- Attention message from the host.

You can turn it off by selecting the Stop/Reset or the Suspend option.

Attention Indicator
The Attention indicator turns on when your attention is required by the host. The indicator can be turned on by a personal computer printer condition that turns the Ready indicator off and turns the Forms or Graphics Check indicator on.

Selecting the Stop/Reset option turns this indicator off.

Forms Indicator
The Forms (out of paper) and Attention indicators notify you that the printer is out of paper. Select the Stop/Reset option to turn the Forms and Attention indicator off. After a new supply of paper is loaded and the printer is made ready, select the Start option to resume printing.

Graphics Check Indicator
The Graphics Check indicator is on when an unprintable character is detected in the print buffer and the Set Graphics Error Action command stop option was set previously. (The line containing the unprintable character is printed with a substitute character in place of the unprintable character.)

The Ready indicator is turned off and the Attention indicator is turned on when the Graphics Check indicator is turned on.

Selecting the Stop/Reset option turns the Graphics Check indicator off.

Data Cleared Indicator
The Data Cleared indicator is turned on when a Clear command is received from the host to tell you that a problem occurred and all print buffers were cleared of data. See the appropriate host instructions for recovery procedures. After the cause of the problem is corrected:

1. Select the Stop/Reset option to turn off the Data Cleared indicator.

2. Align the forms to print the first line.

3. Make the printer ready.

4. Select the Start option to make the Emulation Program ready.

System Available Indicator
The System Available indicator is turned on whenever a printer command, other than a Reset command, is received by the printer Emulation Program.

This indicator is turned off when communication with the host stops.

Printer Session Number (Sn)
The printer session number appears on line 25 as Sn (where n is the number of the session).

Station Address Number (Ax)
The printer workstation address is displayed on the emulated control panel. Pressing the WS Addr key sequence (Alt+Ctrl) again removes the address from the emulated control panel.

User-Defined Printer

The Emulation Program allows you to make a non-supported printer class known to the program. To do this, create a printer function table that the Emulation Program uses to convert controls into the escape sequences, controls, and graphics understood by the printer.

For information about creating printer function tables, see Chapter 10, "Using the Printer Function Table Setup Program."

Chapter 10. Using the Printer Function Table Setup Program

The Printer Function Table (PFT) describes the functional characteristics of a personal computer printer to the Emulation Program. You create and edit this table with the PFT setup program. If your printer is not supported and cannot function as a supported printer, you need a PFT to use the printer with the Emulation Program.

PFTWS.PRN is a worksheet for the program. You can print this file and use it when preparing for the program.

Note: The Emulation Program may not require or use all the functions provided by the printer. Also, the Emulation Program does not use all the functions provided by the PFT setup program itself. Only those functions described in this chapter are supported by the Emulation Program.

Creating a Printer Function Table

Use this procedure to create a PFT:

1. If you have a serial printer, use the DOS MODE command to direct the printer output to the serial port before you run the PFT setup program. At the DOS prompt type the following commands, pressing Enter at the end of each line.

   ```
   MODE COM1:1200,n,8,1,p
   MODE LPT1:=COM1
   ```

   Note: The baud rate and other parameters on the COM1 line vary depending on the printer. See the printer operator's guide for the correct information to enter on the COM1 line.

2. To start the program, type **PFTSETUP** and press Enter.

3. Select the option to create a table.

4. A screen of information appears. Read the information, then press Enter to continue.

5. Enter a PFT file name. Use the second option if you need to make changes to a PFT you have created or a PFT provided by the Emulation Program.

6. The Revise Printer Function Table menu appears. Choose the option you want to define.

7. The program prompts you for all necessary information about printer functions. See "Defining Printer Functions" on page 10-5 for a description of each printer function. See "Entering Control Sequences" for information on entering control sequences in the PFT.

   Refer to the printer operator's guide for the correct terminology for each function. Study the functions and the concepts described to determine the appropriate use or need for each PFT item.

8. After you finish defining functions, run the Function Selection Tests. (See "Function Selection Tests" on page 10-12.)

9. Update the session profile to use the PFT. (For more information, see step 8 on page 3-34.)

Entering Control Sequences

A control sequence is a sequence of hex values that instructs the printer to perform a specific function or print a particular output. Use these rules when entering control sequences:

- Use two hex digits for each byte to be sent to the printer.

- Leave one space between each pair of hex digits.

- Use either upper or lowercase letters.

- Enter a maximum of 41 characters, including spaces, in the first field of a control sequence (14 bytes of hex values).

- Enter a maximum of 59 characters, including spaces, in the continuation field (20 bytes of hex values).

- Use a variable placeholder (*n* or *N*) separated by a space if a printing function can be changed at print time by specifying a variable to the printer.

- Multiple controls can be used in one control sequence. However, you can only use one variable *n* per sequence.

- Do not enter a variable *n* as the first byte of a control sequence.

For example, if the printer operator's guide specifies Esc+E for a particular function, type **1B 45** (1B is the ASCII hex value for Esc, and 45 is the value for E).

Note: If a control sequence sets a printer mode that affects the operation of other control sequences, be sure to reset this mode in the affected sequences.

Variable n

Each printer interprets the value for the variable *n* differently. The interpretation is based on this algorithm:

*(value sent to printer +/- offset) * x/y = n*

Maximum Value of the Variable *n* determines the type of encoding and number of bytes to send to the printer (the *value*, or the variable *n*, in the algorithm). See the printer operator's guide for the maximum decimal value allowed for each variable *n*.

For example, if the printer operator's guide defines a control in which a value of zero is equal to a parameter value of hex 40 (decimal 64) and a maximum number of units supported by the control is hex 0F (decimal 15), then the maximum value of *n* is 79. Or, if the printer operator's guide defines a control sequence, such as Esc+US+*n*, where *n*-1 is the value used by the printer and the value of *n* cannot exceed hex 7E (decimal 126), then the maximum value of *n* is 126.

Offset Added/Subtracted by the Printer to the Value of *n* provides a way to enter a decimal number that the printer adds or subtracts to the variable *n* when it receives the control sequence. For some printers, the value of *n* must be adjusted before being sent to the printer, because the printer performs an adjustment on the value. For example, if the printer operator's guide states *n+1* is the value used by the printer, then the offset is 1 and is added to the variable. Or, if the printer operator's guide specifies a chart where a value of

zero equates to a parameter of hex 40 (decimal 64), then the offset is 64, which is subtracted from the variable.

Control Increments (*x/y* inches) represent a scaling factor used to convert the value of the variable *n* to inches. For some printers, the value of *n* must be defined in fractions of an inch. For example, if *x/y*=1/72, the variable represents units of 1/72 inch.

When *x/y*=1/1, the variable represents units of 1 inch, and the algorithm is simplified to this:

(value sent to the printer +/- offset) = n

If the printer operator's guide defines *n* (or *n* times a fraction) as the value used by the printer (for example, *n*/72), the offset is zero. The algorithm simplifies to this:

*(value sent to the printer * x/y) = n*

Determining the Format of the Variable n
The PFT setup program requires that you run the test to determine the format of the variable *n*.

Each variable *n* must be in a specific format for the printer. The PFT setup program helps you specify the format. When you press Enter in a menu that was just modified and that defines a variable *n*, the PFT setup program tests the variable *n* on the printer. You then examine printed output and respond to questions on the screen. These responses determine the value of the variable *n*. If necessary, you can redefine the control sequence and press Enter again to determine the type of variable. If none of the tests provides the correct result, the Emulation Program cannot use the function on your printer.

Defining Printer Functions

The Revise Printer Function Table menu lists the control sequences you can define for printer functions:

- Initialization and reset
- Vertical and horizontal spacing
- Highlighting
- Paper and page options
- Type styles and character sets
- User-defined controls

The Emulation Program does not support user-defined controls.

Initialization and Reset

The PFT setup program allows you to define Start of Document Initialization and End of Document Reset.

Start of Document Initialization

Note: The PFT setup program sends the control sequence for Start of Document Initialization to the printer before every test.

The Emulation Program uses this control when a printer session is first started or when a printer session is resumed after being suspended. You may define a control in the Start of Document control sequence or set a printer switch to set each of the following conditions:

Vertical Units Units defined for the Variable Line Spacing control.

Line Spacing 6 lines per inch.

Pitch 10 pitch.

Carriage Return With no line feed. If a carriage return cannot be achieved without a line feed, zero index carriage return (ZICR) is not supported. Also, line spacing may always be incorrect if the sequence carriage return line feed causes an extra line feed.

Line Feed Perform a line feed with no carriage return.

Turn Off	Superscript, subscript, underline, overstrike, bold, Proportional Space Mode (PSM), justification.
Character Set	Default of the printer. Set to PC character set 2 if the printer supports it.
Printing Mode	Bidirectional or unidirectional mode, depending on the printer.
Color	Black.
Line Length	Maximum supported by the printer.
Page Length	11 inches.

Do not define a control sequence that can affect a preceding print job.

End of Document Reset

The Emulation Program uses the control sequence for End of Document Reset when a printer session is suspended. You should define a control (where applicable) in this control sequence to achieve the following conditions:

- Vertical units
- Line spacing (in default vertical units)
- Carriage return status
- Line feed status
- Page length
- Left margin
- Printer font (pitch and type style)
- Printer character set
- Portrait and landscape status
- Color
- Printing mode

Vertical and Horizontal Spacing

The Vertical and Horizontal Spacing option allows you to define these functions:

- Vertical line spacing
- Horizontal character spacing
- Horizontal relative movement

Vertical Line Spacing

Vertical line spacing is a measure of the distance between printed lines. You can define vertical line spacing by lines per inch (LPI) or variable line spacing (VLS).

The Emulation Program uses the controls for 6 or 8 LPI. Otherwise, the VLS control is used. VLS must be defined to support 4, 12, and 24 LPI. If your printer has specific controls for 6 and 8 LPI, you should define all three sequences.

Lines per Inch: The most common vertical line spacing is 6 or 8 LPI. The Emulation Program supports 4, 6, 8, 12, and 24 LPI. You can define a control sequence to set 6 LPI and one to set 8 LPI.

Variable Line Spacing: A VLS control sets the vertical line spacing to a variable value. Some printer manuals refer to VLS as Line Feed Pitch. Check the printer operator's guide, especially if a variable increment is allowed, for the function that controls vertical motion.

If you define a VLS, try multiples of 1/48 first. Otherwise, use the smallest increment of vertical spacing supported by the printer. Common values are 1/48, 1/72, and 1/96.

Indexing Functions: The Emulation Program uses indexing to support superscripts and subscripts.

The Begin and End Superscript and Subscript controls function on all feed devices. On some printers, these controls move the print position up or down 1/2 line spaces. Other printers create superscripts and subscripts by compressing the height of the characters. If your printer can only print superscripts and subscripts in one pitch, do not define these controls.

The Emulation Program does not support 1/2 Index Up (reverse), 1/2 Index Down (forward), or Reverse Index. These controls move the print position up or down 1/2 the active line spacing.

Horizontal Character Spacing

Horizontal character spacing refers to the number of characters in a horizontal inch of printing. You can set up Horizontal Character Spacing by pitch value or Horizontal Motion Index (HMI). The value of a pitch is determined by the width of the characters and how far apart they are spaced on the printed page. For example, 10 pitch refers to 10 characters in a horizontal inch. The Emulation Program supports 10, 12, 15, and 17 pitches. It does not support 5 and 8.55 pitches. Proportional Space Mode (PSM) is supported with the HMI control.

Some printers use the HMI control to support pitch. HMI causes the print element to move the appropriate increment to position the characters. If you define an HMI, try multiples of 1/60 inch. If you cannot use these multiples, use the smallest spacing supported by the printer. Common values are 1/60 and 1/120 inch.

For each pitch in a print job, the Emulation Program first checks for a defined pitch control sequence. If it is defined, the active pitch is set accordingly. Otherwise, the Emulation Program sets the defined pitch control nearest to the one received. If no pitch control sequence is defined, the Emulation Program prompts you to change the physical font at the attached printer.

HMI is also used to justify text and to support proportionally spaced fonts.

Horizontal Relative Movement

The Horizontal Relative Movement (HRM) controls move the print position backward or forward relative to the current print position. Some printer manuals refer to HRM as Horizontal Cursor Positioning. Find the function in the printer operator's guide that moves the horizontal position of the printer relative to the current position.

If possible, define control sequences for forward and backward relative movement. Try multiples of 1/60 inch first. Otherwise, use the smallest increment of horizontal spacing supported by the printer. Common values are 1/120 and 1/240 inch.

The Forward Relative Movement control can be used to justify text. The Backward Relative Movement control can be used to unit backspace.

Proportional Space Mode and Justification
You must define HMI or HRM controls to space words evenly on a justified line. You must define HMI to space text proportionally. Otherwise, Proportional Space Mode (PSM) is not supported.

For 5219 emulation, you must define either HMI or forward HRM. If you want to use unit backspacing with 5219 emulation, you must define backward HRM.

Highlighting
The Emulation Program supports Begin Quality Print and End Quality Print.

The Emulation Program supports Begin Emphasis and End Emphasis controls. However, the host currently uses backspace and overstrike to print bold in 5219 emulation. The Emulation Program does not support Begin Underline and End Underline. Multiple passes on the print line are used to underline text.

Paper and Page Options
The paper sources defined during configuration can be supported by defining paper handling and page length controls in the PFT setup program. The Emulation Program does not support the Paper Positioning, Set Left Margin, Carriage Return and Line Feed, Multiple Copies, or Landscape Paper Handling controls. If your printer does not have advanced paper handling capabilities, the Emulation Program provides default values for the controls that are not specifically defined.

Paper Handling
To control the paper source requested by a print job, the Emulation Program uses the control sequences for Bottom, Top, and Envelope Tray Select and Feed for paper feed; Manual Feed Select; and the Automatic Cut Sheet option for ejecting sheets without paper feed. The Emulation Program does not support the controls for Continuous

Feed Select, Ignore Paper End Sensor, Enable Paper End Sensor, Manual Cut Sheet, and Collate.

Some printers require two controls for the paper (or envelope) feed function: one for paper tray selection and one for loading paper from that tray. In this case, define both controls in the control sequence.

If the printer has an automatic sheet-feed device, define all five paper feed items if possible. If the printer supports a paper feed, such as single-drawer automatic sheet feed, but does not define a control sequence to select or feed paper from that paper feed, define a null (hex 00) for that paper feed.

The select and feed controls in the Paper Handling menu can be defined for the bottom, top, and envelope tray. This control causes a sheet of cut paper (or envelope) to be fed into the printer from the specified tray. If the print job indicates that one of these trays is to be used and no control is defined, the Emulation Program uses the manual feed select control.

The manual feed select control allows the automatic sheet-feed device to accept a manually inserted sheet of paper through the manual insertion gate. The printer must stop printing to accept the manually fed sheet.

The Emulation Program assumes that continuous forms feed is available.

If the eject sheet without paper feed (automatic cut sheet) control is defined, the Emulation Program assumes the paper feed controls eject the current page and feed the next page.

The Emulation Program assumes the manual feed select control ejects the current page and stops the printer for the next manually inserted page.

Run the print test for continuous feed select on a continuous forms feed. Run the print tests for bottom, top, and envelope trays on an automatic feed. Run the print test for manual paper feed insertion on a manual feed or automatic feed with a manual insertion gate.

Page Length

The Emulation Program uses the page length controls to set the length of the page. You must specify the page length controls with one of the options (inches or lines).

Type Styles and Character Sets

Type style defines the appearance (font) and pitch of characters. For example, Gothic characters look different from characters printed in a commonly used type style, such as Prestige Elite. You can define default, individual, and group type styles.

Character sets are defined groups of graphic characters. For example, a character set can include a through z, A through Z, and other print characters.

For each individual and group type style definition, you can select a PC character set. When you print, all type styles not defined use the default type style definition. The default definition selects a PC character set.

If the printer has removable print elements, such as a printwheel, you can define a character set to match those on a print element, then associate the character set with a type style number.

You can also define a character set to include characters that can be constructed from those on the print element. For example, if the print element has a tilde, you can define the *n tilde* character as *n backspace tilde*.

The Emulation Program does not support Slot Selection Definition.

Default Type Style

Type style definitions allow you to specify the controls that select the type styles and character sets supported by your printer. Type styles are defined with initial and ending control sequences for PC character sets 2 through 9. The initial control sequence selects the print element for a type style and a character set. The ending control sequence is optional. The Emulation Program outputs this sequence before selecting a new type style or character set.

Individual Type Style

An individual type style definition can be defined to select a type style and associated character sets. Use an individual definition to define a type style that can only be selected using unique control sequences for each print element.

Group Type Styles

You can define a Group Type Style to select a group of type styles and associated character sets on the printer. Each group type style definition is assigned a group type style identifier. There are 26 identifiers (A through Z). Use a group type style definition to define a group of type styles that are selected through common control sequences. For example, you can define a group type style definition for a print element that supports the PC character set and Courier type style in 10, 12, and 15 pitch. The corresponding type style numbers you would type in the definition would be 11, 85, and 223.

Character Set Redefinition

The Emulation Program supports PC character sets 2 through 9.

Function Selection Tests

After you create or revise a PFT, run the function selection tests to verify the print functions you defined in the table:

- Superscript and subscript
- Form feed
- Pitches
- Backspace

You do not need to run the tests for the functions not supported by the Emulation Program (Underline, Emphasis, and Cursor Draw).

Use this procedure to run the tests:

1. Choose the Function Selection Test option from the main menu.

2. Select a test and prepare the printer as directed by the test.

3. The test will print samples. Answer the questions on the screen according to the output from the printer. When more than one

example is printed, choose the first one that provides the appearance you want.

4. If none of the printed results appear as you want, choose the example that is closest. Or, you can redefine the control sequence for the function.

5. If you decide to redefine any controls, run the tests again.

Note: If a control that is not defined is used in a test, the test is printed without that control.

Run the tests to ensure that you have defined the print functions correctly. If you do not, the PFT setup program prompts you to run them before you exit the program.

Chapter 11. Advanced Configuration

This chapter explains the following advanced configuration options:

- Display session options
- Printer session options

For detailed installation and configuration instructions, see Chapter 3, "Detailed Installation and Configuration." For quick start installation and configuration instructions, see Chapter 1, "Quick Start Instructions for the Emulation Program."

Advanced Display Options

The following options are available for each session you have configured as a display:

- Select additional display options

    - Bypass pre-signon screen
    - Immediate hot key option
    - Enable/disable keystroke buffering
    - Set print screen character set
    - Enable/disable autodim feature

- Select emulated display device as either 3196 monochrome display emulation or 3197 color display emulation

- Customize host to PC display code page mapping

- Customize screen colors and attributes

- Select monitor types for color graphics adapter

- Select workstation address list

- Set column separator attribute

The options for customizing the display appear when you choose Select Display Emulation Options from the Advanced Options menu.

More Display Options

Additional options appear when you choose 'Select additional display options' from the Advanced Display Options menu.

Bypass Pre-Signon Screen

The pre-signon screen displays the sessions as they become active when you load the Emulation Program. This option allows you to bypass the pre-signon screen when you load the Emulation Program. Otherwise, when the signon screen appears, you need to press any key to continue.

Immediate Hot Key Option

This option instructs the Emulation Program to switch to the DOS session immediately after you load the program, instead of switching to the first active session.

You can use this option with the Bypass Pre-Signon screen option to load the Emulation Program from a batch file, then return automatically to the batch file processing.

Buffer Keystrokes

This option allows you to "type ahead," that is, continue typing while the host Input Inhibit indicator is on. If keystroke buffering is configured for a session and the Input Inhibited indicator is on, up to 32 keystrokes are stored and then sent to the host when the Input Inhibited indicator is off. If more than 32 keys are pressed, an alarm is sounded for each key and the keystroke is discarded. As the buffer space is freed, additional keystrokes sent to the host are buffered.

Print Screen Character Set

This option allows you to specify the number of characters used when you print the screen. For example, the IBM Graphics Printer and Proprinter prints 255 characters; the IBM Matrix Printer prints 127. If you use a printer that can print 255 characters, you need to specify the 255 character set.

Autodim Feature

Use this option to dim the display after the number of minutes of no activity that you specify. To prolong the life of the display, use this option when you leave the screen unattended and do not want to stop sessions.

Customize Host to PC Display Code Page Mapping

The host EBCDIC-to-PC ASCII table provides the translation of EBCDIC values to ASCII. (See your *Technical Reference* manual for the EBCDIC and ASCII code page tables.)

Use this option to modify the translation of host EBCDIC characters to personal computer ASCII characters. Changing the tables affects only how the characters are displayed, not what is sent from the host.

An example of the use of this option is to assign the ASCII line-drawing characters to unassigned EBCDIC codes to display lines and box corners in a display session.

The session profile maintains two of these tables, one for the display and one for the printer. Modifications to the display table do not affect the printer table.

This table is based on the code page chosen in the Select Host to PC Display Code Page Mapping menu. The default is code page 037 to code page 437. If you have DOS set to code page 850, you may notice some characters do not appear as you expect them. For example, the cent sign (¢), ASCII code point 9B in the 437 code page, is code point BD in 850 code page.

The index to the table is the host EBCDIC code point and the value at that location is the personal computer ASCII code point.

For example, the capital A in EBCDIC code page 037 is at code point x'C1'. The capital A in ASCII code page 437 is at code point x'41'. Find the 'C0' line in Figure 11-1 and look at the value in the '1' column. As shown in Figure 11-1, code point x'41' (which represents the capital A) is at location x'C1'.

```
                  Session Configuration for Enhanced 5250 Emulation

                  Customize Display EBCDIC to ASCII table
          0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
   00    20 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
   10    10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E FE
   20    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
   30    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
   40    20 20 83 84 85 A0 F2 86 87 A4 9B 2E 3C 28 2B 7C   Current ASCII
   50    26 82 88 89 8A A1 8C 8B 8D E1 21 24 2A 29 3B AA   Character   A
   60    2D 2F B2 8E B4 B5 B6 8F 80 A5 B3 2C 25 5F 3E 3F
   70    BA 90 BC BD BE F3 C0 C1 C2 60 3A 23 40 27 3D 22
   80    C3 61 62 63 64 65 66 67 68 69 AE AF C6 C7 C8 F1
   90    F8 6A 6B 6C 6D 6E 6F 70 71 72 A6 A7 91 CE 92 A9
   A0    E6 7E 73 74 75 76 77 78 79 7A AD A8 D4 D5 D6 D7
   B0    5E 9C 9D FA 9F 15 14 AC AB FC 5B 5D E4 FE BF E7
   C0    7B[41]42 43 44 45 46 47 48 49 2D 93 94 95 A2 ED
   D0    7D 4A 4B 4C 4D 4E 4F 50 51 52 EE 96 81 97 A3 98
   E0    5C F6 53 54 55 56 57 58 59 5A FD F5 99 F7 F0 F9
   F0    30 31 32 33 34 35 36 37 38 39 DB FB 9A F4 EA 20


          F1→HELP                          F2→Prev Screen
```

Figure 11-1. Example EBCDIC Code Page 037 to ASCII Code Page 437 Table

Note: Any changes you make to the mapping table are stored in the session profile (DP5250.DAT). If you type **CONFIG** without specifying your existing profile and then save the new profile information, your changes will be lost.

Screen Colors and Attributes
This option allows you to change the display attributes:

- Blink
- Column separator
- High intensity
- Normal

- Reverse
- Underscore
- Screen color

The configuration program first prompts you to specify whether the display is color or monochrome. Then it displays the Customize Color Display Attributes screen, which is shown in Figure 11-2. This screen contains the hex value for each attribute. You can change the appearance of an attribute by changing its hex value.

```
                   Session Configuration for Enhanced 5250 Emulation
                         Customize Color Display Attributes

          [02] 20: Gr/Bk          [C0] 2B: B Bk/Rd          [06] 36: ▬ Ye/Bk
          [20] 21: Bk/Gr          [04] 2C: Rd/Bk; R U       [05] 38: ▬ Ma/Bk
          [07] 22: Wh/Bk          [40] 2D: Bk/Rd; Bk U      [50] 39: ▬ Bk/Ma
          [70] 23: Bk/Wh          [84] 2E: B Rd/Bk; Rd U    [09] 3A: ▬ Bl/Bk
          [02] 24: Gr/Bk; Gr U    [03] 30: ▬ Cy             [10] 3B: ▬ Bk/Bl
          [20] 25: Bk/Gr; Bk U    [30] 31: ▬ Bk/Cy          [05] 3C: ▬ Ma/Bk
          [07] 26: Wh/Bk; Wh U    [06] 32: ▬ Ye/Bk          [50] 3D: ▬ Bk/Ma
          [04] 28: Rd/Bk          [60] 33: ▬ Bk/Ye          [09] 3E: ▬ Bl/Bk
          [40] 29: BK/Rd          [03] 34: ▬ Cy/Bk
          [84] 2A: B Rd/Bk        [30] 35: ▬ Bk/Cy

          Where:
          B ► Blink               Cy ► Cyan                 U ► Underscore
          Bk ► Black              Gr ► Green                Wh ► White
          Bl ► Blue               Ma ► Magenta              Ye ► Yellow
          ▬ ► Column separator    Rd ► Red
                    Press ◄─┘ (Enter) when complete to save updates.


          F1→HELP                              F2→Prev Screen
```

Figure 11-2. Customize Color Display Attributes Screen

The two hex values in the brackets make up the PC color attribute codes. Listed to the right of each PC attribute code is the host attribute code, which is displayed using the PC attribute code that is in the brackets. A description of how the host defines each host attribute is listed to the right of the host attribute code. (For a description of the host attributes, see the *Technical Reference* manual.) You may modify the PC attribute values to whatever you prefer. Press Enter to save your updates.

The first value in the PC attribute code bracket is the background color, and the second value is the foreground color. The values are:

0 = Black	8 = Gray
1 = Blue	9 = Light blue
2 = Green	A = Light green
3 = Cyan	B = Light cyan
4 = Red	C = Light red
5 = Magenta	D = Light magenta
6 = Brown	E = Yellow
7 = White	F = High-intensity white

Note: If you enter a background value from 8 to F, the field will blink.

Host attributes 27, 2F, 37 and 3F are reserved by the host and cannot be modified.

The host attribute codes hex 20 and 21 determine the appearance of the display session status line indicators and the printer operator panel. Hex 20 determines their appearance when they are OFF, and hex 21 when they are ON. You cannot assign hex 20 and 21 the same attribute value.

Monitor Type

This option allows you to specify the type of monitor connected to your color graphics adapter card in your personal computer.

Workstation Address List

In basic configuration, you specified a unique address for each session. You can also enter a list of addresses (that is, an address search list) for a session. This allows, for example, four users to share three addresses. The host allows up to seven addresses on a local workstation line. You can include up to six addresses in a list. The Emulation Program listens to the line and searches for the first address that is not being used by any other workstation. The host first tries the station address specified as "Primary Address," then it tries the remaining addresses in the list. If one of the addresses is

not currently being used by another workstation on the line, the Emulation Program starts the session using the 'free' address.

The addresses should be rotated to reduce the chance of an address conflict. For example, if there are four users (A, B, C, and D) sharing three addresses (1, 2, and 3) the lists should be set up as follows.

Figure 11-3. Workstation Address List				
User	**A**	**B**	**C**	**D**
Address list	1, 2, 3	2, 3, 1	3, 1, 2	1, 2, 3
Address one will likely get	1	2	3	1 (if user A is not online)

Notes:

1. Do not mix display and printer addresses in the same address list.

2. If two workstations attempt to use the same address at the same time, unpredictable results can occur.

For more information about using address lists, see "Addressing Workstations" on page 2-9.

Column Separator Character

This option allows you to change the character used by the personal computer to emulate 5250 column separation. You can also change the character that appears in a host entry field when you type a blank with the Space bar.

Type the character on the keyboard, and it appears. If the character you want is not on the keyboard, press and hold the Alt key while you type the hexadecimal value of the character on the numeric keypad. (To find the hexadecimal value of the character, see the *Technical Reference* manual for the code page that you are using.) For example if you wanted the separator character to be a solid

block, you would enter the decimal value **219**, which represents the character at hex code point x'DB' in code page 850.

Advanced Printer Options

The following advanced printer options are available:

- Printer hardware characteristics

  - Enable/disable printer alarm
  - Printer paper width
  - Characters per inch
  - Lines per inch
  - Prompt to change character density
  - Initial paper handling equipment
  - 5219 Printer hardware options
    - Number of cut sheet drawers
    - Envelope hopper

- Customize printer EBCDIC to ASCII table

- Customize printer initialization string

- Select parallel or serial printer options

The options for customizing the printer appear when you choose Select Printer Emulation Options from the Advanced Options menu.

Printer Hardware

Audible Alarm
If the audible alarm is enabled, the Emulation Program sends a BEL command to the personal computer printer when the host sends a BEL command or when a graphic check occurs. The audible alarm is enabled by default.

Printer Paper Width
You can specify a paper width of either 8 or 13.2 inches. When a personal computer printer with a paper width of 8 inches is used to emulate a 5256, 5224, or 5219 printer, the Emulation Program does not allow printing beyond 8 inches. If the auto new line function is active, a new line operation equivalent to the New Line single byte

control is performed before printing the next graphic character. If the auto new line function is deactivated, an exception condition occurs.

CPI and LPI Selection
When emulating a 5256 or 5224 printer, you can specify the default characters per inch (CPI) and lines per inch (LPI). The Emulation Program uses these defaults until a print job requests a specific CPI or LPI. If these values are not supplied, the Emulation Program uses 10 CPI and 6 LPI.

User Prompt for Font Change
When using 5219 or 5224 printer functions, you may need to change the physical font element to change the CPI. For example, the IBM 5216 requires a printwheel change. This option allows you to specify whether the attached printer has this requirement. If you specify that a prompt is required, the Emulation Program requests a font change each time the CPI is changed by the host. Otherwise, the Emulation Program sends the CPI change to the printer and no user intervention is requested.

You can also use this option if you have defined a non-supported printer to use 5219 printer functions. If you define a control sequence in the printer function table to change the font and request no prompt with this option, the Emulation Program sends the command internally to change the font instead of prompting with the Change Font indicator.

Paper Handling Equipment
This option allows you to specify whether the printer uses continuous forms or cut sheets. The Emulation Program uses this option to determine how to perform page ejection.

5219 Printer Paper Feed Hardware
You can specify the type of paper feed hardware you want to attach to the printer. If a print job requests a type of paper feed that is not defined for your printer, the Emulation Program requests manual insertion of the required form. These types of paper feed hardware can be specified:

- One or two drawers
- Envelope feed

Customize Host to Printer Code Page Mapping

Use this option to modify the translation of host EBCDIC characters to printer ASCII characters. Changing the tables affects only how the characters are printed, not what is sent from the host. For details on modifying the table, see "Customize Host to PC Display Code Page Mapping" on page 11-3.

The session profile maintains two of these tables, one for the display and one for the printer. Modifications to the printer table do not affect the display table.

Printer Initialization String

Up to 32 bytes of initialization data may be specified for the printer. Each time you start the printer session, the Emulation Program sends the initialization data to the printer.

Parallel Attachment Options

If the personal computer printer is parallel attached, you can specify LPT1, LPT2, or LPT3 as the port used to communicate to the printer. The default port is LPT1.

Serial Attachment Options

To configure a serial (asynchronous) attached printer, you need to know the following information:

* Async port name (COM1 or COM2)
* Communication speed (baud rate)
* Number of data bits per frame (7 or 8)
* Number of stop bits per frame (1 or 2)
* Use of parity bit (none, even, or odd)

This information depends on how your particular serial attached printer is configured. For specific information, see the operator's manual that was provided with the printer.

Note: The Emulation Program cannot distinguish between Not Ready and End of Forms conditions for serial attached printers. If either condition occurs, the Emulation Program reports that the attached printer is offline.

Appendix A. Error Codes and Messages

This appendix contains all error codes and messages for the
Emulation Program. This information is from the following sources:

- Communications Errors
- Configuration Messages
- Controller Errors
- Data Stream Errors
- Initialization Messages
- Four-Digit Error Codes
- Operator Errors
- 5219 Printer Messages
- 5224 Printer Messages
- 5256 Printer Messages

Note: References to specific keys are related to the personal
computer style of keyboard customization file. If you are using a
different style of keyboard customization file or if you have redefined
any of the keys, use the appropriate key.

If a keying error occurs when you are typing information while in an
emulated session, a four-digit error code is displayed on the screen
(usually on the last line). Find the four-digit error code in "Four-Digit
Terminal Error Codes" on page A-13 follow the recovery procedure.

If keystroke buffering was selected, additional keystrokes are
buffered and must be cleared using the Error Reset key or the
I Reset key sequence before further recovery actions can be taken.

If keystroke buffering was not selected:

- The host ignores any additional data entered from the keyboard.
- The personal computer beeps each time you press a key.

Notes:

1. Error codes 0040 through 0054 are communication type errors and are valid when the personal computer is attached as a remote workstation through the IBM 5294 or IBM 5394 controllers. These errors must be corrected at the controller.

2. With printer emulation, the Emulation Program can only detect the end of forms (out of paper) and printer not ready conditions on the personal computer printers. If you do not know how to respond to a printer message, see the operator's guide for the printer you are using.

Using the Help Function

Some hosts provide help for error recovery. If an error code is displayed after you sign on to the host, press the emulated Help key. A message is displayed describing the error condition. After you finish reading the message, press the emulated Error Reset key and follow the recovery procedure listed for the error code. You should then be able to continue typing data on your personal computer.

Additional Information

Additional error information can be found in the host system messages manual. If you are not able to recover from an error refer to Appendix B, Problem Determination.

Error Codes and Messages

aaaaa.bbb, File Not Found (Error 100)

You requested a file name on the command line (using I=*aaaaa.bbb*) that was not on the requested (or default) drive. The Emulation Program displays this message, then returns control to DOS. A requested file must exist if the Emulation Program is to run.

aaaaa.bbb, Unusable Initialization Data (Error 200)

The configuration file exists, but does not contain data in the proper format for configuration data. The configuration file is generated by the configuration program (CONFIG.EXE) and can only be edited by CONFIG.EXE. If the Emulation Program does not recognize the configuration data, it displays this message and returns control to DOS. You should delete the configuration file and run CONFIG.EXE to generate a new file.

aaaaa.bbb, Unusable Printer Function Table

The Printer Function Table exists, but does not contain data in the proper format. A printer function table is generated by the PFTSETUP program (PFTSETUP.EXE) and can only be edited by PFTSETUP.EXE. If the Emulation Program does not recognize the configuration data, it displays this message and returns control to DOS. You should delete the PFT file and run PFTSETUP.EXE to generate a new file.

x — Invalid Letter on Command Line

The letter *x* on the command line is not recognized as a valid option. The error is usually caused by not entering an **I=**, **K=**, or **P=** before a file name.

Attached Printer Offline (5219, 5224, 5256 Emulation)

The printer was not online when you requested a printer operation.

This message is removed when the Start option is successfully completed by the program.

Attached Printer Offline: Data Loss May Have Occurred (5219, 5224, 5256 Emulation)

The Emulation Program tried to send host data to the printer, but a printer not ready condition exists.

The printer's internal buffer may have lost some information. The host is only informed that the printer is not available. It is not aware of any possible loss of information. If any information is lost, see the appropriate host recovery procedures.

This message is removed when the Start option is successfully completed by the program.

Note: If you do not know how to respond to an error message, see the operator's guide for the printer you are using.

Cannot Continue, Press Any Key to Exit

No address is available on the address list for the first session. Press any key to return to DOS.

DOS Version Not Supported

The Emulation Program requires DOS Version 5.0 or later.

End of Forms (5219 Emulation)

When an end of forms (out of paper) condition is shown, the following happens:

- The Ready indicator is turned off.
- The End of Forms indicator is turned on.
- The host is notified of the end of forms condition.

To recover:

1. Insert paper and make the printer ready.

2. Select the Start option on the emulated operator panel. The Ready indicator is turned on.

End of Forms (5224 Emulation)

When an end of forms (out of paper) condition is shown, the following happens:

- The Ready indicator is turned off.
- The Attention and Forms indicators are turned on.
- The host is notified of the End of Forms condition.

To recover:

1. Insert paper and make the printer ready.

2. Select the Stop/Reset option on the emulated operator panel. The Attention and Forms indicators are turned off.

3. Select the Start option on the emulated operator panel. The Ready indicator is turned on.

End of Forms (5256 Emulation)

When an end of forms (out of paper) condition is shown, the following happens:

- The Ready indicator is turned off.
- The Attention and Forms indicators are turned on.
- The host is notified of the End of Forms condition.

To recover:

1. Insert paper and make the printer ready.

2. Select the Stop/Reset option on the emulated operator panel. The Attention and Forms indicators are turned off.

    Note: If the printer was turned off to correct the End of Forms condition, select the Suspend option before you select the Stop/Reset option.

3. Select the Start option on the emulated operator panel. The Ready indicator is turned on.

Invalid File Name

Not a valid file specification. For the proper way to name and specify files, see the manual for your operating system.

Invalid Option (5219, 5224, 5256 Emulation)

You have selected an option that does not appear on the emulated operator panel.

This message is removed when a valid option is selected.

Line Check on Station Address *x*

The Emulation Program received data it did not recognize from the host while starting the program (for example, the data contained a parity error). This message suggests a possible hardware error in the host, the cable, or the personal computer.

1. Cancel emulation. The personal computer is returned to DOS and no sessions are active.

2. Retry. The Emulation Program retries the address list.

If the problem keeps coming back, refer to "Line Check Error" on page B-6, for more information.

Output Data Field Values (5219 and 5224 Printer Emulation)

The output data codes for the IBM 5219 and 5224 printers are listed in Figure A-1 on page A-7. These codes may show a print font, a feature, or a condition that has occurred on your printer. Check the table first, then follow these instructions.

If a print font was requested, refer to the information provided for you or request help from your host system operator.

If the host is expecting a printer operation to occur that uses a feature of your printer, follow the instructions given in the operator's manual for the printer you have attached.

If an error condition occurred, follow the instructions given in the operator's manual for the printer you have attached.

Figure A-1 describes the output data field values. The columns are:

Column	Contents
Value	Output data field value
Setup	Setup indicator on (if x)
Form	Form indicator on (if x)
Except	Printer Exception indicator on (if x)
Operator Action	Requested operator action

The requested operator action for each of the output data values in Figure A-1 requires that the operator perform the action listed and then select the Start option.

Figure A-1 (Page 1 of 2). Printer Output Data Field Values				
Value	**Setup**	**Form**	**Except**	**Operator Action**
Blank		X		Load paper.
01	X			Manual paper feed selected. Install appropriate device.
01		X		Manual paper feed override. Feed paper from drawer 1.
02	X			Tractor feed selected. Install appropriate device.
02		X		Manual paper feed override. Feed paper from drawer 2.
03	X			Automatic sheet feed selected. Install appropriate device.
0E		X		Manual paper feed override. Feed from envelope feed.
10-14 16-17 20-26 30-32 40			X	Contact the host or controller operator and report a formatting error. (Include the value in the Output Data field.)

Figure A-1 (Page 2 of 2). Printer Output Data Field Values				
Value	**Setup**	**Form**	**Except**	**Operator Action**
55				Controller stopped the printer. Contact your host or controller operator for directions.
D1		X		Paper feed type is continuous tractor. Change to source drawer 1.
D2		X		Paper feed type is continuous tractor. Change to source drawer 2.
Any Num- ber				If the Change Font indicator is on, change to the font shown by the host system programmer.

Printer Emulation Suspended (5219, 5224, 5256 Emulation)

You have suspended printer emulation, and the printer can now be used by a DOS application program.

This message is removed when the Start option is selected.

Waiting for System Avail at Station A*x*

The Emulation Program waits approximately 10 seconds for the host to respond.

5250 Emulator Already Loaded

The Emulation Program is already loaded. You may not load more than one copy of the code in the personal computer at the same time. The first copy still functions normally.

5250 Hardware Diagnostic Failure

The initialization program detected a possible hardware error. Run the diagnostic program for the adapter using the instructions in the *Guide to Operations* or *Installation and Test Instructions* manual that was supplied with the adapter. The personal computer returns to DOS.

Keyboard Customization File Errors

= Sign Missing or Misplaced

The equal (=) sign must be separated from other characters by at least one space or tab. This syntax error message indicates where the error occurred.

Caps Lock Function Definable Only to Caps Lock Key

The Caps Lock function may be assigned to the shifted and unshifted mode of only the Caps Lock key. This syntax error message indicates where the error occurred.

Caps Lock Function Not Definable in Alternate Mode

The Caps Lock function may not be assigned in a playback sequence. This syntax error message indicates where the error occurred.

Carriage Return or Line Feed Missing

This error occurs if the editor used to create or modify your keyboard customization file does not put a carriage return or line feed at the end of each line. Most editors do this for you. This syntax error message indicates where the error occurred.

Define Not Found

The first word of each line in the keyboard customization file must be DEFINE. This message is displayed when the keyword DEFINE is missing, misplaced, or misspelled. The word can be shortened, but at least the first three characters, DEF are required. The keyword can be uppercase, lowercase, or both. This syntax error message indicates where the error occurred.

Definition Line Exceeds 512 Characters

A definition record was found that exceeds the maximum record length of 512 characters. The first 512 characters of the record follow this message on the screen.

File Empty

The file contains no records.

File Not Found

A file was not found in the current or specified subdirectory on the requested or default drive.

Invalid Character '*x*' Found

A character (*x*), which is not available on a 5250 display, was found in a definition. Refer to the EBCDIC character sets in the *Technical Reference* manual for a list of the valid 5250 characters. This syntax error message indicates where the error occurred.

Invalid Drive Name

An invalid drive was specified for the keyboard customization file in the configuration file or as an execution time parameter.

Invalid File Name

A file name that does not meet the requirements for your operating system was requested.

Invalid Mode Definition

The definition record is trying to assign a shift mode that is not valid. The valid shift modes are:

- Alternate (a-*keyname*)
- Shifted (s-*keyname*)
- Nonshifted (*keyname*)

where *keyname* refers to the name of the key on the personal computer. This syntax error message indicates where the error occurred.

Invalid Scan Code

The value of the hexadecimal number used for the personal computer scan code is not in the range of hex 01 through 7F. The number must contain two digits. Refer to scan code table in the *Technical Reference* manual for the valid scan codes. This syntax error message indicates where the error occurred.

Key Not Definable in Alternate Mode

The Alt, Ctrl, and Scroll Lock keys cannot be defined in alternate mode. The Emulation Program uses these keys for special purposes. For example, Alt+Ctrl is used to display the workstation address where the keyboard buffer indicator is normally displayed. This syntax error message indicates where the error occurred.

No Definition

No text follows the keyword DEFINE on the definition line. The keyword must be followed by an equal sign and a valid 5250 function. For a description of the DEFINE command, see "Changing the Keyboard Customization File" on page 6-8. This syntax error message indicates where the error occurred.

Null Definition

A null definition is not allowed. Null definitions are two delimiters running side by side. For example:

```
def s-a = ""
def a-a = "This [] 'has a null definition.'
def a-s = ""And so does this one!"
```

This syntax error message indicates where the error occurred.

Num Lock Function Definable Only to Num Lock Key

The Num Lock function may be assigned to the shifted and unshifted mode of the Num Lock key only.

Num Lock Function Not Definable in Alternate Mode

The Num Lock function may not be assigned in a playback sequence.

PC Key Name Not Found

Nothing was found on the definition line after the keyword DEFINE. There must be some text following DEFINE. This syntax error message indicates where the error occurred. For a description of the DEFINE command, see "Changing the Keyboard Customization File" on page 6-8.

Playback Sequence Exceeds 510 Bytes

All available space for storing playback sequences is used. You must shorten the playback sequences until they all fit into the 510-byte limit.

Playback Sequence Not Allowed after Hot Key to DOS

Playback sequences may not be continued after the sequence causes a hot key to the DOS session. Direct hot keys to DOS with additional playback data are flagged with this error message. Hot keys to DOS from a round robin hot key cannot be detected during keyboard customization. When they occur online, the playback sequence is ended.

Shift Keys Are Not Definable

The left and right personal computer shift keys (scan codes 2A and 36) are always defined as shift keys and cannot be changed. A shift key cannot be assigned a string or function. The shift keys can only be used with other keys to select a character or function.

String or Function Delimiter Missing

The string delimiter (' or ") or function delimiter ([or]) is missing or misplaced on the right of the equal sign. Strings must begin and end with the same delimiter (' or "), and the delimiter may not be used inside the string. Functions must begin with a left bracket ([) and end with a right bracket (]).

Unknown Function Name '*xxxx*'

A function name (*xxxx*) that is not available on a 5250 display was found in a definition. For a list of valid function names, see Figure 6-4 on page 6-11.

The function names can be in uppercase, lowercase, or both.

Unknown Personal Computer Key Name

An invalid name was used for a personal computer key name. For a list of valid key names, see Figure 6-3 on page 6-10. The special names can be uppercase, lowercase, or both. Common errors are to put a 5250 function name to the left of the equal sign or to put a blank within the personal computer key name.

1 Character or Function Only

Only one character or function may be assigned to each key in the nonshifted mode. You must use the alternate mode to assign a string.

Four-Digit Terminal Error Codes

0000   No Help Text Available

Meaning: You have pressed the emulated Help key; however, either no error code was displayed or the error was issued by a program that does not support this function.

Action: Press the emulated Error Reset key. Then either continue or refer to the meaning of the previously displayed error code and take the action described.

0001   Keying Too Fast

Meaning: The host or controller could not keep up with the rate at which you were pressing keys, and the last keys pressed were not recognized.

Action: Press the emulated Error Reset key and then continue.

0002 Received Invalid Code

Meaning: The host or controller received a key code that is not valid and therefore does not recognize which key you pressed.

Action: Press the emulated Error Reset key and try to continue.

0003 Key Not Command Key

Meaning: You pressed the emulated Cmd key, but the next key you pressed was not one of the command function keys.

Action: Press the emulated Error Reset key and continue by using a valid key sequence.

0004 Protected Field

Meaning: You attempted to press a key for a field that does not allow keyboard input. This field is an input/output feature field.

Action: Press the emulated Error Reset key.

0005 Protected Field

Meaning: You attempted to press a key for a field that is not an input field. Data cannot be entered into a protected area of the screen.

Action: Press the emulated Error Reset key and move the cursor to a valid input field.

0006 Invalid Entry

Meaning: After pressing the emulated Attn key and before pressing either the emulated Enter key or the emulated Error Reset key, you pressed a key that is not valid.

Action: Press the emulated Error Reset key and use a valid key sequence.

0007   Must Enter Field

Meaning: There is at least one mandatory field on the screen into which you must enter data before the screen can be changed or moved. (The cursor goes to the first character position of the first mandatory entry field requiring data.)

Action: Press the emulated Error Reset key and press the required keys.

0008   Alphabetic Only Field

Meaning: The field into which you are trying to enter data takes only alphabetic data, and you pressed a nonalphabetic character. Valid characters are A through Z, blank, comma, period, and hyphen.

Action: Press the emulated Error Reset key and continue by pressing valid keys.

0009   Numeric Only Field

Meaning: The field into which you are trying to enter data takes only numeric data, and you pressed a nonnumeric key. Valid characters are 0 through 9, blank, comma, period, plus, and minus.

Action: Press the emulated Error Reset key and continue by pressing valid keys.

0010   Signed Numeric Only Field

Meaning: The field into which you are trying to enter data takes only signed numeric data, and you pressed a key that is not valid. Valid characters are 0 through 9.

Action: Press the emulated Error Reset key and continue by pressing valid keys.

0011   Sign Position Only

Meaning: You attempted to put data into the last position of a signed numeric field.

Action: Press the emulated Error Reset key. Make sure that the data is correct and exit the field by using the emulated Field– key or the emulated Field+ key.

0012   Field Full

Meaning: There is no room in this field to enter data. Either there is no more room in the field or the cursor is in the last position of the field.

Do not use insert mode to change data or to enter data into the last position of this field.

Action: Press the emulated Error Reset key. Then correct the field, if necessary, and continue.

0013   Insert Mode On

Meaning: You attempted to leave a field while the personal computer was still in insert mode.

Action: Press the emulated Error Reset key and exit the field normally.

0014   Must Fill Field

Meaning: You pressed a function key that would move the cursor out of this field; however, the requirements of this mandatory fill field are not met. A mandatory fill field must be completely filled or left blank.

Action: Press the emulated Error Reset key. Fill the entire field, or move the cursor to the start of the field and then use the emulated Field– key or the emulated Field+ key.

0015   Does Not Compare

Meaning: You entered data into a self-check field; the number and the check digit you just entered do not compare.

Action: Press the emulated Error Reset key. Check that you used the correct number and check digit. If you used the correct characters, check that the number is valid for a self-check field.

0016   Not Signed Numeric Field

Meaning: You pressed the emulated Field– key, but the field you are in is not a signed numeric field or (for some hosts) a numeric only field.

Action: Press the emulated Error Reset key. Continue by pressing data keys or pressing the emulated Field+ key.

0017   Field Not Full

Meaning: You pressed the emulated Field– key or the emulated Field+ key; however, the requirements for this mandatory fill field are not met. A mandatory fill field must be completely filled unless you exit from the first position of the field.

Action: Press the emulated Error Reset key. Then continue by pressing data keys to fill the field or by moving the cursor to the start of the field and using the emulated Field– key or the emulated Field+ key.

0018   Nondata Key Required

Meaning: You must use a nondata key (such as emulated Field+, emulated Field–, emulated Field Exit, or a cursor movement key) to leave this field.

Action: Press the emulated Error Reset key. Then use a nondata key to leave this field.

0019   Dup Key Not Allowed

Meaning: You pressed the emulated Dup key; however, the Dup key is not permitted in this field.

Action: Press the emulated Error Reset key and continue without using the emulated Dup key in this field.

0020 Right Adjusted or Signed Numeric Field

Meaning: You pressed a key that is not allowed in this field. This is either a right-adjusted or a signed-numeric field, and you must exit the field before pressing any of the following keys: Backspace, emulated Enter, emulated New Line, emulated command, emulated Help, emulated Roll Up, emulated Roll Down, and emulated Home (when the cursor is in the home position).

Action: Press the emulated Error Reset key. The cursor is in the same position it was in when you pressed the key that was not valid. Continue by pressing the emulated Field– key or the emulated Field+ key.

0021 Must Enter Field

Meaning: The cursor is positioned in a mandatory enter field. A mandatory enter field must have data in it before you can exit the field by pressing the emulated Field+ or the emulated Field– key.

Action: Press the emulated Error Reset key and then press the required data keys.

0022 System Error

Meaning: A host error occurred. The status of the present field is not known. This error can occur during an insert or delete operation.

Action: Press the emulated Error Reset key. Check the screen to determine whether the insert or delete function was completed properly. If not, correct the field.

0023 Nonhexadecimal Key

Meaning: You are in hexadecimal mode, but the first key pressed was not an **A** through **F** key or a **1** through **9** key; or the second key pressed was not an **A** through **F** key or **0** through **9** key.

This error also occurs when a hexadecimal code is used in a numeric only, signed numeric, alphabetic only, or input/output field.

Action: Press the emulated Error Reset key. Continue by pressing the correct key.

0026 Numeric Only Field

Meaning: You pressed the emulated Field– key to exit a numeric only field, but a number from 0 through 9 was not in the last position of the field.

Action: Press the emulated Error Reset key. Correct the last position of the field or exit the field by using the emulated Field+ key.

0028 Key Not Assigned

Meaning: You pressed a key that is not used by this program.

Action: Press the emulated Error Reset key and continue by pressing a valid key.

0029 Not Diacritic Key

Meaning: The second key pressed during a diacritic key function did not result in a valid combination.

Action: Press the emulated Error Reset key and enter a valid combination.

0040 Data Set Not Ready

Meaning: The 'data set ready' line is inactive, and it should be active.

Action: Notify the controller operator.

0042 Receive Clock Field

Meaning: The receive clock signal failed during a receive operation.

Action: Notify the controller operator.

0043 Data Set Ready

Meaning: The 'data set ready' line is active, and it should be inactive.

Action: Notify the host or controller operator.

0044   Not Receiving Data

Meaning: The 30-second communication time-out expired with no valid data being received.

Action: Notify the controller operator.

0050   Clear and Request to Send Not Together

Meaning: Either the 'clear to send' line was inactive while the 'request to send' line was active or the 'clear to send' line was active while the 'request to send' line was inactive.

Action: Notify the controller operator.

0051   Transmit Clock Failed

Meaning: The transmit clock signal failed during a transmit operation.

Action: Notify the controller operator.

0052   Controller Error

Meaning: The controller detected an internal error.

Action: Notify the controller operator.

0054   Controller Received Invalid Command

Meaning: The controller received a command that is not valid from the host.

Action: Notify the controller operator.

0099   Host Not Available

Meaning: A key that required host action was pressed, and the host was not available.

Action: Determine when the error occurred (before, during, or after signon), and then see Appendix B, "Problem Determination" for more information.

Appendix B. Problem Determination

This appendix can help you solve a problem with your personal
computer and the 5250 Emulation Program. Check to see if any of
the symptoms describe your problem, and take the corrective action.

Cursor Blinking Upper Left

```
■
```
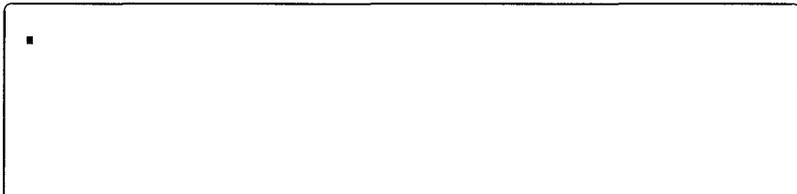
Figure   B-1. Cursor Blinking Upper Left

Meaning:
The cursor is blinking in the upper left corner of the screen.

Action:
1. The System/38 may have varied this session offline.

   This only applies to a System/38 that is running a CPF release
   before release 6.0, program change C. Program change number
   06076 in program change C corrects this problem.

   System/38 varies offline a display following the fourth time it is
   powered off without a user signing on. The display must be
   varied online (VRYDEV) before it can be used again.

   The system continues to vary the display offline each time it is
   subsequently varied online, powered on, and powered off without
   a user signing on. On the eighth consecutive power off
   (including the first four, noted above), a warning message is sent
   to the QSYSOPR message queue. On the ninth occurrence, the
   display's subsystem deallocates the device. The only way to
   recover, at this point, is to terminate (TRMSBS) and restart
   (STRSBS) the subsystem.

The counters are reset each time a user signs on to the display.

When invoking the Emulation Program, a user must sign on to each emulated display at least once every fourth time. This is generally not a problem with the first session. But, the second session may be configured as a display session and not used. The screen for the offline session will be blank except for the cursor in the upper left corner and the status indicators displayed with System Available on.

2. Contact the host system operator and make sure the host is operating correctly.

Cursor Blinking Upper Right
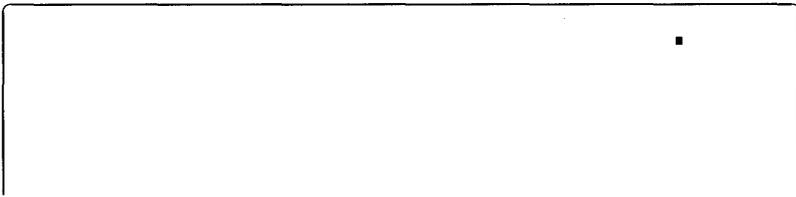
Figure   B-2. Cursor Blinking Upper Right

Meaning:
The cursor is blinking in the upper right corner of the screen.

Action:
1. Contact the host system operator and make sure the host is operating correctly.

2. Make sure that the cable between your personal computer and the host is securely fastened and is not visibly damaged.

3. Make sure the workstation address in the session profile is correct. Ask your host system operator for assistance.

4. Make sure that only the last workstation on your cable is terminated. Ask your host system operator for assistance.

5. If the cursor is still blinking in the upper right corner of the screen, run the diagnostic program for the adapter using the instructions in the *Guide to Operations* or *Installation and Test Instructions* manual that was supplied with the adapter.

6. If the problem persists, report to the host system operator that your workstation is not communicating with the host.

Error Occurred after Signon

Meaning:
If the workstation is locally attached, contact the host system operator to determine whether the host is available. If the workstation is attached through a controller, this error can be caused by a loss of communication between the controller and the host.

Action:
Press the emulated Error Reset key, then try to run a different type of job or procedure. If the error does not occur again, there is a system programming problem or a key that was not valid was pressed. If the error occurs again and the personal computer is attached to a controller, contact the controller operator to determine whether communications with the host was lost and whether the host is not available. For additional error information, contact the host system operator.

Error Occurred before Signon

Meaning:
The function key you pressed is not valid now.

Action:
Press the emulated Error Reset key. Then use the correct procedure to sign on.

Error Occurred during Signon

Meaning:
Either the host is not operating or the controller is not communicating with the host.

Action:
Ask your host system operator for assistance.

Four-Digit Error Code

```
XXXX
```
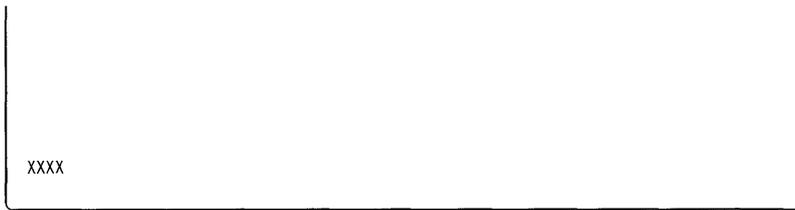
Figure   B-3. Four-Digit Error Code

Meaning:
This error code is displayed in the four leftmost columns in the last row of the screen.

Action:
Find the error code in "Four-Digit Terminal Error Codes" on page A-13 and take the action recommended.

Keyboard Not Working

Meaning:

When you press any key, no data appears or incorrect data appears on the screen.

Action:

1. If the alarm sounds, the keyboard may be input inhibited. Press the emulated Error Reset key.

   If the alarm does not sound:

   a. Turn the personal computer off. Wait 10 seconds, then turn it on.

   b. Test the keyboard by pressing a few keys. If the screen remains blank, refer to your personal computer *Guide to Operations* and run the diagnostics supplied with the program. If the KB indicator is on, empty the keyboard buffer by pressing the Alt and Scroll Lock keys.

2. If characters different from the ones pressed on the keyboard are displayed or you are getting keyboard errors displayed on the screen, you might not have the device configured with an enhanced keyboard.

   a. Change the device description on the host for your workstation so that it specifies an enhanced keyboard.

   b. If you are upgrading from Version 2.3 or earlier of the Emulation Program, you must reconfigure your 3196 device description for an enhanced keyboard.

Line Check Error

```
 XX
```

Figure B-4. Line Check Error

Meaning:
The line check count is displayed as a decimal number at the left end of the status line.

Action:
1. Make sure the cable between your personal computer and the host is securely fastened and is not visibly damaged.

2. Make sure the workstation address in the session profile is correct. Ask your host system operator for assistance.

3. Make sure that only the last workstation on your cable is terminated. Ask your host system operator for assistance.

4. Turn the personal computer off. Wait 10 seconds, then turn it on.

Memory Error

Meaning:
If you receive a memory error message when trying to start the Emulation Program, there is no memory available to install your adapter. In many cases, this is a problem that occurs with memory managers.

Action:
For information about correcting the error, see "Memory Usage" on page 3-23.

Printer Failure Not Defined

Meaning:
If the printer is not operating, you may have forgotten to turn it on before loading the Emulation Program.

Action:
If this situation occurs:

1. Suspend the printer session.
2. Turn the printer on.
3. Ready the printer.
4. Start the printer session.
5. Restart the host print job.

Problem Not Defined

Meaning:
A problem still exists. Your workstation is not operating as expected, and none of the symptoms described in this appendix apply to your situation.

Action:
1. Contact your host system operator and make sure the host is operating correctly.

2. Make sure the twinaxial cable between your personal computer and the host is securely fastened and is not visibly damaged.

3. Make sure the workstation address in the session profile is correct. Ask your host system operator for assistance.

4. Run the diagnostic program for the adapter using the instructions in the *Guide to Operations* or *Installation and Test Instructions* manual that was supplied with the adapter.

Transfer Facility Signon

Meaning:

When requesting data transfers using the IBM System/36 Transfer Facility PRPQ or the IBM System/38 Transfer Facility PRPQ, you must be signed on to session one.

If you try to transfer data when you are not signed on to session one, the workstation signon screen is displayed, but keystrokes are not accepted.

Action:

If this situation occurs:

1. End the 5250 Emulation Program by performing a software reset (pressing Ctrl+Alt+Del) to return control to DOS.

2. Restart the 5250 Emulation Program with DP5250, making sure to sign on to session one.

3. Restart the Transfer Facility.

Appendix C. PCMCIA Setup Considerations

The Enabler/Diagnostic Diskette that comes with the 5250 Emulation PCMCIA Adapter:

1. Tests your 5250 Emulation PCMCIA Adapter card

2. Provides the necessary software to enable and configure your 5250 Emulation PCMCIA Adapter

Notes:

1. It is recommended that you use Card Services to manage your system's resources for PCMCIA cards. For information about using Card Services, see "Installing Card and Socket Services" on page C-7.

2. The 5250 Emulation PCMCIA Adapter requires DOS 5.0 or above to use the 5250 Emulation PCMCIA Adapter. To connect to your host system, you need an additional 5250 emulation package.

3. If your 5250 Emulation PCMCIA Adapter is already in use by other software, do **not** configure it. Unpredictable results can occur.

About the Enabler/Diagnostic Diskette

The Enabler/Diagnostic Diskette contains the following directories:

\ENB5250   Contains files that enable and start the 5250 Emulation PCMCIA Adapter card in DOS mode. The SETUP program copies some of these files to your personal computer.

\DIAG   Contains files for testing the 5250 Emulation PCMCIA Adapter.

\PCMCIA   Contains the DOS Card Services and Socket Services drivers for some IBM personal computers.

Note: There might be more directories.

C-1

The following files are in the root directory of the Enabler/Diagnostic Diskette.

README.TXT   Contains any information about the 5250 Emulation PCMCIA Adapter that was not available when this manual was published

SETUP.BAT   Copies the enable and configuration software for DOS emulation programs to your personal computer

CFG5250.BAT   Sets or changes your 5250 Emulation PCMCIA Adapter configuration

CONFIG.SYS   Starts the diagnostics and the 5250 Emulation PCMCIA Adapter device drivers

Note: There might be more files.

Backing Up the Enabler/Diagnostic Diskette

Make a backup copy of the Enabler/Diagnostic Diskette and keep the original diskette in a safe place. To make a backup copy of this diskette, either use the DOS DISKCOPY command or:

1. Format a new diskette with the /S option to copy the system files to the new diskette.

   Note: If you do not put the system files onto your diskette, the 5250 Emulation PCMCIA Adapter tests will not start.

2. Copy all the files and subdirectories to your new diskette using the DOS XCOPY command with the /S option.

Testing the 5250 Emulation PCMCIA Adapter

To test the 5250 Emulation PCMCIA Adapter:

1. Put the backup copy of your Enabler/Diagnostic Diskette in the default drive.

2. Reboot your personal computer by pressing the Ctrl+Alt+Del keys at the same time.

3. Follow the instructions the program gives.

4. After the tests end, remove the diskette from the default drive and press Enter to restart your personal computer.

Note: If you test the 5250 Emulation PCMCIA Adapter without configuring the diskette, the configuration program runs automatically. After configuring your diskette, enter CFG5250 to change the adapter configuration.

Configuring the Enabler/Diagnostic Diskette

To configure your Enabler/Diagnostic Diskette:

1. Place the backup Enabler/Diagnostic Diskette into the default diskette drive and make this drive the current drive.

2. Enter CFG5250 and select the configuration parameters. This configures the Enabler/Diagnostic Diskette for use.

3. Test the 5250 Emulation PCMCIA Adapter to ensure the Enabler/Diagnostic Diskette is properly configured and the 5250 Emulation PCMCIA Adapter is operational. For more information, see "Testing the 5250 Emulation PCMCIA Adapter" on page C-2.

Installing the 5250 Emulation PCMCIA Adapter Software

To install the 5250 Emulation PCMCIA Adapter software:

1. Complete the steps in "Configuring the Enabler/Diagnostic Diskette."

2. Return the Enabler/Diagnostic Diskette to the default diskette drive. Make this drive the current drive.

3. To copy the software from the diskette to your personal computer, enter **SETUP** **[drive:]** **[path]**
   where [drive:][path] specifies the target directory for your software. You must specify a target directory. If the directory does not exist, the SETUP program creates it.

For example, to install your software in directory ENB5250 on drive C, enter:

`SETUP C:\ENB5250`

4. If directed by the SETUP program, add information to your CONFIG.SYS and AUTOEXEC.BAT files.

5. Reboot your personal computer by pressing the Ctrl+Alt+Del keys at the same time. This causes the changes that you made to the CONFIG.SYS and AUTOEXEC.BAT files to take effect.

6. From the directory that you specified in the SETUP program, run the ENB5250 program to enable your 5250 Emulation PCMCIA Adapter. If your adapter does not successfully enable, you might need to change your adapter or personal computer configuration. If your adapter tested without error in step 3, configuration problems are probably the result of conflicts with specifications in your CONFIG.SYS file. For information about a common CONFIG.SYS problem, see "Memory Managers" on page C-6.

7. If you want to change your 5250 Emulation PCMCIA Adapter configuration, enter CFG5250 in the directory that you specified in the SETUP program.

Configuration Support

There is configuration support for personal computers that have Card Services support 2.00 or 2.01. Higher levels of Cards Services might also work.

It is recommended that you install PCMCIA Card Services on your personal computer and use this configuration option. Card Services manages your personal computer resources for your PCMCIA cards.

The other configuration options directly program your personal computer hardware to enable the 5250 Emulation PCMCIA Adapter. If you configure your personal computer without PCMCIA Card Services, you must select system interrupts, I/O port addresses, and memory mapped addresses that the personal computer and other adapter cards are not using.

Using Card Services

If you select the Card Services option, your personal computer must have:

- Card Services 2.00 or above
- Sockets Services 2.00 or above

If you are using a ThinkPad computer, see "Using the ThinkPad 720" on page C-8 for information about using Card Services and Socket Services.

Programming PCMCIA Controller Hardware

There is configuration support for directly programming some PCMCIA controller hardware. Use this support only when Card Services Support 2.00 or above is not available for your personal computer.

If you do not have PCMCIA Card Services 2.00 or above, select the configuration option in Figure C-1 that best matches your personal computer.

Figure C-1. Supported PCMCIA Controllers	
PCMCIA Controllers	**Personal Computer**
IBM ThinkPad	IBM ThinkPad
SHARP PHIC	Sharp 6700 Labtops
Toshiba ICCCNT	Toshiba 3300SL
Intel** 82365SL PCIC	• AST • NEC • Some Toshiba personal computers • Many other personal computers

If your personal computer is not listed, try the option for the Intel 82365SL PCMCIA support chip. Many personal computers use this PCMCIA support chip. If the Intel 82365SL PCMCIA support chip option does not work for your personal computer, ask your dealer which controller to use or call 1-800-955-5250.

Selecting the wrong configuration information can cause hardware conflicts in your personal computer. The conflicts can cause the 5250 Emulation PCMCIA Adapter tests, 5250 Emulation programs, or the configuration program (CFG5250) to fail. If a program fails, you must turn your personal computer off and on to clear all the hardware conflicts. Rebooting your personal computer by pressing the Ctrl+Alt+Del keys does not always clear hardware conflicts.

Warning: If the 5250 Emulation PCMCIA Adapter is in use, running CFG5250 causes unpredictable results. Do **not** run CFG5250 while the adapter is in use by other software.

Memory Managers

The 5250 Emulation PCMCIA Adapter Card requires 8KB of available memory. You should ensure that any memory managers in your personal computer reserve some space to install the 5250 Emulation PCMCIA Adapter and any other I/O adapters.

For example, if your personal computer uses memory manager EMM386.SYS, the following command in the CONFIG.SYS file reserves a 64KB space, starting at segment address 0xC000 for installing I/O adapters.

```
DEVICE=EMM386.EXE NOEMS X=C000-CFFF
```

Note: You must restart your personal computer for any changes that you make in the CONFIG.SYS file to take effect.

If you are using Card Services to enable your 5250 Emulation PCMCIA Adapter, you might need to reserve more than the 8KB space required for the adapter. Card Services support requires extra space for managing other PCMCIA adapters.

For more information, see the documentation provided with your memory manager. For sample CONFIG.SYS files, see "Sample CONFIG.SYS Files" on page C-9.

Installing Card and Socket Services

PCMCIA Card Services is software that manages personal computer resources for PCMCIA adapters. PCMCIA Card Services 2.00 is not provided with the 5250 Emulation PCMCIA Adapter. Card Services might be available as part of your operating system or from the manufacturer of your personal computer.

Card Services 2.00 requires that Socket Services 2.00 be installed on your personal computer. Your personal computer might already have Socket Services 2.00, or Socket Services might be an option provided by the manufacturer of your personal computer. IBM-DOS 6.1 provides Socket Services code for some IBM personal computers. (See the README.TXT file in IBM-DOS 6.1 for more information.) For information about using the IBM ThinkPad 720, see "Using the ThinkPad 720" on page C-8.

Correction Service Diskettes on BBS

Note: The IBM PC Company Electronic Bulletin Board System (PCC BBS) phone number that is given below is a United States phone number.

Correction diskettes are available from the PCC BBS. You can call the PCC BBS at 1-919-517-0001 on a toll call basis, but with no access charge for the bulletin board. The requirements for the asynchronous electronic connection to the PCC BBS include:

- A 1200 to 144000 baud modem set to 8 data bits, 1 stop bit, and no parity bits

- Communication software that supports 8 data bit file transfer

- A switched telephone line

Using the ThinkPad 720

Attach the adapter cable **before** turning on your personal computer.

Warning: After the 5250 Emulation PCMCIA Adapter is enabled, do **not** attach the adapter cable to the 5250 Emulation PCMCIA Adapter. Failure to attach the adapter cable before turning on your personal computer can cause the socket fuses in your IBM ThinkPad **to permanently disable your PCMCIA socket**.

It is recommended that you install Card Services and use it to enable the 5250 Emulation PCMCIA Adapter.

If you use the IBM ThinkPad configuration option and select the wrong slot, you must turn the computer off and on before you can use the correct slot. If you do not turn the IBM ThinkPad off and on, it will not detect the 5250 Emulation PCMCIA Adapter.

To install Card and Socket Services 2.00 for the IBM ThinkPad 720 from the Enabler/Diagnostic Diskette, change the following lines in the CONFIG.SYS file on the Enabler/Diagnostic Diskette:

```
REM device=\pcmcia\ibmdss02.sys
REM device=\pcmcia\ibmdoscs.sys
REM device=\pcmcia\dicrmu02.sys
```

to:

```
device=\pcmcia\ibmdss02.sys
device=\pcmcia\ibmdoscs.sys
device=\pcmcia\dicrmu02.sys
```

To enable your 5250 Emulation PCMCIA Adapter with Card and Socket Services, select Card Services 2.00 as a configuration selection.

Some levels of Card and Socket Services 2.00 provided with the IBM ThinkPad 720 can cause your personal computer to restart when the 5250 Emulation PCMCIA Adapter is enabled. If this happens, install the copy of Card Services and Socket Services that is in the PCMCIA directory on the Enabler/Diagnostic Diskette.

Note: If you do not have this problem, do not change the DOS Card and Socket Services software that you are using.

To install the copy of Card Services and Socket Services:

1. Copy the following files from the PCMCIA directory on the Enabler/Diagnostic Diskette to your personal computer.

   ```
   ibmdss02.sys
   ibmdoscs.sys
   dicrmu02.sys
   ```

2. Add the following lines to your CONFIG.SYS file:

   ```
   device=[drive:][path]\ibmdss02.sys
   device=[drive:][path]\ibmdoscs.sys
   device=[drive:][path]\dicrmu02.sys
   ```

3. Remove any previous Card and Socket Services information in your CONFIG.SYS file.

Using the SHARP PC-6700

To use the 5250 Emulation PCMCIA Adapter Card with the SHARP PC-6700, configure an IC Card Com Port:

1. Press the setup key on the Sharp keyboard

2. Under the Setup Option for Floppy Driver and IC cards, select IC Card Com Port and enter the requested information.

Sample CONFIG.SYS Files

This section contains sample CONFIG.SYS files for installing DOS Card and Socket Services and 5250 Emulation PCMCIA enabler support. These samples assume that the following directories exist.

C:\DOS   Contains all files provided by DOS.

C:\PCMCIA   Contains all drivers necessary to install Card and Socket Services 2.00 on your computer if the drivers are not provided with DOS.

C:\ENB5250   Contains specific drivers for enabling the 5250
                 Emulation PCMCIA Adapter PCMCIA adapter.
                 These drivers are provided by the
                 Enabler/Diagnostic Diskette.

Sample 1

System:
IBM ThinkPad 720

Card and Socket Services Files:
IBMDSS02.SYS, IBMDOSCS.SYS, DICRMU02.SYS

Card and Socket Services Source:
Either from the PCMCIA directory on the Enabler/Diagnostic Diskette
or provided with your personal computer

```
SHELL=C:\DOS\COMMAND.COM  /P /E:512
DEVICE=C:\PCMCIA\IBMDSS02.SYS
DEVICE=C:\PCMCIA\IBMDOSCS.SYS
DEVICE=C:\PCMCIA\DICRMU02.SYS
DEVICEHIGH=C:\ENB5250\CSDD5250.SYS
```

Sample 2

System:
IBM ThinkPad 720

Card and Socket Services Files:
IBMDSS02.SYS, IBMDOSCS.SYS, DICRMU02.SYS

Card and Socket Services Source:
Either from the PCMCIA directory on the Enabler/Diagnostic Diskette
or provided with your personal computer

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=C000-CFFF
DOS=HIGH,UMB
SHELL=C:\DOS\COMMAND.COM  /P /E:512
DEVICE=C:\PCMCIA\IBMDSS02.SYS
DEVICE=C:\PCMCIA\IBMDOSCS.SYS
DEVICE=C:\PCMCIA\DICRMU02.SYS
DEVICEHIGH=C:\ENB5250\CSDD5250.SYS
```

Sample 3
System:
IBM ThinkPad 720

Card and Socket Services Files:
PCMSS.EXE, PCMCS.EXE

Card and Socket Services Source:
DOS 6.1

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=C000-CFFF
DOS=HIGH,UMB
SHELL=C:\DOS\COMMAND.COM  /P /E:512
DEVICEHIGH=C:\DOS\PCMSS.EXE /APOFF
DEVICEHIGH=C:\DOS\PCMCS.EXE /WAIT=12 /ADDR=C0 /IRQ=10 /NOPM
DEVICEHIGH=C:\ENB5250\CSDD5250.SYS
```

Sample 4
System:
IBM ThinkPad 720

Card and Socket Services Files:
PCMSS.EXE, PCMCS.EXE

Card and Socket Services Source:
DOS 6.1

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=D800-DFFF
DOS=HIGH,UMB
SHELL=C:\DOS\COMMAND.COM  /P /E:512
DEVICEHIGH=C:\DOS\PCMSS.EXE /APOFF
DEVICEHIGH=C:\DOS\PCMCS.EXE /WAIT=12 /ADDR=D8 /IRQ=10 /NOPM
DEVICEHIGH=C:\ENB5250\CSDD5250.SYS
```

Sample 5

System:

IBM PS/2 E

Card and Socket Services Files:

IBMDSS01.SYS, IBMDOSCS.SYS, DICRMU01.SYS

Card and Socket Services Source:

Either from the PCMCIA directory on the Enabler/Diagnostic Diskette
or provided with your personal computer

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=C000-CFFF
DOS=HIGH,UMB
SHELL=C:\DOS\COMMAND.COM  /P /E:512
DEVICE=C:\PCMCIA\IBMDSS01.SYS /H
DEVICE=C:\PCMCIA\IBMDOSCS.SYS
DEVICE=C:\PCMCIA\DICRMU01.SYS
DEVICEHIGH=C:\ENB5250\CSDD5250.SYS
```

Appendix D. Files on the Program Diskette

The program diskettes include all the files necessary for configuring displays and printers. The files are listed below to help you understand the purpose of each file.

Note: To edit these files, you must use the configuration program. Do **not** use a DOS editor to edit the Emulation Program files.

Emulation Files

The following files are used for emulation:

File Name	Description
DP5250.COM	Emulation Program for either display or printer sessions
CONFIG.EXE	Display and printer session configuration program
HWCONFIG.EXE	Adapter configuration program
xxxxxxxP.PRO	Keyboard customization file for the Personal Computer, Personal Computer XT, Personal Computer XT 286, or Portable Personal Computer style keyboard, where xxxxxxx represents the keyboard for a specific country
xxxxxxxA.PRO	Keyboard customization file for the Personal Computer AT style keyboard, where xxxxxxx represents the keyboard for a specific country
xxxxxxxE.PRO	Keyboard customization file for the PS/2 Enhanced keyboard or the PS/2 Space Saving keyboard, where xxxxxxx represents the keyboard for a specific country
abc-xyz.TBL	Code page translation table, where abc represents the EBCDIC code page, and xyz represents the ASCII code page

Printer Function Table Files

The following files are used for printer function support:

File Name	Description
PFTSETUP.COM	A program to create and edit PFTs
PFTWS.PRN	A printer function table worksheet
DEFAULT.PFT	A sample printer function table for supporting other manufacturers' attached printers
HPLASER2.PFT	A printer function table for supporting HP LaserJet Printer Series II and III, and IBM 4019 and 4029 Laser Printers in PCL mode
IBM2390.PFT	A printer function table for supporting IBM Personal Printer Series (IBM 2380, 2380 Plus, 2381, 2381 Plus, 2390, 2390 Plus, 2391, and 2391 Plus printers)
IBM3812.PFT	A printer function table for supporting an IBM 3812 PagePrinter
IBM4019.PFT	A printer function table for supporting IBM 4019 and 4029 LaserPrinters in IBM PPDS mode
IBM4072.PFT	A printer function table for supporting an IBM 4072 ExecJet Printer
IBM4202.PFT	A printer function table for supporting an IBM 4202 Proprinter XL
IBM4208.PFT	A printer function table for supporting an IBM 4208 Proprinter XL 24
IBM4212.PFT	A printer function table for supporting an IBM 4212 Proprinter 24P
IBM4226.PFT	A printer function table for supporting an IBM 4226 Printer
IBM5202.PFT	A printer function table for supporting an IBM 5202 Quietwriter III
IBM5204.PFT	A printer function table for supporting an IBM 5204 Quickwriter

| PCL5.PFT | A printer function table for supporting IBM 4039 Laser Printers and HP LaserJet 4 Printers |

For more information about printer function tables, see Chapter 10, "Using the Printer Function Table Setup Program."

Example Emulation Program Utilities

These example utilities are to help you automatically start the host sessions and to help you use the Application Program Interface (API).

File Name	Description
EMDP.BAT	An AUTOEXEC program that automatically loads emulation with display and printer support
EMPATCH.COM	A patch program that allows updates to the Emulation Program
SS2.BAS	A program that copies the contents of the emulated display screen to a diskette file. (The screen is displayed as it is saved.)
SUBS.BAS	A BASIC subroutine that checks whether the Emulation Program is loaded and initializes access pointers into the emulator data segment
UL.BAS	A program that transmits personal computer files to an attached host system
ASO.BAS	A program that allows you to sign on automatically to the host from a BASIC application program
SS.BAS	A program that copies the contents of the emulated display screen to a diskette file. (The screen is not displayed as it is saved.)
BASICA.COM	The BASIC interpreter program that executes the BASIC (.BAS) programs that are supplied with the Emulation Program.

Appendix E. Keyboards

This appendix provides reference information about keyboards, including:

- How major 5250 functions are mapped to the personal computer keyboards

- Which keyboard customization files are provided with the Emulation Program

- How the enhanced-style keyboard is layed out for each of the supported languages

Keys Used for 5250 Functions

Figure E-1 shows how the basic 5250 functions are mapped to the enhanced-style, PC/XT-style, and PC/AT-style personal computer keyboards.

Figure E-1 (Page 1 of 3). Keys Used for 5250 Functions			
5250 Function	**Enhanced Keyboard**	**PC/AT Keyboard**	**PC/XT Keyboard**
Attention	Esc	SysReq	Ctrl
Bold	Alt+B	Alt+B	Alt+B
Center	Alt+C	Alt+C	Alt+C
Clear	Pause	Shift+Scroll Lock	Shift+Scroll Lock
Toggle Cursor style	Alt+F9	Alt+F9	Alt+F9
Cursor fast left	Alt+Left arrow	Alt+Pad4	Alt+Pad4
Cursor fast right	Alt+Right arrow	Alt+Pad6	Alt+Pad6
Duplicate	Pad1	Pad1	Pad1
End Bold	Alt+J	Alt+J	Alt+J
Enter	Right Alt	Enter	Enter

E-1

Figure E-1 (Page 2 of 3). Keys Used for 5250 Functions			
5250 Function	Enhanced Keyboard	PC/AT Keyboard	PC/XT Keyboard
Erase input	Alt+End	Pad.	Pad.
Field exit	Enter	Alt+Enter	Alt+Enter
Field minus	Pad-	Pad-	Pad-
Field plus	Pad+	Pad+	Pad+
Half index up	Alt+Y	Alt+Y	Alt+Y
Half index down	Alt+H	Alt+H	Alt+H
Help	Scroll Lock	Esc	Esc
Home	Home	Pad7	Pad7
Hexadecimal mode	Alt+F7	Alt+F7	Alt+F7
Hot key sequence	Alt+Esc	Alt+Esc	Alt+Esc
Immediate reset	Alt+Scroll Lock	Alt+Scroll Lock	Alt+Scroll Lock
Insert symbol	Alt+A	Alt+A	Alt+A
Next stop code	Alt+N	Alt+N	Alt+N
Next text column	Alt+D	Alt+D	Alt+D
Page end	Alt+P	Alt+P	Alt+P
Print host side	Shift+Prtsc	Alt+Pad*	Alt+Pad*
Print PC side	Prtsc	Shift+Pad*	Shift+Pad*
Required page end	Alt+R	Alt+R	Alt+R
Reset	Left Ctrl	Alt	Alt
Roll Down	Page Up	Pad9	Pad9
Roll Up	Page Down	Pad3	Pad3
Stop code	Alt+S	Alt+S	Alt+S
System request	Alt+Prtsc	Alt+Sysreq	Shift+Ctrl
Test request	Alt+Pause	Scroll Lock	Scroll Lock
Underline	Alt+U	Alt+U	Alt+U

Figure E-1 (Page 3 of 3). Keys Used for 5250 Functions			
5250 Function	Enhanced Keyboard	PC/AT Keyboard	PC/XT Keyboard
Underline word	Alt+W	Alt+W	Alt+W
Command 1 – Command 10	F1 – F10	F1 – F10	F1 – F10
Command 11	F11	Shift+F1	Shift+F1
Command 12	F12	Shift+F2	Shift+F2
Command 13	Shift+F1	Shift+F3	Shift+F3
Command 14	Shift+F2	Shift+F4	Shift+F4
Command 15	Shift+F3	Shift+F5	Shift+F5
Command 16	Shift+F4	Shift+F6	Shift+F7
Command 17	Shift+F5	Shift+F7	Shift+F7
Command 18	Shift+F6	Shift+F8	Shift+F8
Command 19	Shift+F7	Shift+F9	Shift+F9
Command 20	Shift+F8	Shift+F10	Shift+F10
Command 21	Shift+F9	Alt+F1	Alt+F1
Command 22	Shift+F10	Alt+F2	Alt+F2
Command 23	Shift+F11	Alt+F3	Alt+F3
Command 24	Shift+F12	Alt+F4	Alt+F4
Workstation Address	Alt+Left Ctrl	Alt+Ctrl	Alt+Ctrl

Keyboard Customization Files

The following keyboard customization files are provided with the Emulation Program. You can use one of these keyboard definitions or customize your own.

If you are using a laptop computer, select a keyboard customization file for an enhanced-style keyboard.

For information about the provided keyboard definitions, see "Keys Used for 5250 Functions" on page E-1. For information about changing the keyboard customization file or about assigning your own character and function keys, see "Changing the Keyboard Customization File" on page 6-8. For more detailed information, see the *Technical Reference* manual.

The keyboard customization files listed in Figure E-2 are provided, where *x* represents the keyboard style:

E   Enhanced-style keyboards
A   PC/AT-style keyboards
P   PC/XT-style keyboards

Figure E-2 (Page 1 of 2). Keyboard Customization Files	
Keyboard	**Keyboard Customization File**
Austrian/German IBM Enhanced Keyboard	GERMAN-*x*.PRO
Belgian IBM Enhanced Keyboard	BELGIA-*x*.PRO
Brazilian IBM Enhanced Keyboard	BRAZIL-*x*.PRO
Canadian French IBM Enhanced Keyboard	CANFR--*x*.PRO
Danish IBM Enhanced Keyboard	DANISH-*x*.PRO
Dutch IBM Enhanced Keyboard	DUTCH--*x*.PRO
French (AZERTY) IBM Enhanced 120 Keyboard	FRENCH-*x*.PRO
Greek IBM Enhanced Keyboard	GREEK--*x*.PRO
Icelandic IBM Enhanced Keyboard	ICELAN-*x*.PRO
Italian IBM Enhanced 142 Keyboard	ITALY--*x*.PRO
Latin American/Spanish Speaking	LATIN--*x*.PRO
Norwegian IBM Enhanced Keyboard	NORWEG-*x*.PRO
Portuguese IBM Enhanced Keyboard	PORTUG-*x*.PRO
Spanish IBM Enhanced Keyboard	SPAIN--*x*.PRO
Swedish/Finnish IBM Enhanced Keyboard	SWEFIN-*x*.PRO

Figure E-2 (Page 2 of 2). Keyboard Customization Files	
Keyboard	**Keyboard Customization File**
Swiss-Bilingual-French IBM Enhanced Keyboard	SWFR---x.PRO
Swiss-Bilingual-German IBM Enhanced Keyboard	SWGER--x.PRO
Turkish IBM Enhanced 179 Keyboard	TURKEY-x.PRO
U.K. English IBM Enhanced 168 Keyboard	UK-----x.PRO
U.S. English IBM Enhanced Keyboard	US-----x.PRO

Keyboard Layouts

Figure E-3 lists the enhanced keyboard layouts that the Emulation Program uses and the page number to see for each layout.

Figure E-3 (Page 1 of 2). Supported Keyboard Layouts	
Layout	**Page**
Austrian/German IBM Enhanced Keyboard	E-7
Belgian IBM Enhanced Keyboard	E-8
Brazilian IBM Enhanced Keyboard	E-9
Canadian-French IBM Enhanced Keyboard	E-10
Danish IBM Enhanced Keyboard	E-11
Dutch IBM Enhanced Keyboard	E-12
French (AZERTY) IBM Enhanced 120 Keyboard	E-13
Greek IBM Enhanced Keyboard	E-14
Icelandic IBM Enhanced Keyboard	E-15
Italian IBM Enhanced 142 Keyboard	E-16
Latin American/Spanish Speaking IBM Enhanced Keyboard	E-17
Norwegian IBM Enhanced Keyboard	E-18

Figure E-3 (Page 2 of 2). Supported Keyboard Layouts	
Layout	**Page**
Portuguese IBM Enhanced Keyboard	E-19
Spanish IBM Enhanced Keyboard	E-20
Swedish/Finnish IBM Enhanced Keyboard	E-21
Swiss-Bilingual-French IBM Enhanced Keyboard	E-22
Swiss-Bilingual-German IBM Enhanced Keyboard	E-23
Turkish IBM Enhanced 179 Keyboard	E-24
U.K. English IBM Enhanced 168 Keyboard	E-25
U.S. English IBM Enhanced Keyboard	E-26

Figure   E-4. Austrian/German IBM Enhanced Keyboard

Figure   E-5. Belgian IBM Enhanced Keyboard
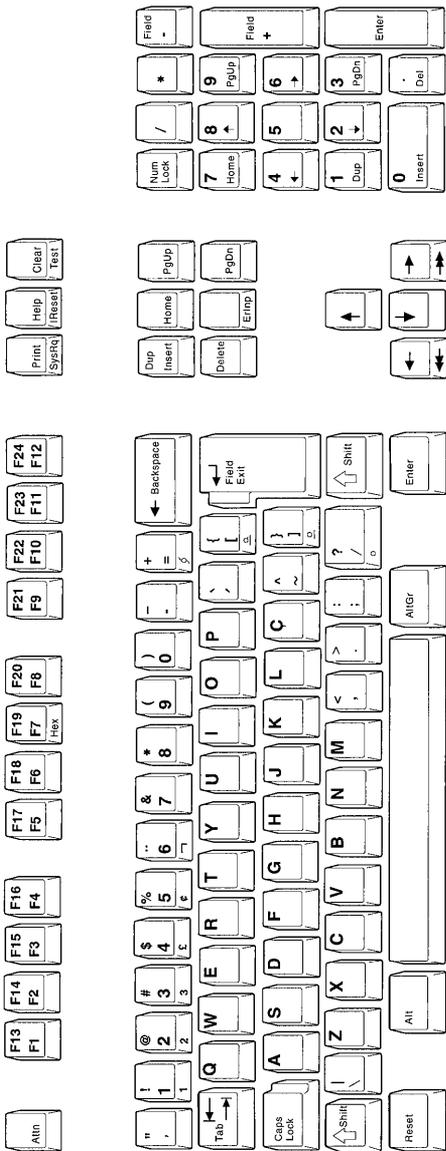
Figure E-6. Brazilian IBM Enhanced Keyboard

Figure   E-7. Canadian-French IBM Enhanced Keyboard
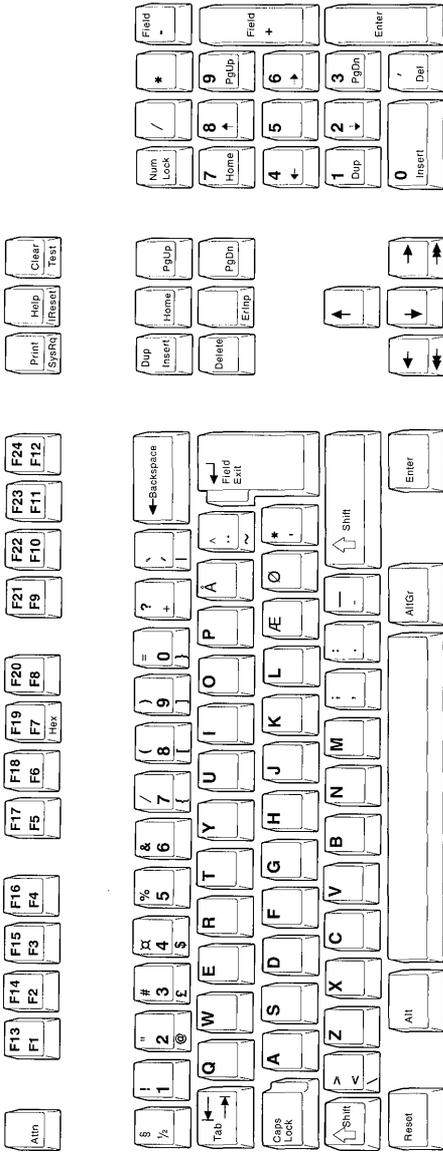
Figure   E-8. Danish IBM Enhanced Keyboard
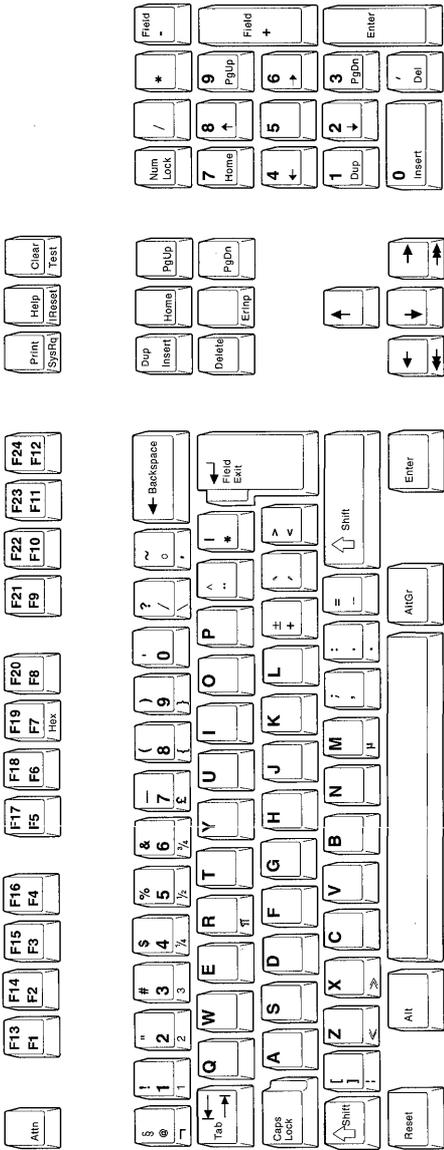
Figure E-9. Dutch IBM Enhanced Keyboard

Figure E-10. French (AZERTY) IBM Enhanced 120 Keyboard
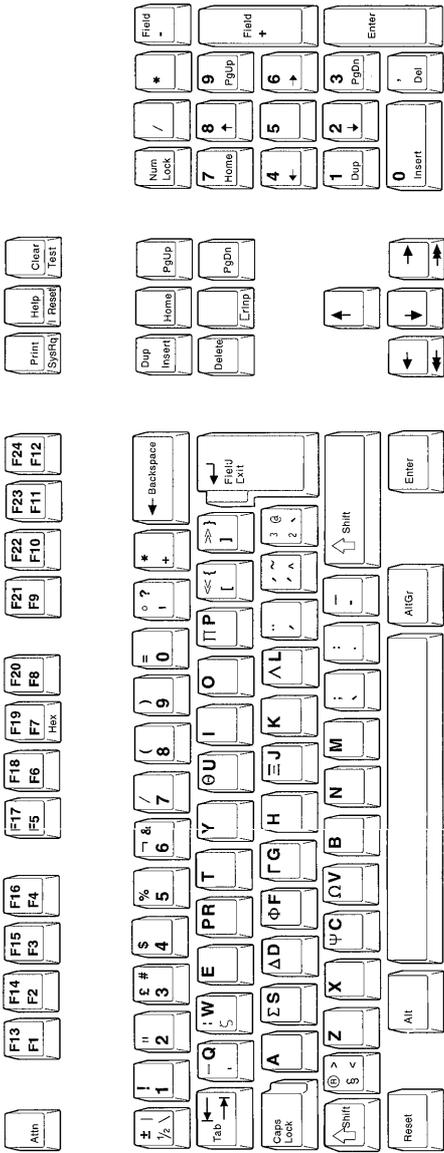
Figure E-11. Greek IBM Enhanced Keyboard
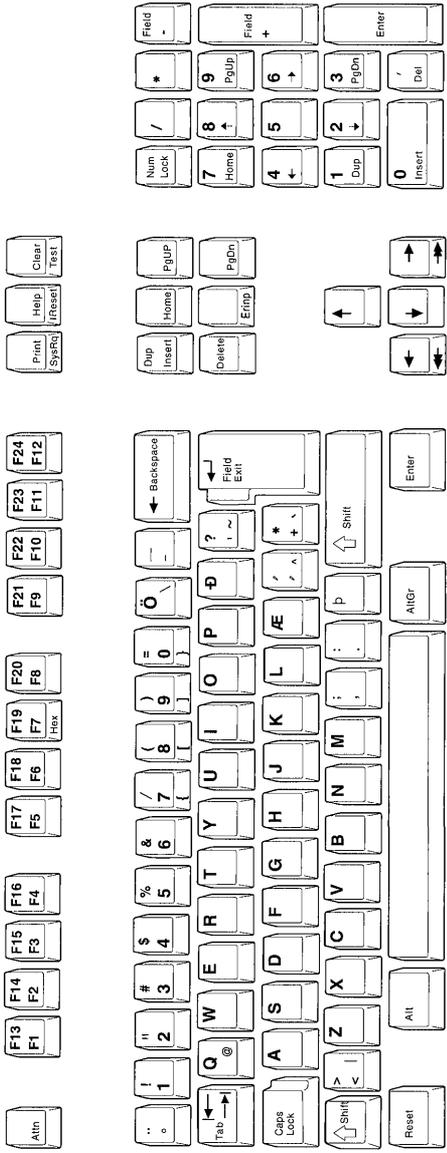
Figure E-12. Icelandic IBM Enhanced Keyboard
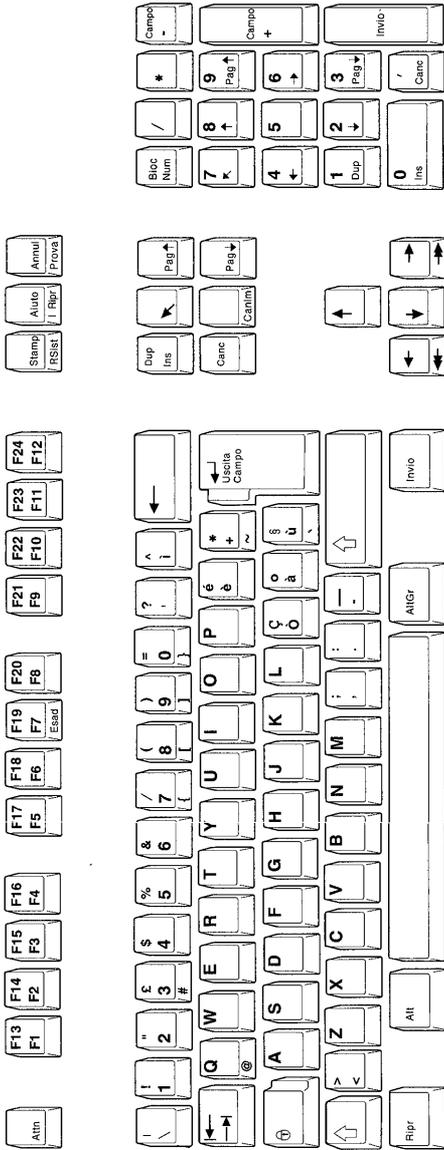
Figure   E-13. Italian IBM Enhanced 142 Keyboard

Figure E-14. Latin American/Spanish Speaking IBM Enhanced Keyboard

Figure   E-15. Norwegian IBM Enhanced Keyboard
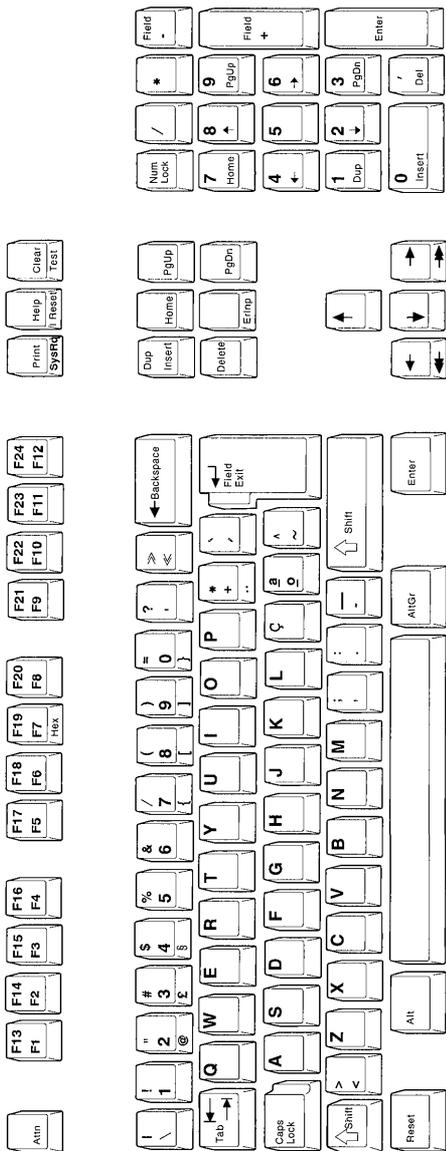
Figure E-16. Portuguese IBM Enhanced Keyboard

Figure E-17. Spanish IBM Enhanced Keyboard

Figure   E-18. Swedish/Finnish IBM Enhanced Keyboard

Figure E-19. Swiss-Bilingual-French IBM Enhanced Keyboard
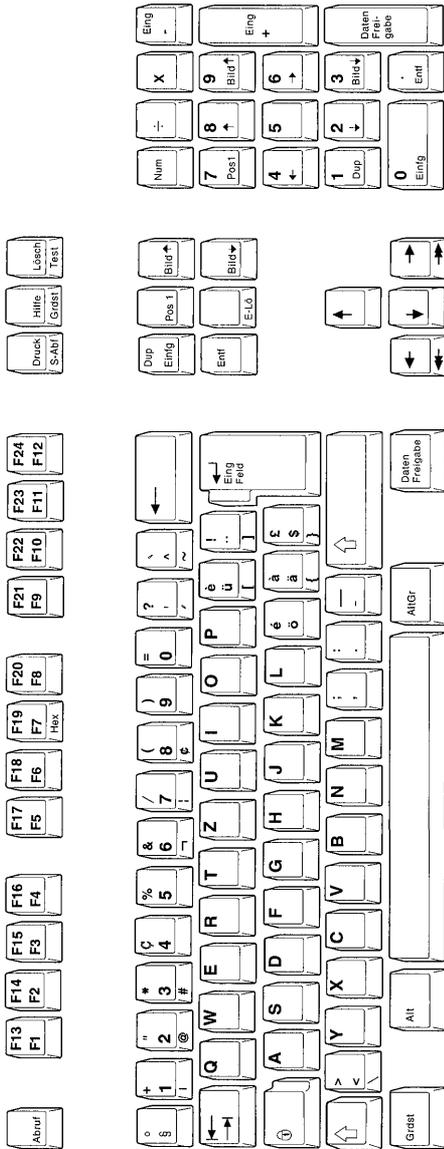
Figure E-20. Swiss-Bilingual-German IBM Enhanced Keyboard

Figure   E-21. Turkish IBM Enhanced 179 Keyboard
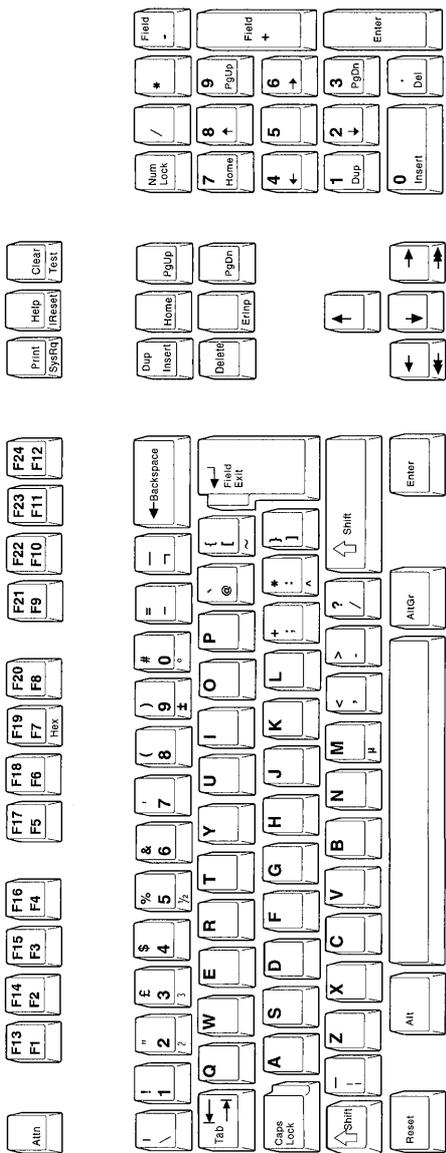
Figure E-22. U.K. English IBM Enhanced 168 Keyboard

Figure   E-23. U.S. English IBM Enhanced Keyboard

Glossary

A

adapter. The part of a device or feature required to attach it to a processing unit.

address. The number assigned to a device or to a location in memory.

align. To bring into or be in line with another or with others. For example, to line up the numbers on the decimal point.

allocate. To assign a resource, such as a disk or a diskette file, to perform a task. Contrast with *deallocate*.

alphabetic keys. The letter keys a through z, blank, comma, period, and hyphen.

alphanumeric. (1) Consisting of both letters and numbers and often other symbols (such as punctuation marks and mathematic symbols). (2) Capable of using alphanumeric characters.

alternate mode. A method of operation that causes keys to be entered as characters or functions (for example, the Backspace key is represented as the clear function when the Alt key is held down). See also *nonshifted mode* and *shifted mode*.

Alt state. The definition for the key when you press that key and an Alt key at the same time.

application program. A program used to perform a particular data processing task, such as payroll.

ASCII. American Standard Code for Information Interchange. The standard code using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information interchange among data processing systems, data communications systems, and associated equipment. The ASCII set consists of control characters and graphic characters.

async. See *asynchronous.*

asynchronous (async). Not happening, existing, or arising at precisely the same time.

attribute. The properties associated with the use of a device.

authorize. To allow a user to communicate with or make use of an object, resource, or function.

auto-configuration. The automatic arrangement of the parts of a computer.

AUTOEXEC.BAT file. A batch file that contains DOS commands or program names that are executed immediately after DOS is started.

B

back up. To copy information, usually onto a diskette, for safekeeping.

backspace. To move back a position along a row.

batch file. A file containing one or more commands that DOS executes one at a time. All batch files must have the extension of .BAT.

beep. An audible tone at a display or printer that is used to get the operator's attention.

binary. Pertaining to a numbering system with a base of 2. Valid digits are 0 (zero) and 1 (one).

bit. The basic unit of computer information, such as 0 or 1.

boot. Loading and executing the boot record. This is accomplished by pressing and holding the **Ctrl** and **Alt** keys and then pressing the **Del** key.

boot record. A record stored on track 0 and sector 0 of a disk(ette) that contains a program designed to load the Disk Operating System into memory and start its execution.

boundary. The division between each of 64KB blocks of physical storage addresses.

buffer. A temporary storage unit that accepts data at one rate and delivers it at another rate.

byte. The amount of storage required to represent one character; a byte is 8 bits.

C

cable splice. The physical connection between two pieces of twinaxial cable.

Cable Thru feature. A special feature that allows more than one display station (except the 5251 Model 2 or 12) and/or more than one printer to be attached to a single cable path.

card. An adapter card that is installed in the personal computer to enable it to be connected to another device or to increase the size of the computer's memory.

character codes. The ASCII or EBCDIC values assigned to the symbols or functions that are used by the personal computer or in the IBM 5250 Information Display System.

character set. A set or style of alphabetic, numeric, and special characters that can be displayed or printed by the personal computer or a device in the IBM 5250 Information Display System.

clicker. A mechanism that sounds when a key is pressed and accepted for processing.

close a file. To remove a file from the program in which it is executing. Contrast with *open a file*.

column. The character position within a print line or on a display. The positions are numbered from 1, by 1, starting at the leftmost character position and extending to the rightmost position.

column separator. The character symbol displayed at the beginning and end of each column in an input field.

command line. (1) A DOS command and any associated parameters, file names, and so on. (2) The line on the display screen following the DOS prompt where you type a DOS command.

compatible. The ability of one device to work with another without the need to change either device.

CONFIG.SYS. A personal computer file that contains the device driver assignments.

configuration. The group of machines, devices, and programs that make up a data processing system.

configure. To connect the devices, workstations, programming, and the host system to each other by using addresses.

contention. The contest of two or more rivals trying to reach the same goal at the same time.

control panel. A panel that contains lights (to observe the status) and switches (to operate) on a device or a system.

controller. A device used to coordinate and control the operation of one or more devices.

CPI. Characters per inch.

current directory. The root directory or the last directory indicated to DOS by a CHDIR (Change Directory) command.

current screen size. The number of rows and columns of data that are displayed on the screen.

cursor location. The location on the screen (row 1 through 24 and column 1 through 80) at which the cursor is located.

D

D-shell connector. A D-shaped connector, like the connector on the cable that connects the Integrated Cable Assembly to the personal computer.

data. All information entered into or used by the computer.

data stream. The sequence of characters being transmitted over a line.

deallocate. To free memory or disk(ette) space from use with a specific task. Contrast with *allocate*.

default value. A value stored in the system that is used when no other value is specified.

deflector. The person or object that changes the course of travel.

delete. To remove, for example, to erase a file.

device. The generic term for a piece of equipment or a mechanism; for example, the personal computer display or the personal computer attached printer.

device address. The unique number assigned to a device that enables it to communicate with other devices in a system.

device driver. A program used to control the operation of an output device.

device type. The number assigned to a unit or box in a system, such as 5150 (the IBM Personal Computer system).

diagnostic. Pertaining to the investigation of the cause of an error.

digit. Any of the numbers from 0 through 9.

directory. A list of files contained on a disk(ette).

disable. To prevent a unit of a data processing system from operating with the rest of the system.

disclosure. The act of exposing to view.

display station. (1) A device that includes a keyboard from which an operator can send information to the system and a display screen on which an operator can see the information sent to or the information received from the system. (2) See also *workstation*.

DOS session. The method of operation that allows the personal computer to perform independently of the host system when attached as an emulated workstation.

DP5250. The controlling program of the Enhanced 5250 Emulation Program. This program allows use of one or two display sessions or one display session and one printer session.

dual session. Ability of one personal computer to perform as two workstations without signing off one to use the other.

E

EBCDIC. (1) An acronym for the Extended Binary-Coded Decimal Interchange Code. A set of 256 eight-bit characters. (2) A set of standards for data transmission.

emulate. To imitate a device with a second device so that the host system accepts the same data and is able to get the same results with the data from either device.

emulated control panel. The screen used on the personal computer to imitate the control panel of the IBM 5256, 5219, or 5224 printer.

emulation. The use of a device or program that emulates another device or program.

emulation mode. The mode of operation in which the personal computer is operated like a workstation in an IBM 5250 Information Display System.

Emulation Program. A program that allows you to imitate an IBM 5250 workstation and uses the functions of a host system.

emulator. A program or device that performs the functions of another program or device.

escape sequence. A combination of keystrokes used to send commands to a printer.

execution. The process of carrying out the instructions of a computer program by a computer.

expansion unit. The box that provides space for additional options to be attached to the personal computer.

F

field. One or more characters of information (such as a name or an amount).

field exit. To move the cursor from a numeric field on the display screen.

field exit required. A rule that requires either a field exit key, a cursor movement key, or a nondata key be used to move the cursor from a numeric field.

file specification. Any DOS file name including the drive and path.

fixed address vector. A pointer in the 5250 Emulation Program that points from fixed addresses to internal addresses that can change.

format. (1) (noun) The specific arrangement of information. (2) (verb) To arrange information in a specific way.

formatted screen. A screen with fields established for specific information.

free key mode. An operating mode that allows the entering of data without control by a system program (unformatted).

function control keys. See *function keys*.

function keys. (1) Personal computer keys F1 through F10, whose functions are assigned by the operating system or application program. (2) A keyboard key that requests an action but does not display a character. The cursor movement keys are examples of function keys.

H

hex. See *hexadecimal.*

hexadecimal. A numbering system with a base of 16. Valid digits range from 0 (zero) through 9 (nine) and A (ten) through F (fifteen).

home position. (1) The first input position of the first input field on the screen of a display station. (2) The position (far left) to which the print head moves after the printer is turned on and after the Stop switch is pressed.

host system. (1) The System/36, System/38, or the AS/400. (2) The primary or controlling system in a data communications configuration.

hot key sequence. A keying sequence that allows you to change sessions.

I

IEEE. Institute of Electrical and Electronic Engineers

II. Input inhibited. The input inhibited indicator used in the Enhanced 5250 Emulation Program.

IM. See *insert mode.*

initialize. To prepare for use. For example, to format a diskette and to initialize registers, and/or program variables to the condition previously determined by a program.

input. Data to be processed.

input field. An area on the screen in which an operator enters data. Input fields are blank on the screen and can have a prompt before the input field.

insert mode. The mode of operation that allows characters to be placed between the characters already displayed on the screen when a character key is pressed. Characters are inserted at the location identified by the cursor.

Integrated Cable Assembly. A cable that connects the Enhanced Display Station Emulation Adapter to the workstation line. This cable automatically terminates the line when a second line is not connected.

interface. The machinery and programs that permit the exchange of information between computers or devices.

interrupt level. A path used to get the processing unit's immediate attention.

I/O. Input/output.

I/O address. See *device address.*

J

justify. To adjust text to be even with the left and right margins.

K

KB. Keystroke buffering. The display indicator used to show the operator when keystrokes are saved.

keyboard layout. The arrangement of the keys on the keyboard attached to a display station.

keystroke. The act of pressing a key on a keyboard.

keyword. A symbol that identifies a parameter.

kilobyte. 1024 bytes of information.

KS. Keyboard shift. The display indicator used to show the operator when the keyboard is in the shifted mode.

L

line. The cable from the host computer or controller to which one or more workstations are attached.

load. To move data or programs into memory.

local display station. See *local workstation*.

local workstation. A workstation that is attached directly to the host system with twinaxial cable.

lowercase mode. The keyboard is in lowercase mode when the Shift keys are not pressed and the shift lock and caps lock functions are unlocked.

LPI. Lines per inch.

M

megabyte. 1,048,576 bytes of information.

make/break key. A key that sends a scan code to the host system when it is pressed and again when it is released.

matrix. Characters arranged in rows and columns.

modem. A device that allows information to be exchanged between computers using telephone lines.

MW. Message waiting. The display indicator used to show the operator when a message received from the host is waiting to be displayed.

N

nonshifted mode. A method of operation that causes keys to be entered as characters or functions similar to when a typewriter's shift key is not held down (for example, the **a** is represented as **a**). See also *alternate mode* and *shifted mode*.

normal image. The display attribute that causes characters to be displayed as light characters on a dark background.

null character. A blank (no character) that is displayed as a

result of zeros occupying a character position in the buffer.

numeric. Refers to any of the numbers 0 through 9.

numeric keys. The characters 0 through 9, blank, comma, period, plus, and minus.

O

offline. The state of not being controlled by, or not directly communicating with, a host system. Contrast with *online*.

on-card memory. The memory contained on the Enhanced Display Station Emulation Adapter.

online. The state of being controlled by, or directly communicating with, a host system. Contrast with *offline*.

open a file. To associate a file with a program. Contrast with *close a file*.

operating system. A program that supervises the execution of user programs by the computer.

overlay. (1) To write over (and therefore destroy) an existing file. (2) A program segment that is loaded into storage and replaces all or part of a previously loaded program segment.

P

panel. A screen display listing options or requesting action.

parallel printer. A printer that uses the parallel printer interface feature.

parameter. A value supplied to a program that is used as input or controls the actions of the program.

path. The sequence of directories designated for DOS to search when looking for a program.

personal computer mode. The method of operation that allows the personal computer to perform independently of the host system when attached as an emulated 5250 workstation.

physical planning. The action taken to prepare a site for the installation of a computer or some related equipment.

playback sequence. A combination of characters and/or functions assigned to a key.

port. (1) The part of the system unit or controller to which cables for workstations are attached. (2) The part of the Integrated Cable Assembly to which the workstation line may be connected.

print buffer. A storage area within the printer where characters to be printed are temporarily stored.

print head. The part of the printer that strikes the ribbon to print characters on the paper forms.

printwheel. The element used to create the impressions printed by the IBM Wheelprinter (Model 5216).

profile. (1) Data file that describes the features of a user, program, or device. (2) A table of attributes containing session numbers, device types, keyboard selections, mode selection, I/O address assignments, on-card address assignments, and an interrupt level.

program diskette. A diskette that contains programs to be executed on the personal computer, for example, the Enhanced 5250 Emulation Program Licensed Program Diskette.

prompt. A displayed request for information or operator action.

protocol. A series of rules for transferring data.

R

recovery procedure. The action performed by the operator when an error message appears on the display screen.

remote display station. See *remote workstation*.

remote workstation. A workstation that is attached directly or indirectly to the host system via some communication channel.

reset. See *system reset*.

resolution. The visual quality of the display.

reverse video. A method of highlighting where the character color on the screen and the background color are swapped. For example, in place of green on black, the characters would appear as black on green. Synonymous with reverse image.

right adjust. To position a character to the rightmost position of the field.

root directory. The directory on a disk(ette) that contains the list of files stored on that disk(ette). If there is more than one directory on the disk(ette), the root directory can also contain the names of each of the other directories. This directory is established when the disk(ette) is formatted.

row. The horizontal arrangement of characters on a screen.

S

SA. System available. The system available indicator is used with the Enhanced 5250 Emulation Program.

scan code. A numeric representation of a key's location on a keyboard.

SCS. SNA (System Network Architecture) character string.

self-loading program. A program that does not use the Disk Operating System to move from a diskette to personal computer memory.

separator. See *column separator*.

serial printer. A printer that uses the serial printer interface feature.

session. (1) The period of time in which the host system and one of the devices are communicating. (2) The logical connection between the host system and a workstation. The session may be established for a display station or for a printer.

session profile. A table of attributes containing session numbers, device types, keyboard selection, mode selection, I/O address assignments, on-card address assignments, and an interrupt level.

shifted mode. A method of operation that causes keys to be entered as a character or function similar to when a typewriter's shift key is held down (for example, an **a** represented as **A**). See also *alternate mode* and *nonshifted mode*.

sign on (verb). To begin a session at a display station.

signed numeric. A format control used to specify that the units position of the field is reserved for the sign (usually, blank for positive and minus for negative).

signed numeric field. A numeric field that has a character in it to identify it as having either a positive or negative value.

signon (noun). The action an operator uses at a display station in order to begin working at the display station.

signon screen. The screen that prompts the user to enter the appropriate signon command.

software reset sequence. A keying sequence that allows you to leave 5250 emulation mode and take the emulated workstation offline.

splice. To join by weaving (as two ropes) or by connecting two objects.

spool. To place in a queue.

station address. See *workstation address*.

station address list. A list of workstation addresses that a session may use.

station protector. A device connected to the twinaxial cable to protect a workstation against lightning.

status line. The 25th (or bottom) row on the screen of the personal computer, which is used to display the condition of the session.

symbol keys. The keys on the keyboard that represent displayable

characters other than alphabetic and numeric characters.

synchronous. A type of data communications protocol that transmits data according to a precisely timed clock pulse.

syntax. The rules for the construction of a statement.

system operator. A person who uses a display station that is designated as the system device to activate certain system functions and control and monitor system operation.

system reset. The pressing and holding of the Alt and Ctrl keys, then the pressing of the Del key. This causes the boot record to be read into memory and given control.

system time. The time of day as recognized by a system.

system unit. The part of the personal computer that contains the central processing unit.

T

table. A list of data in which each item can be uniquely identified.

terminator switch. A switch used to terminate the line at the last workstation when the Cable Thru feature is used.

toggle. To operate a device (switch) that stays in the operated

position until operated a second time.

twinaxial cable. A cable made of two wires inside a shield.

U

uppercase mode. The method of operation that causes alphabetic characters to be displayed as capital letters and all other keys in the typewriter area, when pressed, to be displayed as the character shown on the upper portion of these keys.

utility. A program in general support of the processes of a computer; for example, a sort program.

V

VDI. Virtual device interface

W

working diskette. The program diskette, which contains all the programs necessary to perform one or more tasks and which is used routinely.

workstation. An input/output device consisting of a display station and/or printer that allows you to send and receive information from a host system.

workstation address. The address assigned to a workstation that enables the host system to communicate with it.

workstation line. The cable from a host computer or the chain of workstations to which a workstation is connected.

Numerics

4-digit. Consisting of four digits or numbers.

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Numerics

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P

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