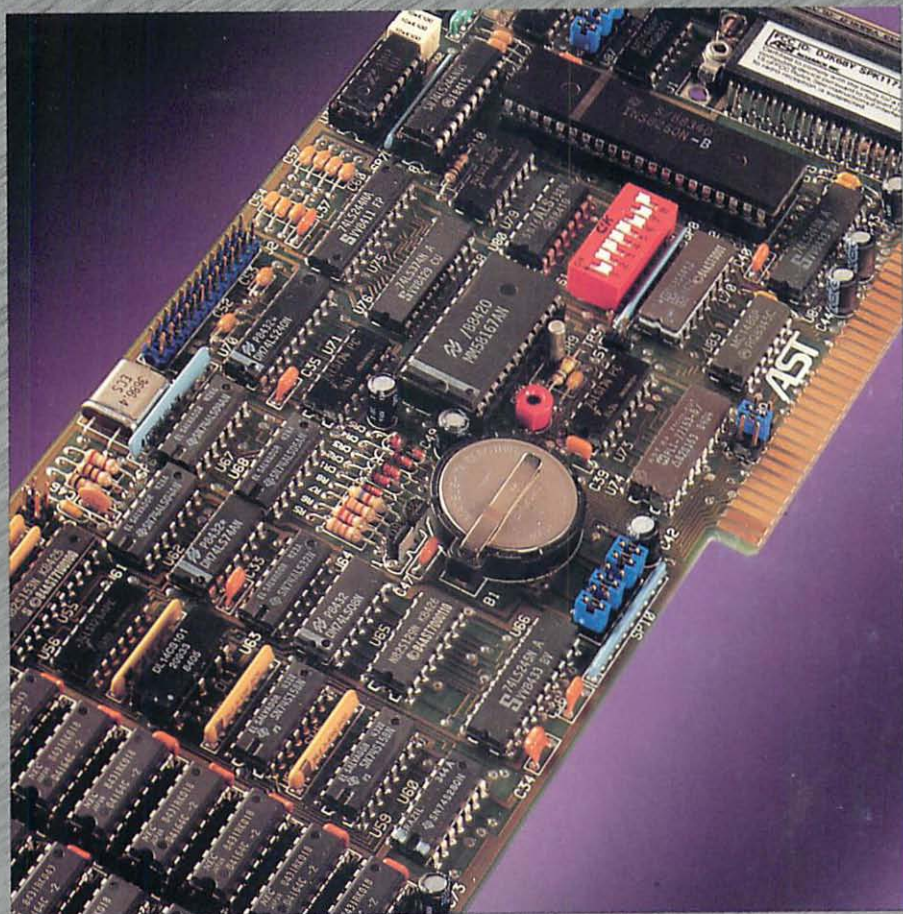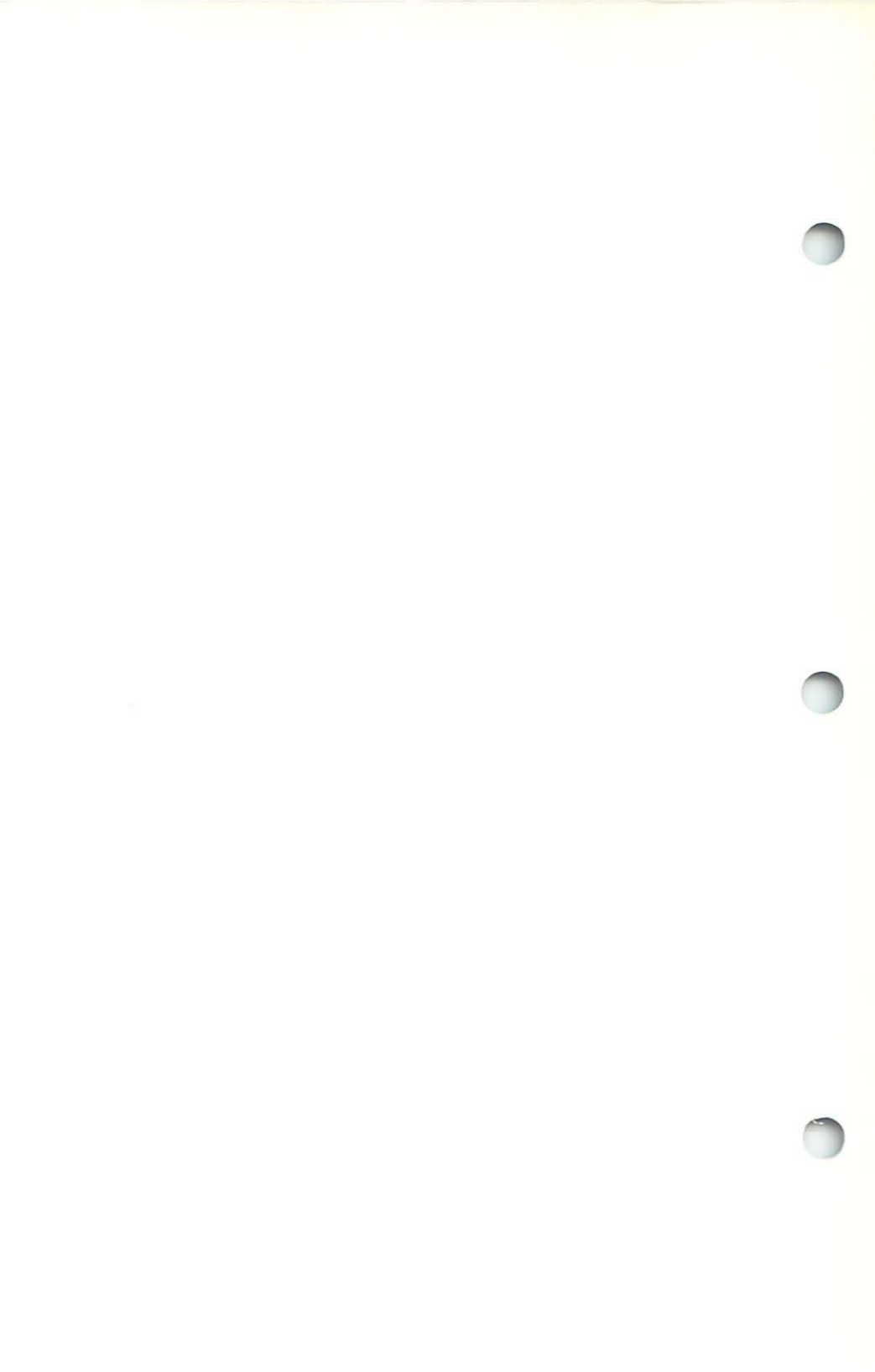# SIXPAKPLUS™

AST RESEARCH INC.

Multifunction Expansion Board for the IBM PC/XT Family Offering up to 384Kb of Memory and Popular I/O Capabilities

User's Manual

SixPakPlus
Memory Expansion and I/O Card
for the
IBM Personal Computer,
IBM PC-XT, IBM Portable PC, and
Other IBM-compatible Computers

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TABLES

SCHEMATICS

SECTION 1

INTRODUCING THE SIXPAKPLUS

The AST SixPakPlus™ is a flexible and powerful multifunction enhancement product for the IBM Personal Computer (PC) family. The SixPakPlus includes these features:

- Memory expansion upgradeable to the maximum addressable user memory in the IBM PC, PC-XT, Portable PC, and 3270 PC systems.

- Real-time Clock-Calendar with battery backup

- RS-232 asynchronous serial communications port

- Parallel printer port

- Optional game adapter port

Your SixPakPlus comes with these valuable utility programs:

- *SuperDrive™*, a disk emulation program that allows you to use part of your memory as a superfast "electronic diskdrive"

- *SuperSpool™*, an intelligent print spooler that allows you to output files to a printer while freeing your PC for other tasks.

- *RAMCLEAR*, a memory initialization program that clears your PC's RAM of any false parity errors.

- *ASTCLOCK*, the real-time clock-calendar program that frees you from having to reenter the time and date every time you turn on your PC.

1.1 Checklist

Before you get started, check that your SixPakPlus package
includes the following:

- SixPakPlus circuit board

- SixPakPlus parallel interface cable and bracket

- SuperPak diskette (version 4.1 or later)

- *SixPakPlus User's Manual*

- *SuperPak User's Manual*

- Plastic card guide

- Game adapter port ribbon cable and bracket (if the
  game port option is included on your SixPakPlus
  board)

NOTE

Be sure to fill out your warranty card and
mail it in.

1.2 Related Reading

Your SixPakPlus comes with a SuperPak diskette. You can
find detailed information on the SuperPak utilities in the
SuperPak User's Manual.

This manual assumes some familiarity with the PC-DOS
operating system (including versions 1.1, 2.0, and 2.1) and
the IBM PC, PC-XT, Portable PC, or 3270 PC hardware. You
can find this information in these manuals for your IBM PC:

Guide to Operations

Technical Reference

Disk Operating System

BASIC

1.3 What's In This Manual?

Section 2 of this manual gives an overview of the SixPakPlus

Section 3 of this manual tells you how to configure your SixPakPlus and install it into your PC

Section 4 tells you how to use the SixPakPlus clock-calendar

Section 5 describes SixPakPlus memory configuration in detail

Section 6 describes the SixPakPlus serial port in detail

Section 7 of this manual describes the SixPakPlus parallel printer port in detail

Section 8 provides information on the optional SixPakPlus game adapter port

Appendix A gives recommended wiring to interface specific serial devices to the SixPakPlus serial port

Appendix B gives general serial port wiring information

Appendix C provides a program that routes printer output from one parallel port to another

Appendix D tells you how to patch the DOS 1.1 versions of DISKCOPY and DISKCOMP

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This section provides the following information:

The factory configuration of your SixPakPlus board (see 2.1)

Standard SixPakPlus features (see 2.2)

Optional SixPakPlus features (see 2.3)

Compatibility and IBM PC model definitions (see 2.4)

Non-PC-DOS operation information (see 2.5)

2.1 Factory Configuration

The SixPakPlus is shipped from the factory in this configuration:

- Clock-calendar enabled

- Uses serial port COM1 (and interrupt line IRQ4)

- All serial port input lines driven by the connected device

- Parallel port configured as LPT1

- Game port enabled (if the optional game port ICs are installed)

To verify standard factory configuration, check that your SixPakPlus board is configured as shown in Figure 2-1.

DIP Switch S1

Configure for Starting
Address, Memory Size,
Parity

Factory
Configuration:
Serial Inputs
CTS, DSR, and
DCD Driven By
Connected
Device

Bracket

J4-Parallel Port
Connector

J3-Game
Port Connector

Bank 6   Bank 5   Bank 4   Bank 3   Bank 2   Bank 1
(384 K)   (320 K)   (256 K)   (192 K)   (128 K)   (64 K)

SixPakPlus

Clock-Calendar Battery

Edge Connector

J1-Serial Port
Connector

IRQ Jumper Block

Port Enable Jumper Block

3 4 7

Factory Configuration:
COM1 (IRQ4), LPT1,
Game Port,
Clock-Calendar
Enabled

Factory
Configuration:
IRQ4 (COM1)
and IRQ7 (Not
Used) Enabled

Figure 2-1. SixPakPlus Board Layout

2.2 Standard Features

These are the standard SixPakPlus features:

- 64 KB of Random Access Memory (RAM).

- An RS-232C serial port. You can use the serial port to interface to a modem, serial printer, remote display terminal, or other serial device. You can also use the serial port as an asynchronous communications port to another computer or peripheral operating under separate asynchronous communications software control. (Note: The SixPakPlus does not support a current loop teletype interface).

- A parallel printer port. You can use the parallel port to connect a parallel printer to the PC.

- A real-time clock-calendar with battery backup. Battery backup frees you from having to reenter the time and date every time you start your system. The battery power is only used when your system is turned off.

- The SuperPak™ utility diskette containing SuperDrive™, SuperSpool™, clock software, and the RAMCLEAR memory initialization utility program.

NOTE

You must use a version 4.1 (or later) SuperPak diskette with the SixPakPlus. For information on the SuperPak utilities, see your *SuperPak User's Manual*.

2.3 Available Options

These options are available for your SixPakPlus:

- Memory expansion is available in 64 KB increments up to 384 KB. The 384 KB on the SixPakPlus added to 256 KB on the PC system board provides 640 KB, the maximum addressable user memory for a PC. Each 64 KB upgrade consists of one Memory Upgrade kit (AST Model No. MP-0009).

- A game adapter port (AST Model No. SPK-000G) that can be used with an IBM-compatible joystick. Section 8 provides further game port adapter information.

You can purchase these options onboard or install them at a later date. Upgrade kits are available from your dealer.

2.4 Compatibility & PC Model Definitions

The SixPakPlus is completely compatible with the IBM PC, PC-XT, Portable PC, and the IBM 3270 PC (*not* the PCjr). It is also compatible with the Compaq and other IBM look-alikes. The compatible IBM PC models are defined as follows:

1. The **PC-1** is the original IBM Personal Computer. The system board contains 64 KB of memory. The system maximum memory capacity is 640 KB. System board switches, however, recognize a maximum of 544 KB.

2. The **PC-2** is the newer, updated version of the PC-1. The system board **must** be fully populated with 256 KB of memory before utilizing any expansion card memory. If your PC-2 is **not** fully populated, then the AST Memory Upgrade Kit can be used for this purpose. Switch settings are given in Section 3. The maximum memory capacity of this system is 640 KB.

3. The **PC-XT** comes standard with 256 KB of memory, the maximum system board capacity. However, the system board does NOT have to be fully populated before using expansion card memory; you may, however, use AST memory upgrade kits on your system board if desired. The XT computer automatically recognizes memory up to a maximum of 640 KB.

   The XT comes with a standard serial port configured as COM1. When the standard XT serial port is present, you should reconfigure the SixPakPlus serial as COM2 to avoid addressing conflicts with COM1. Section 5 of this manual tells you how to reconfigure the serial port.

4. The **Portable PC** comes standard with 256 KB of memory, the maximum system board capacity. However, the system board does NOT have to be fully populated before using expansion card memory; you may, however, use AST memory upgrade kits on your system board if desired. The Portable PC automatically recognizes memory up to a maximum of 640 KB.

5. The **3270 PC** combines the advantages of a PC (such as local storage and the ability to run PC software) with the ability to access a host mainframe's computational power and data base.

   The 3270 PC comes standard with 256 KB of memory. However, the system board does NOT have to be fully populated before using expansion card memory. The 3270 PC automatically recognizes memory up to a maximum of 640 KB.

2.5 System Requirements: Non-PC-DOS Operation

All references to operating system commands in this manual assume operation under PC-DOS (including versions 1.1, 2.0, and 2.1). The SixPakPlus hardware is completely IBM-compatible and will function properly under other IBM-approved operating system software. Of course, configuring the I/O ports under another operating system requires the use of commands specific to that operating system. See your operating system manual for the appropriate command syntax.

SECTION 3

CONFIGURATION & INSTALLATION

To use your SixPakPlus board you must:

1. Configure the SixPakPlus board for starting address, memory size, and parity checking enabled/disabled (subsection 3.1)

2. Get your IBM PC ready to install the SixPakPlus (subsection 3.2)

3. Install the SixPakPlus into your PC (subsection 3.3)

4. Test the new installation (subsection 3.4)

3.1 SixPakPlus Configuration

DIP switch S1, the memory configuration switch (refer to Figure 2-1) on the SixPakPlus controls three different memory functions:

1. The starting address of the SixPakPlus (see 3.1.1)

2. The amount of memory installed on the SixPakPlus (see 3.1.2)

3. Parity checking enabled or disabled (see 3.1.3).

Section 5 of this manual tells you how to configure your board if you are installing multiple memory expansion boards in your PC, how to install additional memory onto your SixPakPlus, and how to troubleshoot memory problems.

3.1.1 SixPakPlus Starting Memory Address

The SixPakPlus card must be configured to indicate how much memory is installed below it—that is, what its starting address should be. Positions 1 through 3 of S1 set the SixPakPlus starting address. Figure 3-1 shows the SixPakPlus starting address settings.

SixPakPlus Starting Memory Address

Starting Address	S1	S2	S3	Maximum RAM On SixPak
64K (:10000)	OFF	OFF	OFF	384K
128K (:20000)	OFF	OFF	ON	384K
192K (:30000)	OFF	ON	OFF	384K
256K (:40000)	OFF	ON	ON	384K
320K (:50000)	ON	OFF	OFF	320K
384K (:60000)	ON	OFF	ON	256K
448K (:70000)	ON	ON	OFF	192K
512K (:80000)	ON	ON	ON	128K

On S1 1 2 3 4 5 6 7 8 SixPak Switch 1

Figure 3-1. Starting Address Settings

The SixPakPlus starting address setting depends on what type of PC you have:

PC-1: Set the SixPakPlus starting address to 64 KB as shown in Figure 3-1.

PC-2, or other compatible system with a 256 KB system board: Set the SixPakPlus starting address to 256 KB, as shown in Figure 3-1.

PC-XT, Portable PC, and 3270 PC: Set the SixPakPlus starting address to the setting in Figure 3-1 that corresponds to the amount of memory installed on the system board.

3.1.2 Amount of Memory Installed on the SixPakPlus

You must set S1 positions 4 through 6 to tell the SixPakPlus how much memory is installed on it (see Figure 3-2).

Number of Banks Installed on the SixPakPlus

Banks Installed	S4	S5	S6	Total SixPak RAM
NONE	OFF	OFF	OFF	0K
1	OFF	OFF	ON	64K
2 (1-2)	OFF	ON	OFF	128K
3 (1-3)	OFF	ON	ON	192K
4 (1-4)	ON	OFF	OFF	256K
5 (1-5)	ON	OFF	ON	320K
6 (1-6)	ON	ON	OFF	384K

On ◄ S1 | 1 2 3 4 5 6 7 8 | SixPak Switch 1
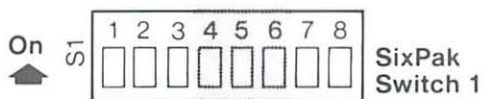
Figure 3-2. SixPakPlus Memory Size Settings

Note that when the starting address (see Topic 3.1.1) is 320 KB or higher, the SixPakPlus automatically limits the amount of usable memory on the card. This prevents conflicts with areas of memory reserved for the monochrome or color display cards. This occurs even if S1 positions 4 through 6 are configured for more memory than the maximum indicated in Figure 3-1.

NOTE

Position 7 on SixPakPlus switch S1 is not used, and it can be ON or OFF.

3.1.3 Parity Check Enable

S1 position 8 on your SixPakPlus (see Figure 3-3) sets full parity error checking enabled or disabled. To ensure the highest possible data integrity, AST Research recommends that you always enable the parity check function by leaving S1-8 ON. However, if you want to disable parity checking, set position 8 OFF.

Parity Check Enable

On S1 | 1 2 3 4 5 6 7 8 | SixPak Switch 1

S-8 ON = Parity Enabled
S-8 OFF = Parity Disabled
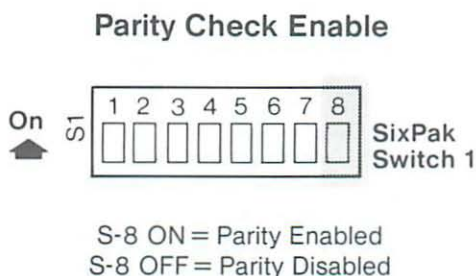
Figure 3-3. Parity Check Enable Setting

3.2 Getting Your PC Ready

Before you can install the SixPakPlus, you must turn off your PC, remove its cover, and set the proper DIP switch on your IBM PC, PC-XT, Portable PC, or 3270 PC system board.

CAUTION

Be sure that the power switch is off and the AC cord is removed from the system unit. Turn off any other equipment connected to the computer. Installing any component while the power is on can permanently damage your computer and its components.

STEP 1

Remove cover (IBM PC, PC-XT, and 3270 PC only; see STEP 2 if you have a Portable PC): Remove the cover retaining screws on the rear panel of the PC and pull the PC cover off (see Figure 3-4). GO TO STEP 3.
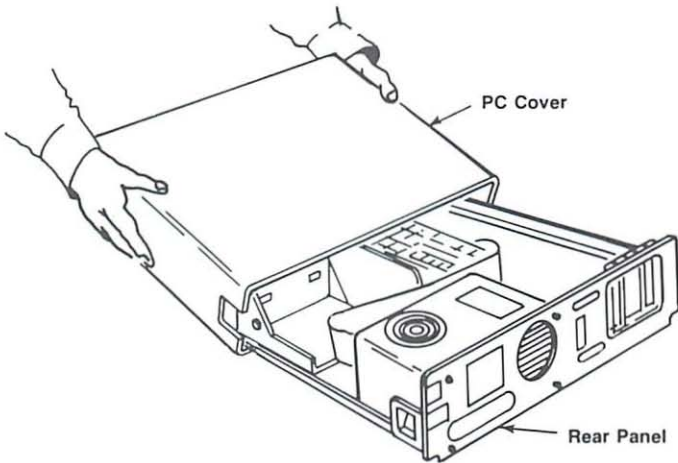
Figure 3-4. Remove PC Cover

STEP 2

Remove cover and metal shield (Portable PC only): Remove the keyboard and unplug the keyboard cable from the Portable PC. Use a flathead screwdriver or a hex wrench to remove the six mounting screws from the front of the Portable PC (one in each corner, one in the top center and one in the bottom center). Slide the system unit cover towards the rear until it comes off, shown in Figure 3-5.
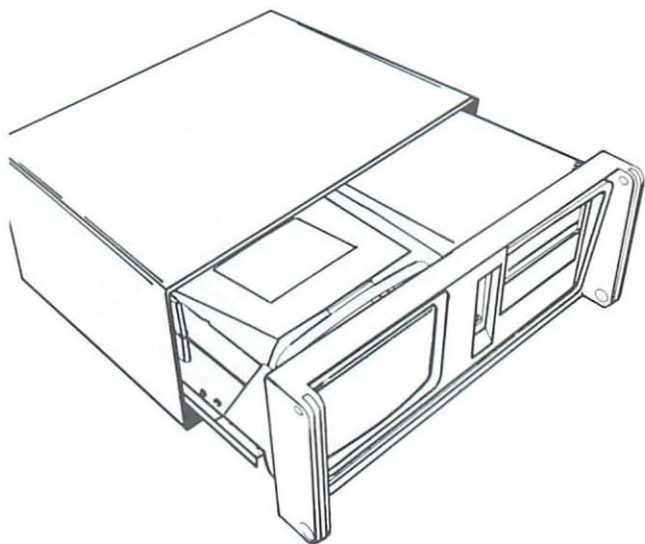
Figure 3-5. Remove System Unit Cover from Portable PC

Disconnect the internal keyboard-cable connector as shown in Figure 3-6.

Remove metal shield screws: Locate the metal shield on the right hand half of the unit as shown in Figure 3-6. Use a flathead screwdriver or a hex wrench to remove the three screws (one at the middle on top, one on the side at the bottom in front, and one on the side in the rear).
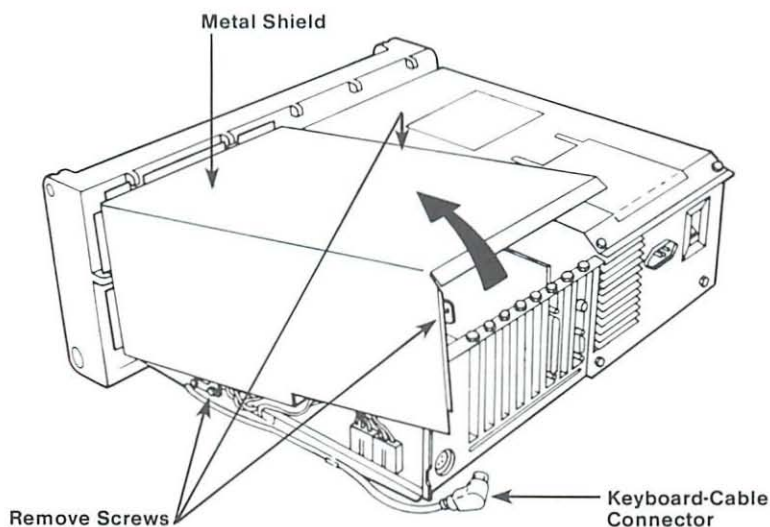
Figure 3-6. Remove Keyboard Cable & Metal Shield from Portable PC

STEP 3
Set PC DIP switch:

    PC-1: See topic 3.2.1
    PC-2: See topic 3.2.2
    PC-XT, Portable PC, and 3270 PC: See topic 3.2.3

You can also refer to the IBM *Guide to Operations* manual for your PC model.

NOTE

If you have an IBM Expansion Unit, you
must set the Extender Card DIP switch to
reflect the total amount of memory installed
in your system.

3.2.1 PC-1 System Board Switch Settings

You must tell the PC-1 how much total memory (including any
expansion memory, such as the SixPakPlus) is installed in the
computer.

Add together the amount of memory on the system board (64
KB) and the amount of memory on the SixPakPlus. Set the
PC-1 system board DIP switch SW2 to the corresponding total
as shown in Figure 3-7.

Total Memory Installed in PC-1

Total Memory	S1	S2	S3	S4
64K	ON	ON	ON	ON
128K	ON	OFF	ON	ON
192K	ON	ON	OFF	ON
256K	ON	OFF	OFF	ON
320K	ON	ON	ON	OFF
384K	ON	OFF	ON	OFF
448K	ON	ON	OFF	OFF
512K	ON	OFF	OFF	OFF
544K	OFF	OFF	OFF	OFF

On ⬆

1 2 3 4 5 6 7 8

**PC-1 System Board
Switch 2**
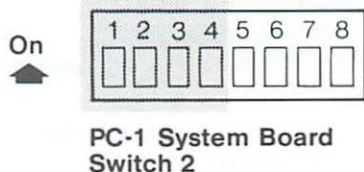
Figure 3-7. PC-1 System Board Switch Settings

Notice that the system board switches for the PC-1 have a maximum setting of 544 KB, even though you can install up to 640 KB in the computer.

Some application programs available for the PC do not work correctly when the switches are set for 544 KB. We therefore recommend that you use the 512 KB setting even if you have more than 512 KB installed in your PC-1. The excess beyond that setting is still usable by SuperDrive and SuperSpool, as well as certain other programs. If your PC-1 is equipped with the IBM Expansion Unit and has the new ROM BIOS installed, then you can address a full 640 KB, and you should use the switch settings for the PC-2 (see Figure 3-8).

3.2.2 PC-2 System Board Switch Settings

You must tell the PC-2 how much total memory (including any expansion memory, such as the SixPakPlus) is installed in the computer.

Add the amount of memory on the system board (256 KB) and the amount of memory on the SixPakPlus. Set PC-2 system board DIP switch SW2 to the total as shown in Figure 3-8. Remember that your system board must be fully populated with 256 KB before you can include SixPakPlus memory in this total. If your PC-2 system board does not contain 256 KB, you can use an AST Research Memory Upgrade Kit to fully populate your PC-2 system board.

Total Memory Installed in PC-2

Total Memory	S1	S2	S3	S4	S5
64K	ON	ON	ON	ON	ON
128K	ON	OFF	ON	ON	ON
192K	ON	ON	OFF	ON	ON
256K	ON	OFF	OFF	ON	ON
320K	ON	ON	ON	OFF	ON
384K	ON	OFF	ON	OFF	ON
448K	ON	ON	OFF	OFF	ON
512K	ON	OFF	OFF	OFF	ON
576K	ON	ON	ON	ON	OFF
640K	ON	OFF	ON	ON	OFF

On
↑

```
 1 2 3 4 5 6 7 8
[□□□□□□□□]
```
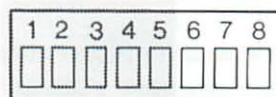
PC-2 System Board
Switch 2

Figure 3-8. PC-2 System Board Switch Settings

3.2.3 PC-XT, Portable PC, and 3270 PC System Board Switch Settings

You must tell the PC-XT, Portable PC, or 3270 PC how much memory is installed on the system board (this does *not* include expansion memory).

You must set system board DIP switch for the amount of memory installed on your PC's system board (the DIP switch is already properly set unless you have installed additional memory on the system board):

Set DIP switch SW2 on the PC-1 and PC-2

Set DIP switch SW1 (the only one) on the 3270 PC and Portable PC

Set the switch as shown in Figure 3-9 (do not include any
memory installed on an expansion board such as the
SixPakPlus). The PC-XT, Portable PC, and 3270 PC
automatically recognize the expansion board memory, and
include this memory in the total system memory up to a
maximum of 640 KB. You do not need to fully populate the
PC-XT, Portable PC, or 3270 PC system board before you
can use the memory on an expansion board.

Memory On PC-XT, Portable PC, or 3270 PC System Board

System Board Memory	S3	S4
128K	OFF	ON
192K	ON	OFF
256K	OFF	OFF

On ▲

1 2 3 4 5 6 7 8

PC-XT, Portable PC,
or 3270 PC System Board Switch

**Figure 3-9. PC-XT, Portable PC, or 3270 PC System Board
Switch Settings**

3.3 Installing the SixPakPlus into Your PC

You can install the SixPakPlus card in any of the unused full-
length expansion slot receptacles on the PC, PC-XT, Portable
PC, or 3270 PC system board, or the longest expansion slot
receptacle in the Portable PC.

CAUTION

Be sure that the power is off and that the
power cord is removed from the PC before
installing or removing any equipment.

STEP 1

This step is required only if you plan to use the game adapter or the parallel printer ports mounted on the supplied brackets. If not, go directly to STEP 2.

Install the ribbon cable(s): Find the ribbon cable(s) for the parallel port and/or the game adapter port. The parallel port ribbon cable is about 1¼ inches wide, with a rectangular connector at one end and a DB25 connector at the other end. The game adapter port ribbon cable is about ¾ inches wide, with a rectangular connector at one end and a DB15 connector at the other end.

Each ribbon cable comes with a bracket. Mount the D connector(s) on the bracket(s). *Parallel port:* Plug the rectangular connector onto connector J3. *Game port:* Plug the rectangular connector onto connector J4.

Plug the connector onto the board so that pin 1 on the rectangular connector (indicated by a triangle and the red stripe on the ribbon cable) is closest to pin 1 on the J3 or J4 connector (indicated by the "1" silkscreened in white on the board), as shown in Figure 3-10.
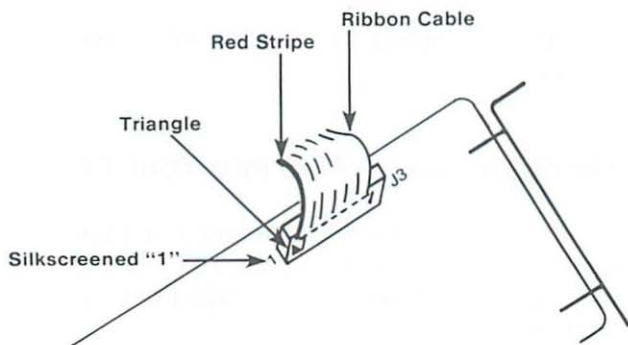
Figure 3-10. Install Ribbon Cable onto SixPakPlus

STEP 2

Select an open expansion slot: The SixPakPlus board requires one full-length slot. You will need an additional slot if you use the parallel port bracket or the game adapter port bracket.

STEP 3

Remove brackets: Locate the metal bracket that covers the cut-out in the back panel of the PC chassis for the slot that you have selected. Remove and save the bracket-retaining screw using a small flathead screwdriver. Remove the bracket.

STEP 4

Install the SixPakPlus board: The SixPakPlus comes with a plastic card guide. If you have a PC, PC-XT, or 3270 PC install the plastic card guide supplied with the SixPakPlus (if one is not already installed) on the inside of the front panel of the PC for the slot that will hold your SixPakPlus board (Figure 3-11). The Portable PC has a built-in card guide.

Front panel

Card guide

(Note that "fingers" point down)
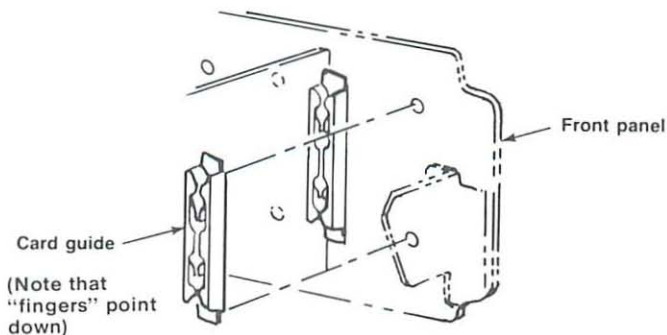
Figure 3-11. Install Plastic Card Guide (PC, PC-XT, or 3270 PC only)

Line up your SixPakPlus card and position its front bottom corner in the card guide channel. Keeping the top of the SixPakPlus card level, lower the card until its edge connector is resting on the expansion slot receptacle. Using an evenly distributed pressure, press the SixPakPlus straight down until it seats in the expansion slot (Figure 3-12).
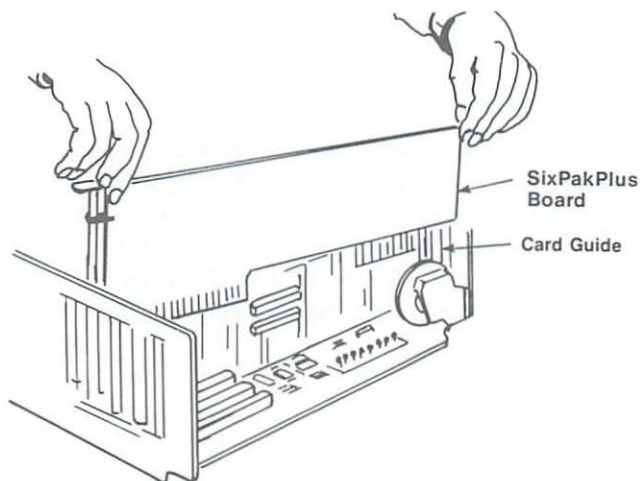
Figure 3-12. Install Your SixPakPlus Board

STEP 5
Install parallel port and/or game port: Install the bracket(s) with the D-shell connector(s) into the cutout(s) you have chosen. Figure 3-13 illustrates an example installation, including one ribbon cable.

<u>NOTE</u>

To avoid wear on the ribbon cable when you remove and replace the PC cover, do not route the parallel port or game port cable over any board in the PC.

Connector J4
On SixPakPlus
Board

Secure Brackets With Screws

Parallel Port Connector

1   2   3   4   5
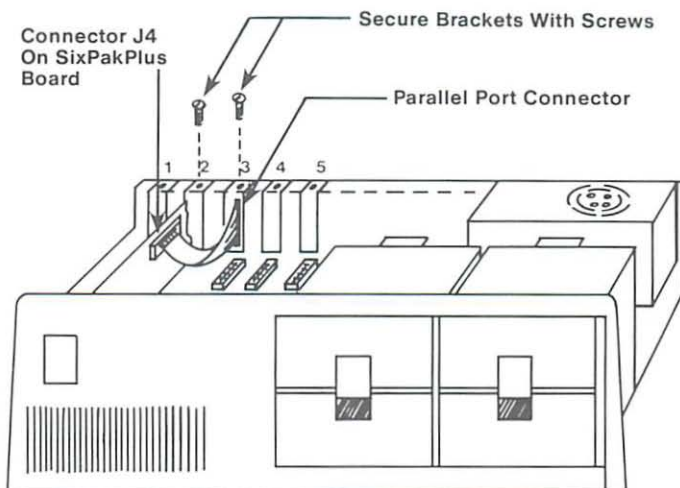
NOTE: This an example only: you can install the SixPakPlus
and its parallel port into any slots in the PC.

Figure 3-13. Example Installation (one ribbon cable)

STEP 6

Reinstall the bracket-retaining screw(s): Secure the bracket(s)
to the rear of the PC chassis.

STEP 7

Replace PC cover: You can replace the system unit's cover
prior to check out or you can wait until later.

PC, PC-XT, and 3270 PC: Carefully slide the cover from the
front until it stops securely against the rear panel. Reinstall
the cover retaining screws you removed earlier.

Portable PC: Replace the metal shield to its original position
over the right half of the chassis and reinstall the shield
screws. Carefully slide the cover from the rear until it stops
securely against the front panel. Replace the cover mounting
screws.

STEP 8

Install cables: Replace the power cord to the system unit and be sure that the keyboard and the monitor connectors are plugged in (Figure 3-14).
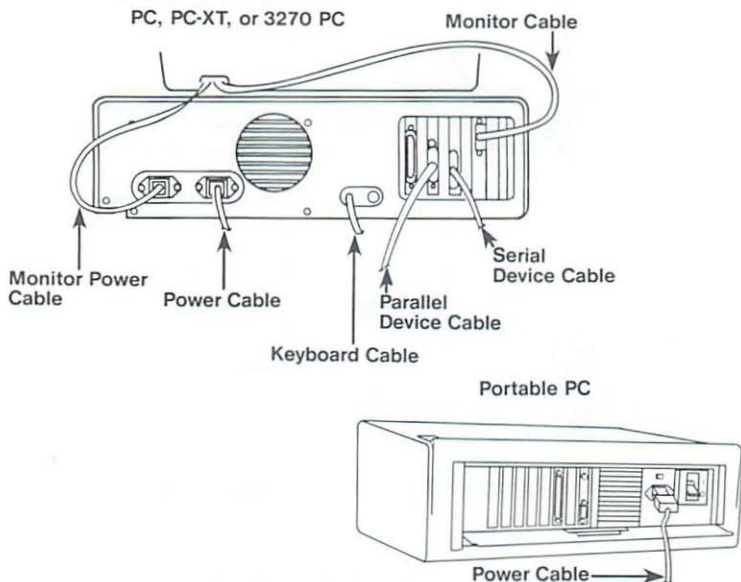
Figure 3-14. Install Cables

3.4 Testing the New Installation

This procedure tests your new installation:

STEP 1

With the power off, insert a DOS diskette in drive A, and turn on the power. If the installation was done correctly, the system will boot normally. Because there is now more memory installed in your PC, the PC will take longer to boot up than before.

STEP 2
Run the IBM diagnostic routines to check out the features you
have just installed (if you have an AST Research MonoGraphPlus,
be sure to modify the IBM diagnostics as described in the
MonoGraphPlus documentation). See your IBM *Guide to
Operations* manual for instructions. The diagnostic routines do
not test the Clock-Calendar feature.

STEP 3
Use the clock-calendar software (included on your SuperPak
diskette) to set the correct time and date on your SixPakPlus.
Section 4 tells you how to set your SixPakPlus clock-calendar.

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THE CLOCK-CALENDAR

The AST Research clock-calendar can answer the TIME and
DATE prompts that the DOS operating system issues each
time you boot the system. The PC is not aware of the
existence of any expansion card clock unless you use the
clock software supplied on your SuperPak diskette.

NOTE

> You must use a version 4.1 (or later)
> SuperPak diskette with your SixPakPlus.

The standard SixPakPlus clock-calendar features:

1. 24-hour clock, maintained in an advanced
    microprocessor chip on the SixPakPlus board

2. Four-year calendar (no leap year)

3. Battery backup power supply (with a battery life of
    approximately one year)

4. Replaceable Lithium battery

5. Full PC-DOS compatibility.

Optional CP/M-86 and CCP/M-86 clock utility software is
available from your dealer.

4.1 Configuring the Clock-Calendar

The SixPakPlus is shipped from the factory with the Clock-Calendar enabled. To confirm the default configuration, check that a shorting plug is installed at position 6 of the Port Enable Jumper Block, as shown in Figure 4-1.

Port Enable Jumper Block

PIN 6-Clock Enable
(Install shorting plug to enable clock-calendar.
Remove shorting plug to disable clock-calendar.)
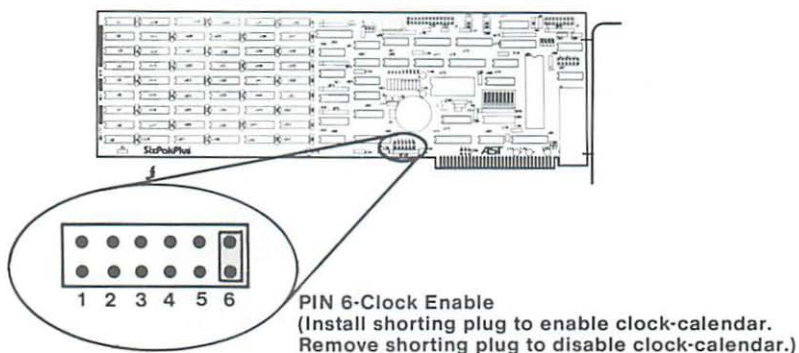
Figure 4-1. Clock-Calendar Factory Configuration

4.1.1 Disabling the Clock-Calendar

You can disable the clock-calendar by removing the shorting plug shown in Figure 4-1. You might want to disable the clock-calendar to avoid a conflict between the I/O addresses used by the SixPakPlus clock and other devices installed in your PC. The SixPakPlus clock-calendar uses these I/O addresses:

2C0 through 2C7 hex

Subsection 4.5 provides further technical information on the SixPakPlus clock-calendar.

4.2 Preparing Your Working DOS Diskettes

Once you've installed your SixPakPlus card, you can prepare your working DOS diskettes to automatically initialize the time and date each time that you boot the system. This subsection tells you how to prepare your DOS diskettes to automatically invoke the clock-calendar.

STEP 1
If you have not already done so, copy the clock software to your working DOS diskette. Copy the ASTCLOCK.COM program from a SuperPak diskette (version 4.1 or later).

If you are unsure how to COPY a file, consult your *DOS* manual.

STEP 2
If your working DOS diskette already has an AUTOEXEC.BAT file, you must alter that file to include the ASTCLOCK command. To see the current contents of your AUTOEXEC file, insert the working DOS diskette in drive A: and from the A> prompt, enter this command:

TYPE AUTOEXEC.BAT <Enter>

Your screen will the display the contents of your AUTOEXEC file. Now you must create a new AUTOEXEC file in which the command ASTCLOCK precedes these other command(s). Enter this command sequence:

COPY CON: AUTOEXEC.BAT <Enter>
ASTCLOCK <Enter>
.
.   (other commands)
.
<**Function key F6**> <Enter> or <**Ctrl-Z**> <Enter>

If your working DOS diskette has no AUTOEXEC file, use the sequence above to create one. The only command in the file will be ASTCLOCK.

STEP 3
Reboot your PC (press <**Ctrl-Alt-Del**>).

If necessary, use the ASTCLOCK /R utility to set the TIME and DATE on the SixPakPlus as detailed in subsection 4.3.

4.3 Setting the Clock-Calendar TIME & DATE

This subsection tells you how to set the time and date in the SixPakPlus clock chip. You must use a version 4.1 (or later) SuperPak diskette to set the SixPakPlus clock chip.

Once you have transferred the clock-calendar software to your working DOS diskette, you can use the ASTCLOCK program to update the clock-calendar on the SixPakPlus internal microprocessor chip. DOS TIME and DATE commands only update the system's time and date parameters in memory; they don't update the values stored in the SixPakPlus clock chip until you execute this procedure:

STEP 1
Boot the system with a diskette that puts the A> prompt on the screen.

NOTE

The ASTCLOCK.COM program must be on your DOS diskette. Subsection 4.2 tells you how to add this program to your DOS diskettes.

STEP 2
Enter this command:

A>**ASTCLOCK /R**<**Enter**>

Your screen will display the current date and time, and a message that indicates that resident date and time processors are loaded. "/R" selects the *resident* option which allows you

to update the date and time in both PC memory and the SixPakPlus clock chip (you cannot update the clock chip unless a certain portion of the ASTCLOCK.COM program is resident).

If you use the ASTCLOCK command without the /R parameter, it simply initializes the PC's date and time by reading that information from the SixPakPlus clock chip, and then "goes away"; no portion of ASTCLOCK remains resident, so you cannot update the date and time information in the clock chip.

STEP 3
Enter the DOS command DATE. The screen will display the current date, and you can enter a new date. Press <**Enter**> if no change is necessary. To change the date enter this command:

    mm/dd/yy<**Enter**> or **mm-dd-yy**<**Enter**>

DOS will figure out the day of the week from the information that you enter.

STEP 4
Enter the DOS command TIME. The screen will display the current time, and you can enter a new time. Press <**Enter**>if no change is necessary; to change the time, type in a new time in the form **hh:mm:ss** <**Enter**>. For maximum accuracy, type in a time that is 10 to 15 seconds ahead of the actual time, then observe a digital clock, and press <**Enter**> when the seconds reading on the clock catches up to the value that you typed in.

STEP 5
Reboot your computer by pressing <**Ctrl-Alt-Del**>.

4.4 The Clock-Calendar Battery

It is easy to replace the lithium clock-calendar battery; the battery should last for about a year. You can purchase replacement batteries from your dealer.

Since the battery is used only when your PC is not operating, the actual life of your battery will be determined by how much the PC is used. The more the PC is in use, the longer the battery will last. The clock chip on your SixPakPlus is powered by the PC system when your PC is on. The battery is used as backup power while your PC is off.

To replace the battery, slightly lift the retaining clip with your finger (or a small screwdriver) and use another small screwdriver to pry up the silver battery from its holder, then slide it out sideways. Do not remove the battery socket from the board.

Take care not to damage or bend the retaining clip by lifting it too far. The clip completes an electrical circuit and must make solid contact with the positive (+) side of the battery. Whenever the battery is removed, it is a good idea to check the clip in the bottom of the battery holder; be sure that it is sticking up high enough to make good contact with the bottom surface of the battery. When installing a new battery, make sure it is clean and dry.

NOTE

If you replace the battery, be sure to use the procedure described in Subsection 4.3 to restore the proper time and date.

4.5 Technical Information

This technical information is for reference only; you do not need to read this section to use the clock-calendar feature. The SixPakPlus clock-calendar uses the I/O locations 2C0 through 2C7 hex. Table 4-1 summarizes the clock-calendar I/O locations and functions. For further information on the clock-calendar, see the data sheet for the National Semiconductor MM58167A Real Time Clock.

To write to the Clock-Calendar, you first write the five-bit address of the counter, RAM, or register that you want to modify to I/O address 2C0. You then write the value of that parameter to I/O address 2C1.

Table 4-1. Clock-Calendar Chip I/O Addressing

I/O Address	Function
2C0 (or 2C2, 2C4, or 2C6)	Write only: Write the 5-bit address of the clock counter, RAM, or register.
2C1, (or 2C3, 2C5, or 2C7)	Read or write: the parameter value specified by the 5-bit address stored at I/O address 2C0 hex.

Value Written to 2C0	Clock Counter, RAM, or Register Specified
00	1/1000 second counter
01	1/100 and 1/10 second counter
02	Second counter
03	Minute counter
04	Hour counter
05	Day of the week counter
06	Day of the month counter
07	Month counter
08	RAM-upper nibble only
09	RAM-last month storage
0A	RAM-last year storage (-80)
0B	RAM-reserved
0C	RAM-not used
0D	RAM-not used
0E	RAM-not used
0F	RAM-not used
10	Interrupt status register
11	Interrupt control register
12	Counter reset*
13	RAM reset*
14	Status bit
15	GO command
16	Standby interrupt
17-1E	Unused
1F	Test mode

*Counter and RAM reset format

Data	Function
01	1/10,000 of seconds
02	1/100 and 1/10 of seconds
04	Seconds
08	Minutes
10	Hours
20	Days of the week
40	Days of the month
80	Months

SECTION 5

SIXPAKPLUS MEMORY CONFIGURATION

This section tells you how to:

1. Install other memory expansion boards in your PC along with the SixPakPlus (see 5.1)

2. Install additional memory on your SixPakPlus board (see 5.2)

3. Troubleshoot memory problems (see 5.3)

Section 3 of this manual tells you how to configure your SixPakPlus board (for starting address, memory size, and parity error checking enable/disable) before you install it into your PC.

5.1 Installing Multiple Memory Boards into Your PC

The advanced design of the AST Research SixPakPlus makes it compatible with most other expansion cards available for the IBM PC. However, when more than one memory expansion card is installed, you must configure the cards to prevent conflicts between them.

When you install multiple memory cards, you must first determine where each card is to reside in the PC's memory area. You can usually install your SixPakPlus either "above" or "below" the address space occupied by another card:

Topic 5.1.1 tells you how to install another memory board "below" the SixPakPlus.

Topic 5.1.2 tells you how to install another memory board "above" the SixPakPlus.

5.1.1 Installing a Card "Below" the SixPakPlus

To address another memory card "below" the SixPakPlus,
follow this procedure:

STEP 1
*Configure other card to reside immediately "above" the PC
system board memory:* Follow the configuration instructions
supplied with the other card.

STEP 2
Disable any unused memory sockets on the other card: If
there are any unused rows of memory sockets on the other
card, disable them so they won't conflict with the SixPakPlus.
Refer to the other card's manual for information on how to
disable unused sockets. If you cannot disable unused memory
sockets, you should address the other card "above" the
SixPakPlus (as described in the next topic, 5.1.2). If the other
card has switch settings for the amount of memory on it, then
it will probably automatically disable any unused memory
sockets.

STEP 3
Set the SixPakPlus starting address and memory size: Add the
amount of memory on the other card to the amount of memory
on the PC's system board, and set the SixPakPlus starting
address at this value as shown in Figure 3-1 (Section 3 of this
manual). Set the SixPakPlus memory size as shown in Figure 3-2.

STEP 4
PC-1 and PC-2: *Set the PC system board switches for the
total amount of memory in your PC:* The total amount of
memory includes the system board, the SixPakPlus, and the
other memory expansion card.

PC-XT, Portable, and 3270 PC: *Set the PC system board
switches for the memory installed on the system board* (do not
include the memory on the SixPakPlus or any other expansion
memory board).

NOTE

If you have an IBM Expansion Unit, you
must set the Extender Card DIP switch to
reflect the total amount of memory installed
in your system.

5.1.2 Installing a Card "Above" the SixPakPlus

To address another memory card "above" the SixPakPlus,
follow these steps:

STEP 1
Set the SixPakPlus starting address and memory size: The
SixPakPlus starting address corresponds to the amount of
memory on the PC system board. Set the memory size for
the amount of memory on the SixPakPlus itself (See Figures
3-1 and 3-2).

STEP 2
Set the other board's starting address and memory size: Add
the total memory installed on your PC system board to the
amount of SixPakPlus memory. Follow the instructions
supplied with the other memory board to set its starting
address for this total. If necessary, also configure the other
board for the amount of memory installed on it.

STEP 3
PC-1 and PC-2: *Set the PC system board switches for the
total amount of memory in your PC:* The total amount of
memory includes the system board, the SixPakPlus, and the
other memory expansion card.

PC-XT, Portable PC, and 3270 PC: *Set the PC system board
switches for the memory installed on the system board* (do not
include the memory on the SixPakPlus or any other
expansion memory board).

NOTE

If you have an IBM Expansion Unit, you
must set the Extender Card DIP switch to
reflect the total amount of memory installed
in your system.

5.2 Installing Additional Memory on the SixPakPlus

It is easy to add memory to your SixPakPlus any time; you
can upgrade the SixPakPlus to a maximum 384 KB of RAM.
To upgrade the SixPakPlus, install additional 64 KB RAM
sets, such as AST Memory Upgrade Kit (Model No. MP-009).

Specifications: If you want to upgrade the SixPakPlus
yourself, use 64 KB Dynamic Random Access Memory
(DRAM) with these characteristics:

    200 nanosecond (ns) access time
    Pin 1 not used
    +5 Volt only

Compatible memory chips: These memory chips are compatible
with the SixPakPlus and the PC or PC-XT system board:

    Fujitsu MB8264-20M
    Hitachi HM4864P-3
    Inmos IMS2600P-20
    Intel P2164A-20
    Micron Technology MT4264-3 or MT4264-20
    Mitsubishi M5K4164P-20
    Mostek MK4564N-20
    Motorola MCM6665AP20
    NEC UPD4164C-2
    OKI MSM3764-20RS
    Texas Instruments TMS4164-20NL
    Toshiba TMM4164P-4

Follow this procedure when you add memory to the SixPakPlus:

STEP 1
Shut off the power to the PC and remove the SixPakPlus
board from the PC.

STEP 2
Install each additional set of nine 64 KB memory chips in the
next consecutive empty bank on the card. For example (refer
to Figures 2-1 and 2-2), if your SixPakPlus has 64 KB on it
now, it has memory in Bank 1 only. If you add 128 KB to the
SixPakPlus, you will install two sets of 64 KB chips, one each
in Banks 2 and 3. Install the new chips carefully, and take
care not to bend the legs.

STEP 3
Set SixPakPlus DIP switch S1 for the new total amount of
memory on the card. Figure 3-2 shows you how to set S1 for
the SixPakPlus memory size.

STEP 4
PC-1 and PC-2 only: Set DIP switch SW2 on the PC system
board to the new total amount of memory installed in the PC.
Figure 3-7 shows you how to set SW2 for PC-1. Figure 3-8
shows you how to set SW2 for PC-2.

This step is unnecessary for the PC-XT, Portable PC, or 3270
PC.

STEP 5
Reinstall the SixPakPlus into the PC and power it up. Now
that there is more memory in the PC, the powerup diagnostics
will take longer to run. If all goes well, the system should
operate normally and show the correct new total amount of
memory when you enter the DOS **CHKDSK** command.

If you get an error, recheck the installation of the new chips
and the switch settings on both the system board and the
SixPakPlus. If everything appears to be correctly installed and
configured, and you still get an error, then proceed to
Subsection 5.3 for help in troubleshooting the problem.

5.3 Troubleshooting Memory Problems

The most common indication of a memory problem in the PC is a **PARITY CHECK 2** message on powerup. These examples illustrate the format of error messages you might see:

If you have a PC-1 or PC-2:
  4020 201

If you have a PC-XT, Portable PC, or 3270 PC:
  40000 20 201
or 40000 (S)
or 40000 (S) 201
or ????? (S) 201

Sometimes you can use the error code to isolate the problem to a specific memory chip. The **201** in the error message indicates that there is a problem in memory.

The first digit (**4**) of the error message tells us in which 64 KB bank the error is occurring. The message **4020** or **40000** tells us that the error is occurring in Bank 4 of the PC; since the computer numbers its memory banks beginning with Bank 0, Bank 4 is actually the fifth bank in the system. If you have a PC-1, this error code would be pointing to Bank 4 of the SixPakPlus; Bank 0 is on the system board, followed by Banks 1 thru 6 on the SixPakPlus.

If you have a PC-2, don't confuse the bank numbering scheme used in Figure 2-1 with the bank indicated by the PC's error code. In the PC-2, error codes falling on Banks 0 thru 3 are on the system board, followed by Banks 4 thru 9 on the SixPakPlus. Therefore, Bank 4 in a PC-2 would be Bank 1 on the SixPakPlus.

The **20** in the first two examples tell us which chip in the bank (that is, which bit in the 8-bit data byte) is failing. Look at Figure 2-1: the fourth chip from the top of each memory bank is numbered **20**.

An error code of **4020** or **40000   20** means that the fourth chip (the chip numbered "20" in Figure 2-1) from the top of the fourth memory bank in the PC is failing. If you have a PC with 256 KB (Banks 0 through 3) installed on its system board, Bank 4 would be the first bank on the SixPakPlus board.

Once you determine which chip you believe is causing the problem, replace it with a spare chip and see if the error is corrected (you can tell that the error is corrected when you reboot your PC and it does not display an error message). If no spare chip is available, try exchanging the suspect chip with another one in the same bank which is not failing. If the error then moves to the new socket, you definitely have a bad chip. If the error persists at the original socket, you may have a problem with the board; contact your dealer for assistance.

If you get an error message such as **40000   (S)   201**, it tells you that you have a memory problem in Bank 4 in your PC; the **(S)** simply means that the failing chip is somewhere in the system unit (that is, somewhere in your computer). The best way to isolate the problem chip is to swap each chip in the failing bank with a good chip and see if the error is corrected.

If you get a **?????   201** error message, it tells you only that you have a memory problem somewhere in your computer. You can try to isolate the problem bank by swapping each memory bank with good memory chips. Once you have determined which memory bank is failing, you can replace each of the original chips and rebooting your computer each time you replace a chip. An error message at boot-up then indicates a faulty chip.

If the bit number of the error code does not match any of the values shown in Figure 2-1, you might have more than one failing memory chip. This could be due to a malfunctioning board, incorrect switch settings, multiple bad memory chips, or even something as simple as a dirty gold edge connector.

If the failing bank number is higher than the amount of memory installed in the PC, recheck your system board switch settings.

If you cannot correct the problem, contact your dealer for assistance.

SECTION 6

SERIAL PORT

Your SixPakPlus comes standard with one serial port for asynchronous communications. You can use the serial port to connect your PC to a serial printer, modem, or other device which uses an RS-232C interface. The SixPakPlus interface is a DTE type (Data Terminal Equipment) with a male DB25 connector.

This section includes the following information:

1. Subsection 6.1 tells you how to reconfigure the serial port: changing COM1 to COM2, forcing RS-232C inputs true, disabling the SixPakPlus serial port.

2. Subsection 6.2 discusses serial port programming.

3. Subsection 6.3 gives SixPakPlus serial port I/O address assignments and pinouts.

4. Subsection 6.4 discusses SixPakPlus serial port diagnostic testing.

6.1 Configuring the SixPakPlus Serial Port

You can install up to two serial ports (called COM1 and COM2) into your IBM PC, PC-XT, Portable PC, or 3270 PC. The SixPakPlus serial port has been factory-configured to respond as COM1 (which uses IRQ4). You can confirm this by checking that shorting plugs are installed at these positions:

Position 1 on the Port Enable Jumper Block
Position 4 on the IRQ Enable Jumper Block

Figure 6-1 illustrates how to configure the SixPakPlus serial port as COM1 or COM2.

Configure Port Enable and IRQ Jumper Blocks:

IRQ Jumper Block

Port Enable Jumper Block

PIN2-COM2

PIN1-COM1
(Default Position)

IRQ3-COM2

IRQ4-COM1
(Default Position)
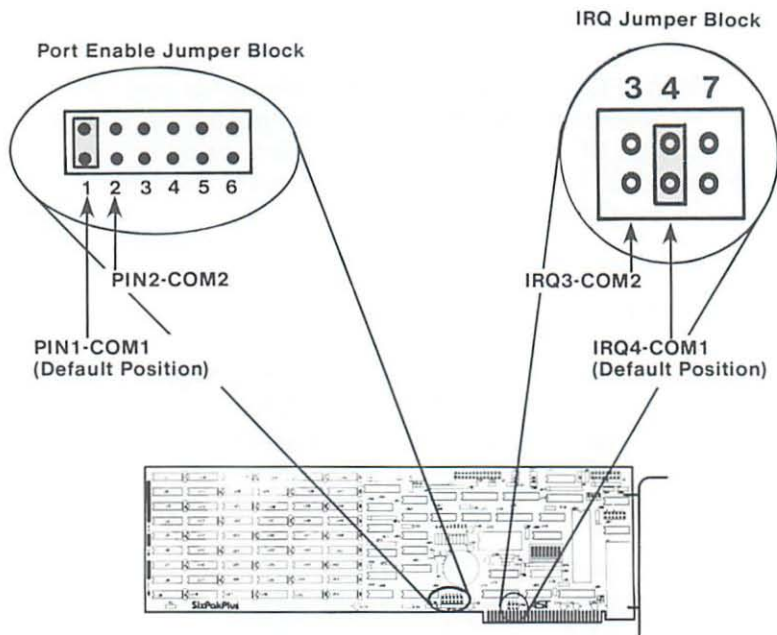
Figure 6-1. Serial Port Factory Configuration

6.1.1 Installing Multiple Serial Ports in a PC

If your PC already has another card with a serial port on it configured to respond as COM1 (such as the PC-XT with its standard serial board), you must change the port on the SixPakPlus to respond as COM2 as shown in Figure 6-1:

Move the Port Enable Jumper Block shorting plug from 1 to 2
Move the IRQ Enable Jumper Block shorting plug from 4 to 3

The SixPakPlus serial port will now respond as COM2.

6.1.2 Configuring the RS-232C Interface Lines

The AST Research SixPakPlus conforms to the Electronic Industries Association (EIA) RS-232C communication standard: The RS-232C standard describes the interface between Data Terminal Equipment (DTE) and Data Communication Equipment (DCE). That means that all inputs to an AST serial port (with the exception of Ring Indicator, pin 22) must be connected to a signal, even if the connected device does not use one or more of the interface lines at connector J1.

NOTE

The SixPakPlus does not support the current loop teletype interface.

SixPakPlus factory configuration: In its factory (default) configuration, the serial port on the SixPakPlus expects the connected device to drive all its inputs.

To force certain inputs true: If your serial device does not drive all of SixPakPlus serial port inputs, you can configure the SixPakPlus RS-232C jumper block to "force true" these three inputs to the serial port:

    BLOCK PIN 6: CTS input (J1 pin 5)
    BLOCK PIN 4: DSR input (J1 pin 6)
    BLOCK PIN 2: DCD input (J1 pin 8)

Figure 6-2 illustrates how to force one or more of the above signals to always be in the true state. Move the corresponding shorting plug on the RS-232C jumper block (the jumper block near the top of the SixPakPlus board) from the left pair of pins ("Normal") to the right pair of pins ("Forced True").

EXAMPLE: To force the DSR input true, move the shorting plug from position 4 to position 3.

When you force a signal true, its connection to connector J1
will not affect the function of the serial port.

**Normal (Default): All Inputs
Driven By Connected Device**

2-CTS Normal	1-CTS Forced True
4-DSR Normal	3-DSR Forced True
6-DCD Normal	5-DCD Forced True
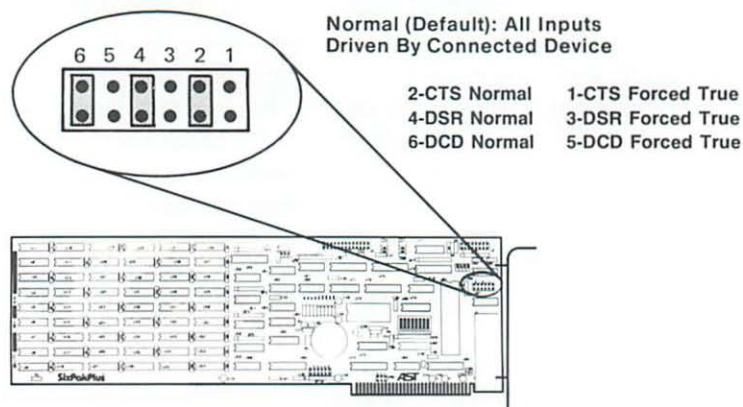
Figure 6-2. Creating a "Forced True" State

Whether you use the RS-232C jumper block to force certain
inputs true depends on what device you connect to the serial
port.

You might want to leave the shorting plugs in their "normal"
configuration and instead build a special cable for the serial
device. This would be especially convenient if you will be
using different serial devices on the port at different times.

Appendix A provides wiring diagrams for various printers.
Many of these diagrams show two or three pins jumpered
together at the SixPakPlus end of the cable. If you follow
those diagrams, leave the SixPakPlus RS-232C shorting plugs
in the "Normal" position.

Appendix B gives general information on building cables for
devices not listed in Appendix A. Also refer to the manual
supplied with your serial device for help in designing cables.

6.1.3 Disabling the Serial Port

You can completely disable the serial port on the SixPakPlus by removing both of the shorting plugs shown in Figure 6-1:

Remove the shorting plugs from positions 1 or 2 on the Port Enable Jumper Block.
Remove the shorting plugs from positions 3 or 4 on the IRQ Enable Jumper Block.

You must disable one serial port if your PC already has two serial ports installed; this prevents conflicts between multiple ports. Be sure to save the shorting plugs for possible future use.

6.2 Programming the Serial Port

The serial port on the SixPakPlus is completely under software control, and must be initialized for correct baud rate, parity, number of databits, and number of stopbits before it can be used. You or your software must initialize the serial port each time you turn on the computer.

Typically, the DOS MODE command initializes the serial port (refer to your DOS manual for a detailed explanation of this command). A typical MODE command might look like this:

MODE COM1:1200,N,8,1,P<Enter>

The above command initializes serial port COM1 for 1200 Baud, no parity, 8 databits, and 1 stopbit. The "P" is optional and tells DOS that you will be using the port with a serial printer.

Many application programs (such as word processors) automatically handle port initialization, making it unnecessary to use the MODE command. Refer to your software manual; if it does not mention the MODE command, it is probably safe to assume that you can omit that step. If you are unsure, it will not harm anything to go ahead and use the MODE command anyway.

If you are using the serial port to operate a serial printer, you may also need to redirect printer output from LPT1 to COM1 or COM2. This is because DOS always assumes that printer output goes to parallel port LPT1 unless told otherwise. You can use the MODE command to redirect printer output from a parallel port to a serial port. For example:

MODE LPT1: = COM1: < Enter >   For printer output to COM1
MODE LPT1: = COM2: < Enter >   For printer output to COM2

A redirection command should follow the first MODE command that sets set up the baud rate, parity, etc. Again, it is possible that your application program is handling this redirection automatically. If so, you can eliminate this step as well.

6.3 Serial I/O Address Assignments and Pinouts

The serial port on the SixPakPlus uses these system I/O addresses and IRQ interrupt request lines:

Port Configuration	I/O Addresses	IRQ Line
COM1	3F8-3FF Hex	IRQ4
COM2	2F8-2FF Hex	IRQ3

This is the pinout for the SixPakPlus serial port connector J1:

J1 Pin #	Signal Name	Direction
1	Chassis Ground	------
2	TX (TRANSMIT DATA)	OUTPUT
3	RX (RECEIVE DATA)	INPUT
4	RTS (REQ. TO SEND)	OUTPUT
5	CTS (CLEAR TO SEND)	INPUT
6	DSR (DATASET READY)	INPUT
7	SG (SIGNAL GROUND)	------
8	DCD (CARRIER DETECT)	INPUT
20	DTR (DATA TERM RDY)	OUTPUT
22	RI (RING INDICATOR)	INPUT*

*Ring Indicator connection is not required

6.4 Serial Port Diagnostic Testing

Whenever there is any question about the operation of the SixPakPlus serial port, we recommend that you run the IBM diagnostics, preferably the Advanced Diagnostics supplied with the IBM Hardware Maintenance Manual.

For proper diagnostics operation, disconnect any device connected to the SixPakPlus serial port (such as a modem or serial printer). Also, make sure that the CTS, DSR, and DCD jumpers (Figure 6-2) are in the normal (not "forced true") setting.

You can use a "wrap plug" on the J1 connector to perform a very thorough test of the serial port with the Advanced Diagnostics. To build this wrap plug, you need a female DB25 connector, such as a Winchester Electronics P/N 49-1125S. Jumper the connector pins as follows:

    Pin 2 to Pin 3 (TX to RX)
    Pin 4 to Pin 5 & 22 (RTS to CTS & RI)
    Pin 20 to Pins 6 & 8 (DTR to DSR & DCD)

Answer the Advanced Diagnostics loopback plug question with " Y " when this plug is installed on the J1 connector.

Certain versions of the IBM diagnostics may fail on the first pass. You should therefore ignore the results of the first pass if an error occurs.

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PARALLEL PRINTER PORT

The SixPakPlus has as a standard feature a parallel port for interfacing the PC to a parallel printer (such as the IBM/Epson MX-80). This port is completely compatible with the IBM PC and uses the same female DB25 connector as an IBM port.

This section includes the following:

1. Subsection 7.1 tells you how to configure the parallel port (as LPT1 or LPT2, when there are multiple parallel ports in the PC, when you have an IBM Monochrome Display card, and how to disable the parallel port).

2. Subsection 7.2 discusses SixPakPlus parallel port programming.

3. Subsection 7.3 gives SixPakPlus parallel port I/O address assignments and pinouts.

4. Subsection 7.4 discusses SixPakPlus parallel port diagnostic testing.

5. Subsection 7.5 tells you how to configure your SixPakPlus to allow interrupt-driven parallel printer software to operate correctly.

Section 3 of this manual tells you how to install the parallel port ribbon cable onto your SixPakPlus board, and how to install the board and the parallel port into your PC.

7.1 Configuring the Parallel Port

You can install a maximum of three parallel ports in the IBM PC (called LPT1, LPT2, and LPT3). The parallel port on the SixPakPlus has been configured at the factory to respond as LPT1 (LPT2 when the monochrome display card is present;

see Topic 7.1.2). You can confirm that the serial port is configured as LPT1 by checking that a shorting plug is installed at position 3 of the Port Enable Jumper Block (see Figure 7-1).

Port Enable Jumper Block

PIN3-LPT1 (Default)

PIN4-LPT2

1 2 3 4 5 6
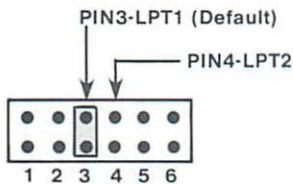
NOTE: When IBM Monochrome Card is installed, SixPakPlus LPT1 will respond as LPT2, and SixPakPlus LPT2 will respond as LPT3.

Figure 7-1. Parallel Port Factory Configuration

7.1.1 Installing Multiple Parallel Ports in a PC

If your PC already has another card with a parallel port on it configured to respond as LPT1 (except for the IBM Monochrome Display / Printer Adapter card—see 7.1.2) then you must change either the other card or the SixPakPlus to respond as LPT2 (this avoids conflicts between the two ports). To reconfigure the SixPakPlus, move the shorting plug from position 3 to position 4 (see Figure 7-1). The parallel port on the SixPakPlus will now respond as LPT2.

7.1.2 IBM Monochrome Display / Printer Adapter Card

The parallel port on the IBM Monochrome Display / Printer Adapter Card always responds as LPT1 and cannot be changed. If you have an the IBM Monochrome Display / Printer Adapter Card in your PC, the SixPakPlus parallel port

7-2

will automatically respond as LPT2 in its factory default configuration. You do not need to reconfigure the SixPakPlus to respond as LPT2. If you do reconfigure the SixPakPlus for LPT2 when an IBM Monochrome display card in your PC, the SixPakPlus parallel port will respond as LPT3.

7.1.3 Disabling the Parallel Port

You can disable the SixPakPlus parallel port by removing the shorting plug shown in Figure 7-1. You can disable the parallel port to avoid conflicts when you have several parallel adapters installed in your PC. Save the shorting plug for possible future use.

7.2 Parallel Port Programming

The IBM PC always sends printer output to parallel port LPT1 unless specifically told otherwise. Unfortunately, PC-DOS 1.0 and 1.1 do not allow you to redirect output from one parallel port to another. Appendix C of this manual tells you how you can cause the PC to redirect printer output from LPT1 to LPT2 or LPT3.

Although it is not required, you can use the DOS MODE command to set the line width and the number of lines per page. Refer to your IBM *DOS* manual for more information.

7.3 Parallel Port I/O Addresses and Pinouts

The parallel port on the SixPakPlus uses these PC I/O addresses:

PORT CONFIGURATION	I/O ADDRESSES
LPT1*	378-37F Hex
LPT2*	278-27F Hex

*When you use the IBM Monochrome Display card, the PC sees a SixPakPlus parallel port configured for LPT1 as LPT2, and a SixPakPlus parallel port configured for LPT2 as LPT3.

You can use the standard IBM Parallel Printer Cable to connect the SixPakPlus to an IBM or IBM-compatible printer. You can also use this SixPakPlus parallel port pinout to help build a cable for your parallel printer:

Parallel Port Signal Line Configuration

LINE NAME	J4 Pin	AST ADAPTER CABLE OUTPUT DB25S	IBM MATRIX PRINTER CENTRONICS INTERFACE
-STROBE	1	1	1
D0	3	2	2
D1	5	3	3
D2	7	4	4
D3	9	5	5
D4	11	6	6
D5	13	7	7
D6	15	8	8
D7	17	9	9
-ACK	19	10/	10/
BUSY	21	11	11
PE	23	12	12
SLCT	25	13	13
-AUTOFD	2	14	14
-ERROR	4	15	32
-INIT	6	16	31
-SLCT IN	8	17	36
GROUND	(10/,12,14,16, 18,20/,22,24)	(18-25)	(16,19-30/,33)

(A dash in front of the line name denotes lines which are functionally active when low.)

7.4 Parallel Port Diagnostic Testing

Unlike some other multifunction cards, the parallel port on your SixPakPlus is competely compatible with the IBM Diagnostics. However, you must configure the parallel port as LPT1 so that the port can be recognized by the diagnostics.

If you run the Matrix Printer test, your printer must be 100% compatible with an Epson MX-80 or errors will be generated.

7.5 Interrupt-Driven Parallel Printer Software

Interrupt-driven parallel printer software uses IRQ7. To ensure that your interrupt-driven parallel printer software operates correctly, you must enable IRQ7 on the SixPakPlus, as shown in Figure 7-2. It will not harm anything to enable IRQ7 even if you do not run interrupt-driven software for your parallel printer.

IRQ Jumper Block
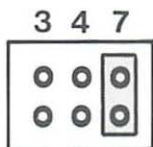
Figure 7-2. IRQ7 Enabled

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SECTION 8

GAME ADAPTER PORT

This section describes the optional game adapter port for the SixPakPlus card. You can use one IBM-compatible joystick with this port.

This section includes the following:

Subsection 8.1 tells you how to enable or disable the SixPakPlus game adapter port

Subsection 8.2 discusses software compatibility

Subsection 8.3 gives the I/O address assignment for the game port

Subsection 8.4 discusses SixPakPlus game port diagnostic testing

Subsection 8.5 gives you the information you need to upgrade the SixPakPlus to add the game port

8.1 Configuring the SixPakPlus Game Adapter Port

To enable the game hardware: You must install all required parts and insert a shorting plug on the Port Enable Jumper Block. Section 3 of this manual tells you how to install the game adapter port ribbon cable onto the SixPakPlus board and install the port into your PC.

Find the Port Enable Jumper Block on your SixPakPlus board (see Figure 2-1 or 2-2). Install a jumper on the fifth set of pins, as shown in Figure 8-1.

Port Enable Jumper Block

PIN5-Game Port Enable
(Install shorting plug to enable game port. Remove shorting plug to disable shorting plug.)
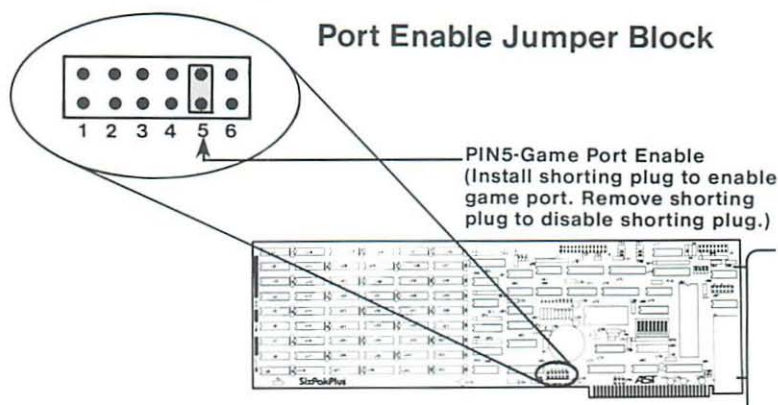
Figure 8-1. Game Adapter Port Enable/Disable

To completely disable the SixPakPlus game adapter port:
Remove the jumper shown in Figure 8-1.

8.2 Software Compatibility

The game port is totally software-compatible with the IBM game adapter when using the IBM-type joystick.

NOTE

Since there are always variations among joysticks, some software may not function properly, even when an IBM-type joystick is being used. Therefore, AST Research recommends that you make sure that your software includes a joystick-centering function.

8.3 Game Port I/O Address Assignment

The game adapter uses I/O address hexadecimal 201. This information is for technical reference only; you do not need to know the I/O address to use the game adapter.

8.4 Game Port Diagnostic Testing

You can use the IBM diagnostics to test the game adapter port. Because of a problem in the diagnostic program, however, the port may not always show up on the listing of installed devices. You might prefer to use the program below to test out the port. This program requires the use of BASICA (not BASIC).

```
10 DEFINT A-Z:KEY OFF:CLS:STRIG ON:SCREEN 2
20 PRINT " X1", " Y1","S1";"S3"
30 X1 = STICK(0):Y1 = STICK(1)
40 A = STRIG(1):C = STRIG(5)
50 LOCATE 3:PRINT X1,Y1,A;C
60 GOTO 30
```

When you run the above program, moving the joystick in the X-plane (left-right) causes a change in the "X1" readout, while moving the joystick in the Y-plane (up-down) causes a change in the "Y1" readout. Pressing the switch (either one or two, depending on your joystick) causes a change in the "S1" or "S3" readouts from 0 to -1. Note that, depending on the quality of your joystick, you may not be able to get a zero reading in the X and Y planes when running the program. This is normal and no cause for alarm.

8.5 Adding the Game Port to Your SixPakPlus

It is easy for you to add the game adapter port to your SixPakPlus card. To order the game port upgrade kit: order model number SPK-000G for the game adapter port option kit which consists of two ICs and a cable.

NOTE

Although the AST Research SixPakPlus
card is designed for easy user expansion,
the warranty coverage applies only to the
configuration of the board as originally
shipped from the factory. The expansion
sockets and any additional expansion-
related components are not warranted.

APPENDIX A

RECOMMENDED SERIAL PORT WIRING

Appendix A gives the wiring configurations you need to interface your SixPakPlus serial port to these serial devices:

1. Modems (such as the Hayes Stack Smart modem, Novation Cat, and UDS).

2. These serial printers: NEC 7700 series, TI 810 series, Epson MX-100-3, Brother HR-1, OKIDATA Microline 83A, OKIDATA Microline 84, and the Anadex 9501.

3. The Qume Sprint 9/45 and 9/55 serial printers.

4. CRTs and printers that run at low baud rates (110-300 baud).

5. The Diablo 620 printer.

6. The Diablo 630 printer.

7. These serial printers: Smith-Corona TP-1, Epson MX-80, and IDS Prism.

8. The Hewlett-Packard H-P 7470A plotter.

For all of these devices:

1. The interface diagrams in this appendix refer to DTE interfaces (such as the SixPakPlus serial port) only.

2. Use a DB25S (female/socket) connector for the SixPakPlus side and a DB25P (male/plug) connector for the serial device side. If you use a device that requires a DB25S (for example, the NEC 7720), you must use an adapter to connect to the port.

To interface other products to your SixPakPlus serial port, see Appendix B for general information and your serial device manual. You can also contact the serial device manufacturer for advice on connecting the device to an IBM PC asynchronous serial port.

Modems

The interface diagram below illustrates the interface between the SixPakPlus serial port and modem devices such as the Hayes Stack Smart modem, Novation Cat, and UDS.

```
     SixPakPlus                      Modem
     Serial Port                     Port
     Connector                       Connector

         1--------------------------------1
         2--------------------------------2
         3--------------------------------3
         4--------------------------------4
         5--------------------------------5
         6--------------------------------6
         7--------------------------------7
         8--------------------------------8
        20-------------------------------20
        22-------------------------------22
```
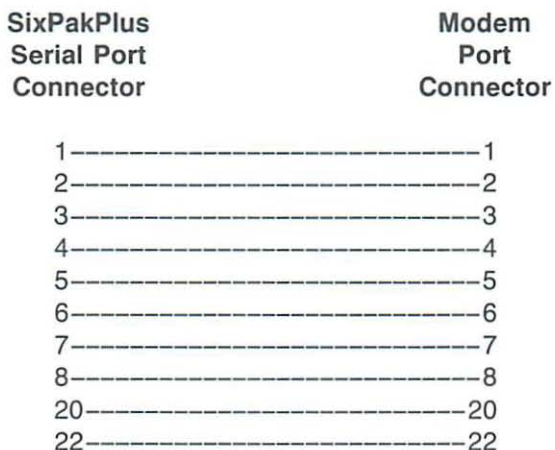
Serial Printers

The interface diagram below illustrates the suggested wiring for the NEC 7700 series, TI 810 series, Epson MX-100-3, Brother HR-1, OKIDATA Microline 83A, OKIDATA Microline 84, and Anadex 9501 serial printers. This wiring allows the printer to inform the PC that its receiving buffer is full.

SixPakPlus　　　　　　　　　　　　**Printer**
Serial Port　　　　　　　　　　　　**Port**
Connector　　　　　　　　　　　　**Connector**

```
1-----------------------------------1
2-----------------------------------3
3-----------------------------------2
4-----------------------------------5
5-----------------------------------11  {TI, Brother, Epson
                                          OKIDATA only
5-----------------------------------19  {MX-80, IDS only
6 & 8-------------------------------20
7-----------------------------------7
20---------------------------------6 & 8
```
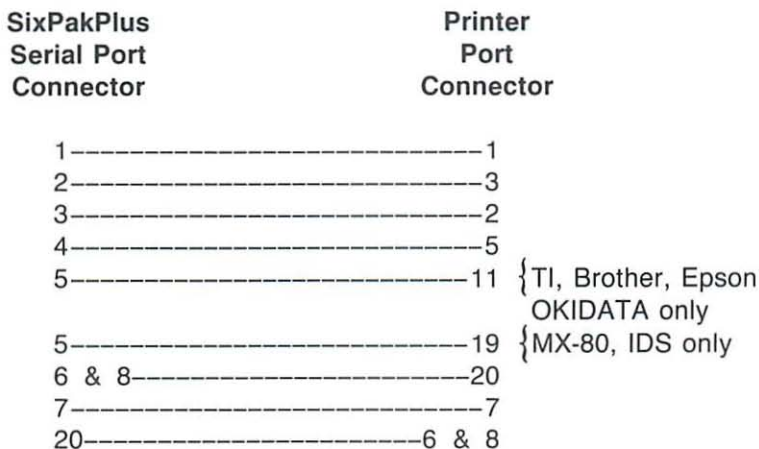
NOTE

SixPakPlus pins 6 and 8 are jumpered together and connected to printer pin 20. Printer pins 6 and 8 are jumpered together and connected to SixPakPlus pin 20.

Serial Printers

The interface diagram below illustrates the suggested wiring
for the Qume 9/45 and Qume 9/55 serial printers. This wiring
allows the Qume printer to inform the PC that its receiving
buffer is full.

```
     Security
     SixPakPlus                        Printer
     Serial Port                        Port
     Connector                       Connector

      1--------------------------------1
      2--------------------------------3
      3--------------------------------2
      4--------------------------------5
      5--------------------------------20
      6 & 8----------------------------4
      7--------------------------------7
     20--------------------------------6 & 8
```

NOTE

SixPakPlus pins 6 and 8 are jumpered
together and connected to printer pin 4.
Printer pins 6 and 8 are jumpered together
and connected to SixPakPlus pin 20.

Slow CRTs and Printers

The following interface diagram illustrates the suggested
wiring for CRTs and printers that running at low baud rates
(110-300 baud). This wiring does not use standard EIA
RS-232C handshaking, but it should work with most CRTs
and some printers.

```
   SixPakPlus                        CRT/Printer
   Serial Port                          Port
   Connector                         Connector

        1---------------------------------1
        2---------------------------------3
        3---------------------------------2
        7---------------------------------7
        4 & 5                            ---
        6 & 8----------------------------20
        ---                            5 & 20
                            (or 4 & 5 if needed)
```
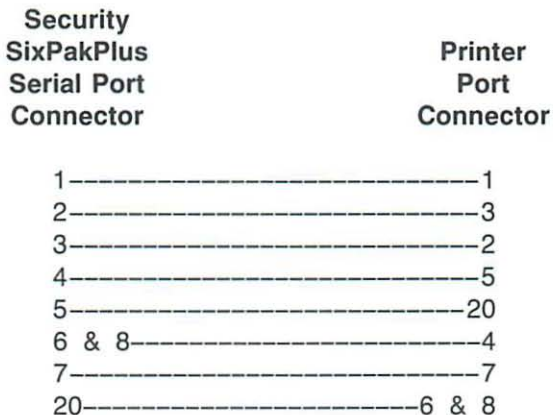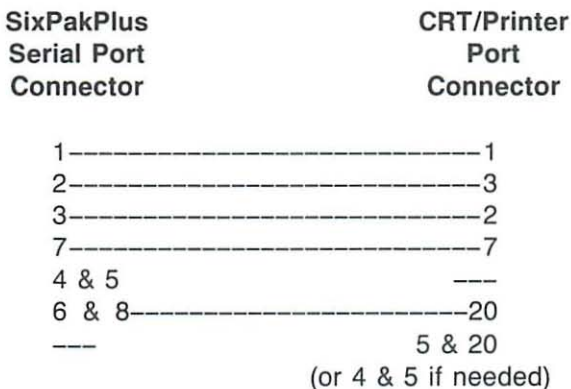
NOTE

SixPakPlus pins 4 and 5 are jumpered
together, and SixPakPlus pins 6 and 8 are
jumpered together. You can jumper
together CRT/printer pins 5 and 20 or 4
and 5. Consult the user's manual for your
CRT or printer for your specific
configuration.

The Diablo 620 Printer

The interface diagram below illustrates the suggested wiring for the Diablo 620 serial printer. This arrangement allows the Diablo to inform the PC side of the interface that its receive buffer is full.

SixPakPlus   **Diablo 620**
Serial Port   **Serial Port**
Connector   **Connector**

```
1------------------------------------1
2------------------------------------3
3------------------------------------2
5------------------------------------4
7------------------------------------7
6 & 8------------------------------20
20-----------------------------------6
```
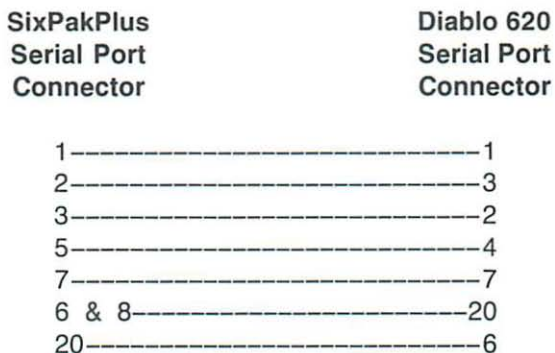
NOTE

SixPakPlus pins 6 and 8 are jumpered together and connected to Diablo 620 pin 20.

Diablo 630 Printers

There are several different versions of the Diablo 630 printer. AST Research has had the best success with the following serial interface wiring:

SixPakPlus Serial Port Connector	Diablo 630 Serial Port Connector
1 —————————————————	1
2 —————————————————	3
3 —————————————————	2
5 —————————————————	11
7 —————————————————	7
6 & 8 & 20 ————————————	6 (or 6 & 4)

NOTE

If this wiring does not work for your 630 Diablo printer, contact Diablo or your printer dealer.

Serial Printers

The interface diagram below illustrates the suggested wiring for these serial printers: Smith-Corona TP-1, Epson MX-80, and IDS Prism. This arrangement gives these printers sufficient control over output from the PC side of the interface to allow both devices to remain in a ready state, while pins 4 and 5 actually control the flow of data from one side to the other.

```
SixPakPlus                      Printer
Serial Port                      Port
Connector                     Connector

    1----------------------------------1
    2----------------------------------3
    3----------------------------------2
    4----------------------------------5
    5----------------------------------4    (TP-1 only)
    5---------------------------------20    (MX-80, IDS only)
    6 & 8 & 20                        ---
    7----------------------------------7
    ---                     6 & 8 & 20    (TP-1 only)
```

NOTE

SixPakPlus pins 6, 8, and 20 are jumpered together and TP-1 printer pins 6, 8, and 20 are jumpered together.

Hewlett-Packard H-P 7470A Plotter

The interface diagram below illustrates the suggested wiring
for the Hewlett-Packard H-P 7470A plotter.

SixPakPlus　　　　　　　　　　**H-P 7470A**
Serial Port　　　　　　　　　　**Serial Port**
Connector　　　　　　　　　　**Connector**

```
1-------------------------------1
3-------------------------------2
2-------------------------------3
7-------------------------------7
5-------------------------------20
6 & 8 & 20                     ---
```
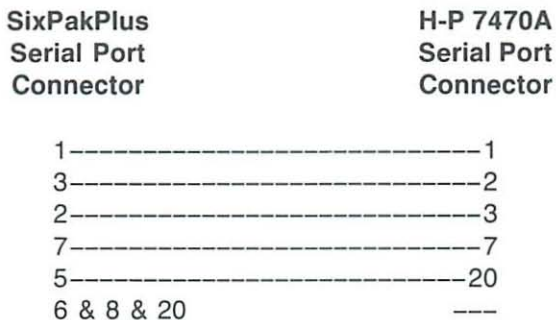
NOTE

SixPakPlus pins 6, 8, and 20 are jumpered
together.

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APPENDIX B

GENERAL SERIAL INTERFACE
WIRING INFORMATION

This appendix provides general information for wiring your AST Research SixPakPlus serial communications port to remote devices using the Electronic Industry Association (EIA) RS-232C standard interface.

NOTE

The SixPakPlus does not support the current loop teletype interface.

The EIA RS-232C standard describes the arrangement of control and data signals on both sides of a serial communications interface. Control signals are used to control the flow of data, and data signals contain the information to be transmitted. The RS-232C standard describes an ideal case of a data terminal connected to a modem. A modem (MOdulator/DEModulator) is a communications device. The communications device interfaces to a transmission medium (for example, phone lines) that carries the signal to a remote, such as a modem connected to a port on another DTE port or the communications element of a mainframe computer system.

The RS-232C standard describes the signals that travel between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE). The signals control the exchange of data to and from the local modem and local terminal. These signals travel on separate wires from pins on the DTE side (terminal) to pins on the DCE side (modem).

For asynchronous applications (such as the SixPakPlus serial communications port) you only need to use only eight or nine (of the 25 possible) signals between the DTE (your serial port) and the DCE (a modem or serial printer DCE port).

Interfacing DTE to DCE

To familiarize yourself with the signal and sequence requirements of the RS-232C standard, imagine that you want to connect the serial port on your AST Research board (DTE) to a telephone modem (DCE). A correctly configured DCE/DTE interface is wired straight across: DTE pin 20 wired to DCE pin 20, pin 2 to pin 2, and so forth. The two devices can then interact to function properly (this interaction is called "handshaking").

When the PC serial port (DTE) wants to transmit data it raises the voltage on pin 20; pin 20 carries the DTR (Data Terminal Ready) signal. This voltage travels to DCE pin 20 where the modem (DCE) interprets it to mean that a communications link is being requested by the terminal device.

If an open phone line exists, the DCE brings up two lines on its side of the interface: DSR (Data Set Ready, pin 6) and DCD (Data Carrier Detect, pin 8). When the DTE (your PC port) sees high voltage at its pins 6 and 8, it can then bring up pin 4, RTS (Request To Send). RTS tells the DCE that the DTE has data to transmit to it. The DCE checks that it is ready to receive data; if so, it brings up pin 5, CTS (Clear To Send).

Once the DTE sees voltage on its pin 5, it starts transmitting on the wire connected to pin 2, TxD (Transmit Data). DTE Pin 3, RxD (Receive Data) receives any incoming signals.
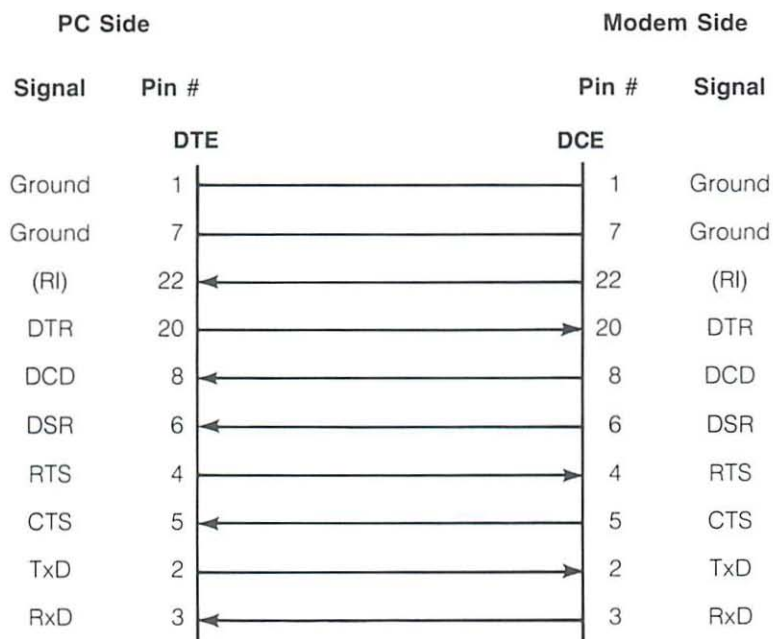
Some modems have an automatic answer mode that uses the signal RI (Ring Indicator, pin 22) to alert the terminal that incoming data is due. The terminal uses DTR to respond to RI.

CAUTION

To help protect your equipment from damage, be sure to connect the ground wires (pins 1 and 7).

Figure B-1 illustrates an ideal DTE to DCE interface, including signals, signal directions, and sequence (top to bottom). Notice that the DTE (PC side) input signals include DCD, DSR, CTS, and RxD. The DTE output signals include DTR and RTS. The interface must handle these signals before the DTE can transmit or receive data.

The Ideal: Terminal to modem

PC Side				Modem Side	
Signal	**Pin #**			**Pin #**	**Signal**
	DTE			DCE	
Ground	1			1	Ground
Ground	7			7	Ground
(RI)	22	←		22	(RI)
DTR	20	→		20	DTR
DCD	8	←		8	DCD
DSR	6	←		6	DSR
RTS	4	→		4	RTS
CTS	5	←		5	CTS
TxD	2	→		2	TxD
RxD	3	←		3	RxD

Figure B-1. Ideal Case: DTE to DCE Interface

Figure B-1 illustrates the interface signals in order of occurrence (top to bottom). From the DTE's standpoint, it must send DTR, see DCD, see DSR, send RTS, and see CTS before transmitting or receiving data: the inputs must have voltage applied to them for the interface to become operational. (The outputs matter only in that they are inputs to the DCE side of the interface.) The hardware that controls the DTE serial interface does not release data to the communications link until it has received the proper set and sequence of signals.

You can think of certain pins on one side of the interface as "functional pairs"; for example, when the AST serial port sends DTR, it expects to see DSR (and DCD) raised in response. DTR and DSR are signal and response to one another: they act as a pair. The same is true of RTS and CTS, and of TxD and RxD.
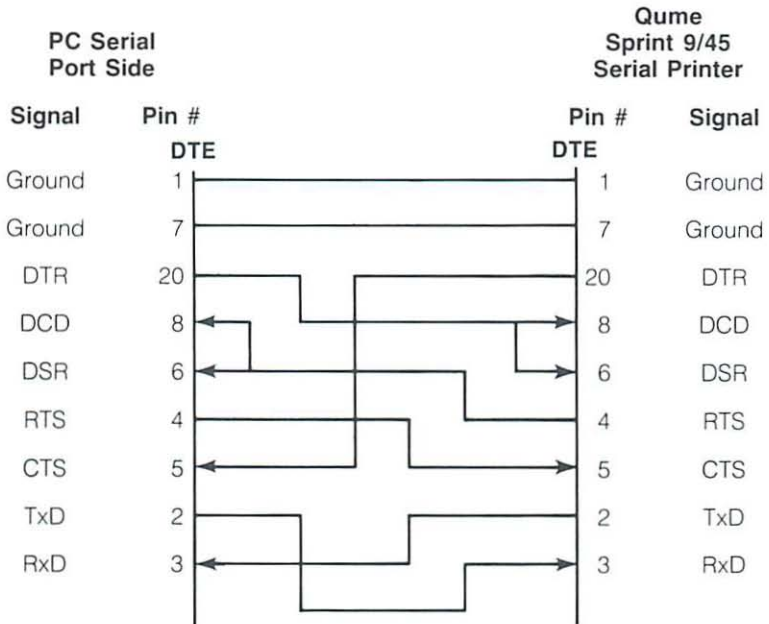
Interfacing DTE to DTE

Many devices, such as serial printers, are set up as DTE. To output data from your PC serial port (also DTE) to a serial printer or other DTE device, you must wire a DTE to DTE interface. A DTE to DTE interface must fool each side of the link into thinking that it is receiving "response" inputs from a DCE. The input voltages must be present, and they must occur in the correct sequence (the correct sequence varies from device to device).

Each side of a DTE to DTE interface acts like the DTE side of a DTE to DCE interface. Both sides of the DTE to DTE interface must send and receive these signals in this sequence before sending or receiving data:

    Send DTR
    Receive DCD and DSR
    Send RTS
    Receive CTS

Figure B-2 illustrates a DTE to DTE interface, including signals, signal directions, and sequence.
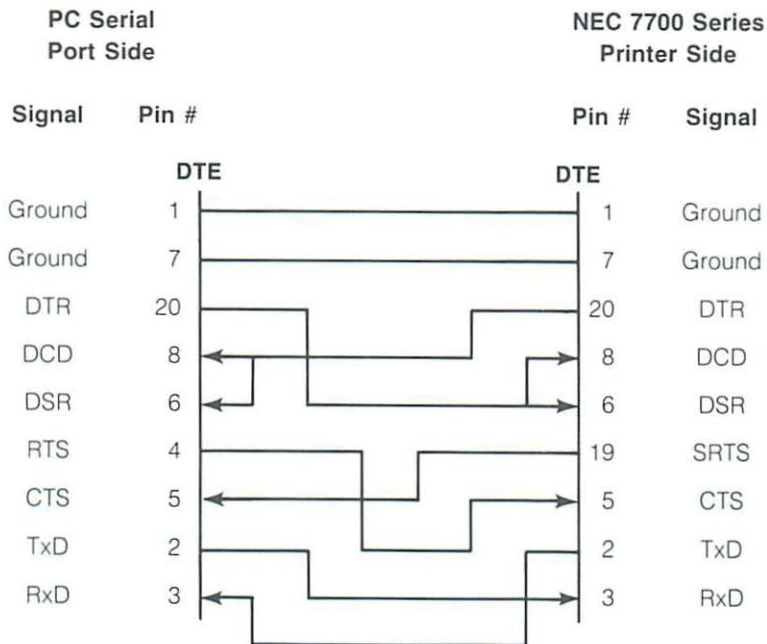
Example of a Specific DTE to DTE Interface

	PC Serial Port Side			Qume Sprint 9/45 Serial Printer	
Signal	Pin # DTE			Pin # DTE	Signal
Ground	1			1	Ground
Ground	7			7	Ground
DTR	20			20	DTR
DCD	8			8	DCD
DSR	6			6	DSR
RTS	4			4	RTS
CTS	5			5	CTS
TxD	2			2	TxD
RxD	3			3	RxD

Figure B-2. Typical DTE to DTE Interface

Notice that the necessary input signals are supplied to both sides. DCD, DSR, and CTS have voltage applied to them on either side.

This example does change the ideal sequence by having the printer DTR signal drive PC signal CTS; however, the integrated circuit that controls the PC side (INS 8250) is fairly flexible in reading the sequence of inputs. The reason for the sequence change is that when the Qume printer receive buffer is about to fill up it drops its DTR signal. To avoid losing data by overflowing the printer's receive buffer, we halt PC data output immediately by dropping the CTS input to the PC side immediately. The remainder of the interface then "idles" until the printer raises DTR again. Remember that this is a specific case for Qume serial printers.

Figure B-3 illustrates another example of interfacing a serial DTE printer to the PC's SixPakPlus serial port.

AST Serial Port DTE to NEC 7700 Series Serial DTE Printer

PC Serial Port Side				NEC 7700 Series Printer Side

Signal	Pin #		Pin #	Signal
	DTE		DTE	
Ground	1		1	Ground
Ground	7		7	Ground
DTR	20		20	DTR
DCD	8		8	DCD
DSR	6		6	DSR
RTS	4		19	SRTS
CTS	5		5	CTS
TxD	2		2	TxD
RxD	3		3	RxD

Figure B-3. DTE to DTE (NEC 7700 Printer) Interface

In this case, the printer uses SRTS (Secondary Request To Send, pin 19) instead of pin 4 (RTS); apart from that exception, Figure B-3 follows the ideal DTE input and sequence rules.

The advantage of the interface shown in Figure B-3 is that every pin is driven by its functional counterpart on the other side of the interface; the functionally related signal pairs include DTR/DSR, RTS/CTS, and TxD/RxD. This should also hold true for the interface you design.

Design Aids

Your serial device manual tells you how the device uses the RS-232C line signals and which pin numbers supply which signals. You can also contact the device manufacturer for further information on interfacing to an IBM PC asynchronous serial port. Serial ports on all AST Research boards are IBM-compatible.

Your dealer can direct you to a parts store that carries the products you need to construct an interface cable. You must use the correct type of 25-pin connectors (male or female) to connect both ends properly. Your SixPakPlus serial port end requires a DB25S (female/socket type) connector.

To wire your serial interface signals properly, we suggest you use the form shown in Figure B-4 as a design aid:

	AST Serial Port **IBM PC Side**			**Serial** **Peripheral** **Device**	
Signal	**Pin #**			**Pin #**	**Signal**
Ground	1			1	Ground
Ground	7			7	Ground
Output	DTR	20			
Input	DCD	8			
Input	DSR	6			
Output	RTS	4			
Input	CTS	5			
Data Out	TxD	2			
Data In	RxD	3			
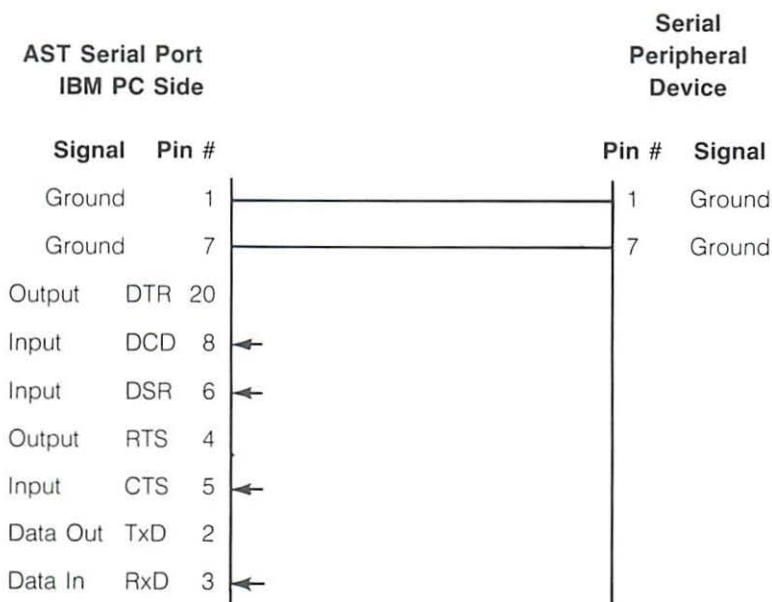
Figure B-4. Serial Interface Form

If you plan to use several different serial devices on your serial port, you can make a separate interface assembly for each device. That way you can use the same long cable to connect your PC to any of these devices.

APPENDIX C

SWITCHING BETWEEN
PARALLEL PRINTER PORTS

This appendix gives you programs you can use in a batch file to direct printer output normally designated for the device attached to port LPT1, to instead be routed to the device attached to port LPT2 or LPT3. (The program also directs output, normally designated for the device attached to port LPT2 or LPT3, to instead be routed to the device attached to port LPT1.) For more information on creating a batch file, see your IBM Personal Computer *DOS* manual.

The programs in this appendix are particularly useful if your application program (a word processing program, for example) is capable of sending print output to only one parallel port. You might also use this program when your LPT1 printer (call it printer #1) is down for service, or when you want to take advantage of the type style or speed of the printer attached to LPT2 or LPT3 (call it printer #2 or #3). This program allows you to quickly switch between outputs without having to alter your hardware interface or change each line in programs where LPT1, LPT2, or LPT3 appear as your output port designation.

If your printers are not configured to the same parameters, as defined in the PC DOS MODE command, you must add two MODE statements when switching devices.

Notice that the "swap" program below is written in BASIC. Since the printer port swap is best handled in DOS, BASIC is invoked within the .BAT file. No RUN command is required when the BASIC call and the program file name occur on the same line (*BASIC LPTSWAP*). Consult your IBM Personal Computer *BASIC* manual if you have any questions about entering and saving the LPTSWAP.BAS program.

Switching Between LPT1 and LPT2

The following DOS batch file and BASIC program will redirect printer output from LPT1 to LPT2 or vice versa, depending on which port is being used at the time.

LPTSWAP.BAT (or a name of your choosing) with the following:

MODE LPT1:[parameters for printer #2 (if needed)]
MODE LPT2:[parameters for printer #1 (if needed)]
BASIC LPTSWAP

LPTSWAP is a BASIC program, as shown below. The comments are included for clarification and need not be included in the actual program:

```
10 DEF SEG = &H40          ' finds port address table
20 A = PEEK (8): B = PEEK (9)   ' save LPT1 address
30 POKE 8,PEEK (10):       ' LPT2 address to LPT1
POKE 9,PEEK (11)
40 POKE 10,A: POKE 11,B    ' LPT1 address to LPT2
50 SYSTEM                  ' return to DOS
```

Omit statement 50 if you will be LPRINTing from BASIC.

To restore LPT1 to LPT1 AND ALSO to restore LPT2 to LPT2:

Use the same program, LPTSWAP, to restore your parallel printer ports to their original arrangement. Be sure to restore the proper parameters using a new batch file and MODE statements.

LPTRSTR.BAT is as follows:

MODE LPT1:[parameters for printer #1 (if needed)]
MODE LPT2:[parameters for printer #2 (if needed)]
BASIC LPTSWAP

Switching Between LPT1 and LPT3
The following DOS batch file and BASIC program will redirect
printer output from LPT1 to LPT3 or vice versa, depending on
which port is being used at the time.

LPTSWAP.BAT (or a name of your choosing) with the following:

MODE LPT1:[parameters for printer #3 (if needed)]
MODE LPT3:[parameters for printer #1 (if needed)]
BASIC LPTSWAP

LPTSWAP is a BASIC program, as shown below. The
comments are included for clarification and need not be
included in the actual program:

```
10 DEF SEG = &H40          ' finds port address table
20 A = PEEK (8): B = PEEK (9)   ' save LPT1 address
30 POKE 8,PEEK (12):         ' LPT3 address to LPT1
POKE 9,PEEK (13)
40 POKE 12,A: POKE 13,B      ' LPT1 address to LPT3
50 SYSTEM                    ' return to DOS
```

Omit statement 50 if you will be LPRINTing from BASIC.

**To restore LPT1 to LPT1 AND ALSO to restore LPT3 to
LPT3:**

Use the same program, LPTSWAP, to restore your parallel
printer ports to their original arrangement. Be sure to restore
the proper parameters using a new batch file and MODE
statements.

LPTRSTR.BAT is as follows:

MODE LPT1:[parameters for printer #1 (if needed)]
MODE LPT3:[parameters for printer #3 (if needed)]
BASIC LPTSWAP

(This page intentionally left blank)

APPENDIX D

PATCH PROCEDURES

The patches in this appendix correct problems in the DOS 1.1 versions of DISKCOPY and DISKCOMP.

Create a DOS diskette which contains the DEBUG utility and the program to be patched. (Your *DOS* manual explains the use and function of the DEBUG utility.) Place this disk in drive A and boot the computer. After the patch is applied, the new (patched) version can be copied over to your working diskettes. DO NOT APPLY PATCHES TO YOUR MASTER DISKETTES — USE BACKUPS ONLY! TEST THE PATCHED VERSION BEFORE ACTUALLY USING IT!

In the following procedures, the user enters all boldface text, exactly as shown; BE SURE TO INCLUDE SPACES. The computer responds with all other output. Refer to your *DOS* manual for more information on using the DEBUG commands.

Patch for DOS 1.1 Version of DISKCOPY Utility

This patch fixes a problem in DISKCOPY when you have a large amount of memory and double-sided drives.

```
A>DEBUG DISKCOPY.COM<Enter>
-E861 E8 74 00<Enter>
-E8D8 3D 51 00 72 02 B0 50 A2 36 05 C3<Enter>
-RCX<Enter>
CX 07D8
:7E3<Enter>
-W<Enter>
Writing 07E3 bytes
-Q<Enter>

A>
```

Patch for DOS 1.1 Version of DISKCOMP Utility

This patch fixes a problem in DISKCOMP when you have a large amount of memory and double-sided drives.

```
A>DEBUG DISKCOMP.COM<Enter>
-E6EC E8 79 00<Enter>
-E768 3D 51 00 72 02 B0 50 A2 95 04 C3<Enter>
-RCX<Enter>
CX 0668
:673<Enter>
-W<Enter>
Writing 0673 bytes
-Q<Enter>

A>
```
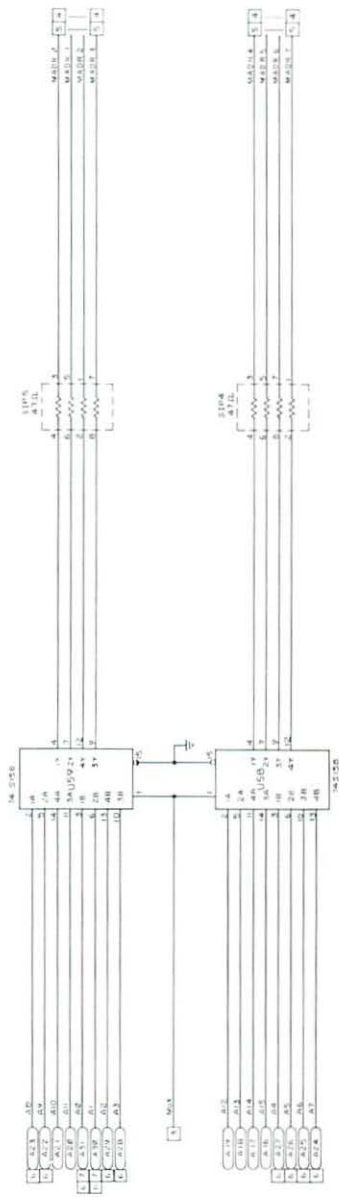
UNLESS OTHERWISE SPECIFIED

FINAL RELEASE PER ECO

1. ALL CAPACITOR VALUES ARE IN MICRO FARAD.
   ALL RESISTOR VALUES ARE IN OHMS.
NOTE: UNLESS OTHERWISE SPECIFIED.

MEMORY ADDRESS MUX

64/256 MEMORY ARRAY

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GAME PORT INTERFACE

REAL TIME CLOCK

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Instructions to User

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.

- Relocate the computer with respect to the receiver.

- Move the computer away from the receiver.

- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

- Ensure that board slot covers are in place when no board is installed.

- Ensure that all brackets are fastened securely to the PC chassis.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission (FCC) helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.
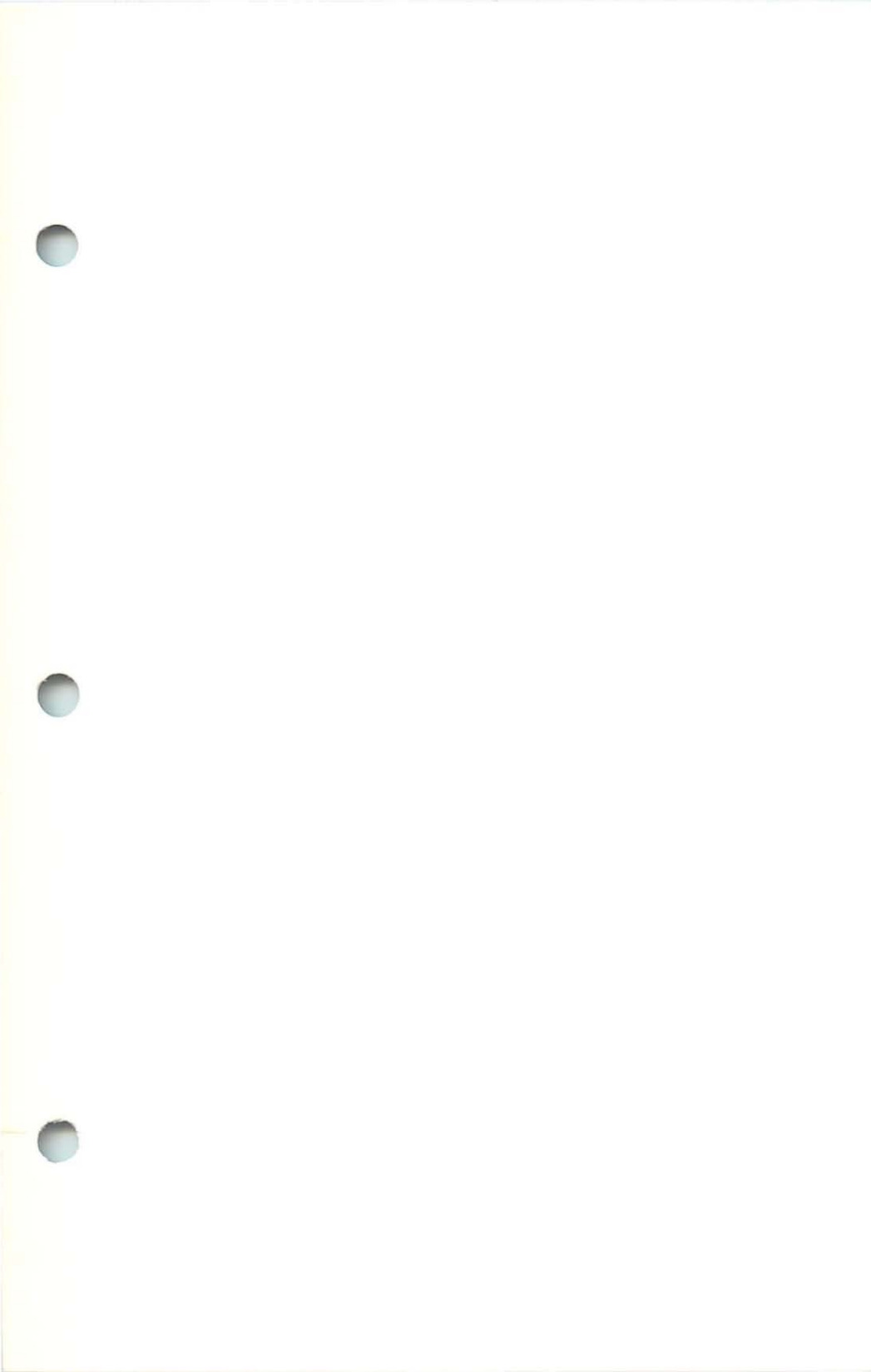
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