

286 EXPRESS CARD™ INSTALLATION GUIDE

FCC NOTICE

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 the computer and receiver are on different branch circuits.

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 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.

PC Technologies, Inc.
704 Airport Blvd.
Ann Arbor, MI 48108
313/996-9690

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Chapter 1 Package Contents

Figure 1 shows what we provide with the 286 Express Card. Please check the contents of your package to insure that it is complete. If not, notify your dealer.

- 286 Express Card
- Program diskette
- I/O Cable/8088 daughterboard combination
- Extraction tool for integrated circuits (ICs)

Before Starting

Before installing the 286 Express Card in your computer, we suggest that you complete and return the Warranty Registration card packaged with this manual. If you register with us, we can send you technical updates and other useful information that will help you get the most out of owning the 286 Express Card.

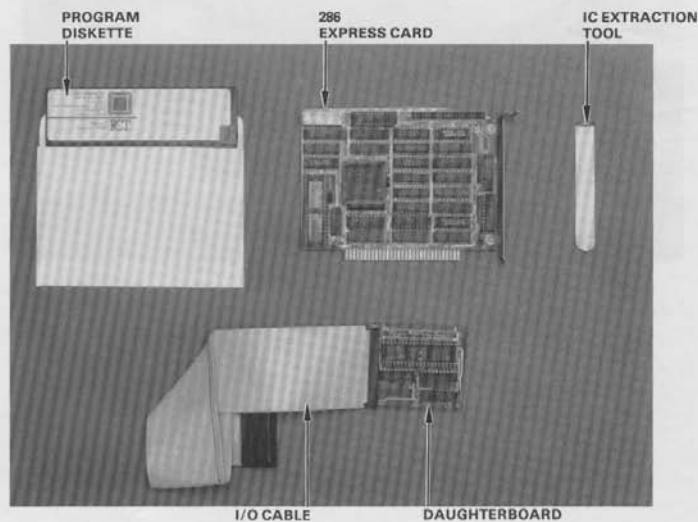


Figure 1. 286 Express Card Components

Package Contents

A Problem You Might Have

If you are installing the 286 Express Card in a Tandy 1000 computer, the daughterboard that came attached to the I/O cable *will not work* in your system. You can identify which model of Tandy computer you own by checking the Model ID plate on the rear of your computer. Figure 2 shows its location. If you own a Tandy 1000 (Model No. 25-1000) computer, you must obtain a special daughterboard (Part Number AXX-7130) from your Radio Shack dealer.

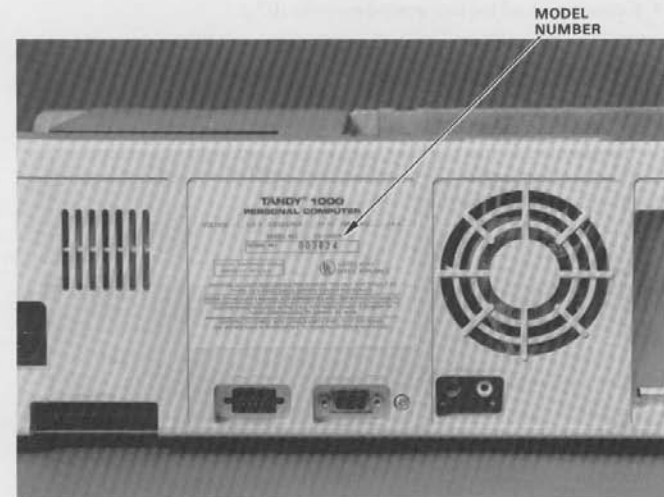


Figure 2. Model ID Plate

Chapter 2

Configuring the 286 Express Card

This manual tells you how to install the 286 Express Card in the Tandy 1000SX, Tandy 1000A, and Tandy 1000 computers.

Copying Files from Distribution Diskette

Before starting the installation, copy *all* of the files from the diskette that came with the 286 Express Card to your "default" hard disk directory, or to your system diskette:

- EXPRESS.SYS a device driver for the 286 Express Card that turns caching on and off and provides a way for the system to erase the 8K cache memory.
- PCT.EXE a program that allows you to use keyboard commands or batch files to switch between your system's 8088 processor and the 286 Express Card's 80286 processor. Also included are routines that let you turn memory caching on or off and test hardware status.
- README.BAT this file uses the remaining files on the distribution diskette (DEMO.EXE, PCTINFO.BAT, etc.) to demonstrate the power of the 286 Express Card.

NOTE

Source file CACHE.ASM is also provided on the distribution diskette. We have included this program to provide you with an example of how to code your own caching on/off routine.

System Configuration

Creating or Modifying the CONFIG.SYS File

For the 286 Express Card to operate properly, the operating system must be configured to load the EXPRESS.SYS device driver at system start-up. You do this using the CONFIG.SYS file. We suggest that you configure your system *before* you install the 286 Express Card. That way, your system will operate properly when you first turn it on following installation.

If you do not already have a CONFIG.SYS file you must create one. You can either use a word processor or the EDLIN line editor that came with your operating system. If you already have a CONFIG.SYS file, add the line shown below as the first line in the file.

CONFIG.SYS File

```
DEVICE = EXPRESS.SYS [OFF] [88] [CPU] [CACHE] [ALT]  
other device drivers
```

The parameters enclosed in brackets may or may not be required depending upon your system configuration. When entering the parameters, do not include the brackets.

Parameter	Purpose
OFF	If this parameter is listed, the system boots, then turns caching off. If you omit this parameter, the 286 Express Card's memory caching feature is turned on immediately following boot-up. Normally, you will want to omit this parameter and leave caching enabled.
88	If this parameter is listed, the system remains in the slower 8088 mode following boot-up. The only time you should want to remain in the 8088 mode is when you want to run a speed-sensitive program immediately following boot-up. If you omit this parameter, your system boots in the 8088 mode, but is then automatically switched to the faster 80286 mode by the system driver. Normally, you will want to omit this parameter and switch to the faster 80286 processor following boot-up.
CPU	Following boot-up, the "Hot Keys" (ALT < or ALT >) used to switch between processors are enabled when this parameter is listed. If this parameter is omitted, the processor switching "Hot Keys" are disabled and have no effect.

System Configuration

Parameter	Purpose
CACHE	Following boot-up, the "Hot Key" (ALT-Right SHIFT key) used to enable or disable memory caching is enabled when this parameter is listed. If this parameter is omitted, the cache enable/disable "Hot Key" is disabled and has no effect.
ALT	The standard I/O address (0100h) the software uses to access the 286 Express Card is the correct one for most applications. If you have an optional board installed in your computer that already uses the 0100h address, you must list the ALT parameter in the command line. This changes the address the software uses to 03E0h. If the ALT parameter is listed, you must also change the 286 Express Card's address by setting option switch 9 ON.

If no parameters are listed, the default status is:

- Caching enabled
- 80286 enabled
- Processor switching "Hot Keys" disabled
- Cache enable/disable "Hot Key" disabled
- Standard I/O address (0100h) used by 286 Express Card

System Configuration

Setting Option Switches

Before installing the 286 Express Card, you must set the option switches and the jumper shown in Figure 3. These configurable options define the board's environment and describe the particular operating mode you have chosen.

Two different labeling schemes are used by switch manufacturers. The switches on your board will either be labeled "ON" or "OPEN". The two terms are opposite: OPEN is the same as OFF. If you need to translate the settings shown in this section, substitute "not OPEN" for ON in the following charts.

Note that an asterisk (*) next to a switch indicates the switch's "as-shipped" setting.

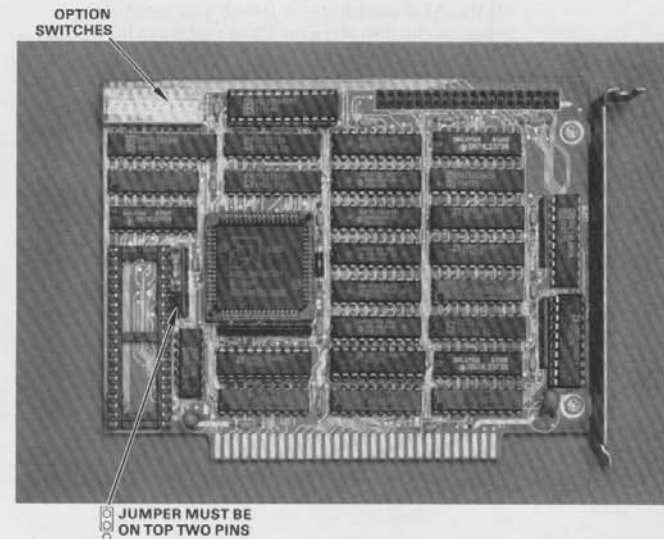


Figure 3. 286 Express Card Option Switches

System Configuration

Switches 1, 2, and 10 — Clock Speed for Math Co-processor

S1	S2	S10	Definition
ON	ON	ON	Invalid Setting
ON	OFF	OFF	8 MHz Clock Speed (80287-8)
OFF	ON	ON	5 MHz Clock Speed (80287-3)
*OFF	*OFF	*OFF	No Numeric Processor

There are two types of 80287 math co-processors: 80287-8 or 80287-3. Either co-processor will work in the 286 Express Card as long as these switches are set properly. Determine which type you have by looking at the printing on the chip, then set these switches accordingly. (Note: A 6 MHz co-processor can be used in place of a 5 MHz co-processor if desired. Use the 5 MHz switch setting.)

Switch 3 — Computer Model

S3	Definition
*ON	286 Express Card installed in Tandy 1000SX
OFF	286 Express Card installed in Tandy 1000 or 1000A

For Tandy computers, the model number is shown on a plate at the rear of the case. See Figure 2.

System Configuration

Switches 4 through 7 — Memory Limits for Caching

Switches 4 through 7 let the 286 Express Card know how much memory you want to cover with the memory caching feature. Normally, you should set these switches to reflect the total amount of memory you have installed, since the 286 Express Card can provide caching for everything below the DOS 640K boundary.

Memory Size	S4	S5	S6	S7
64K	—	—	—	—
128K	—	—	—	ON
192K	—	—	ON	—
*256K	—	—	ON	ON
320K	—	ON	—	—
384K	—	ON	—	ON
448K	—	ON	ON	—
512K	—	ON	ON	ON
576K	ON	—	—	—
640K	ON	—	—	ON
and larger				

Legend

— = Switch is OFF (OPEN)
ON = Switch is ON (CLOSED)

Switch 8 — Must be OFF

Switch 9 — I/O Address

S9	Definition
ON	I/O Address 03E0h
*OFF	I/O Address 0100h

If the 286 Express Card's standard I/O address (0100h) conflicts with an existing option board, set this switch ON. You must also specify the ALT parameter on the EXPRESS.SYS command line in the CONFIG.SYS file. The ALT parameter tells the system to use the alternate I/O address for the Express Card.

If there is no address conflict, leave this switch OFF and omit the ALT parameter.

Chapter 3

Installing the 286 Express Card in a Tandy 1000SX

Tools Required

- Phillips screwdriver
- Small flat-bladed screwdriver
- IC extraction tool (provided)

Installation Procedure

1. Turn your computer off. Unplug your computer, monitor, and all peripherals. Also unplug all AC power cords from the wall outlet.
2. Remove the screws shown in Figure 4 and set them aside. Slide the computer's cover forward to remove it.

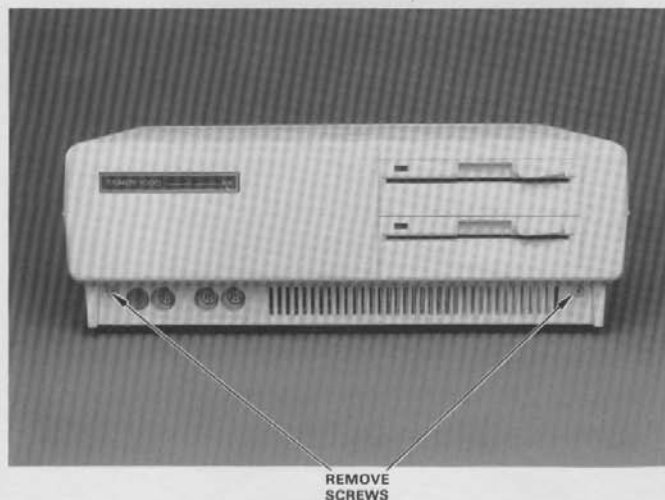


Figure 4. Cover Mounting Screws

Installation — Tandy 1000SX

3. Remove the bracket shown in Figure 5 by lifting it straight up and off.

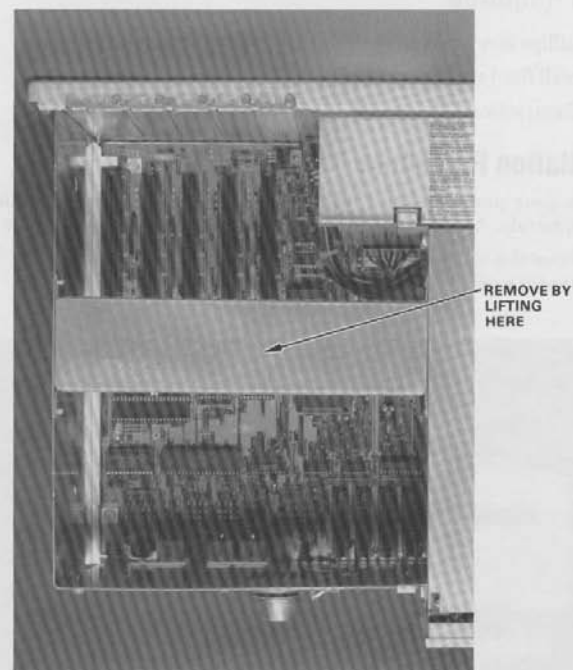


Figure 5. Inside the Tandy 1000SX

4. There are five expansion slots in the Tandy 1000SX. See Figure 6. You can install the 286 Express Card in any slot, but we suggest using the middle slot, the one labeled J13. Remove the screw and cover plate for this slot and set them aside.

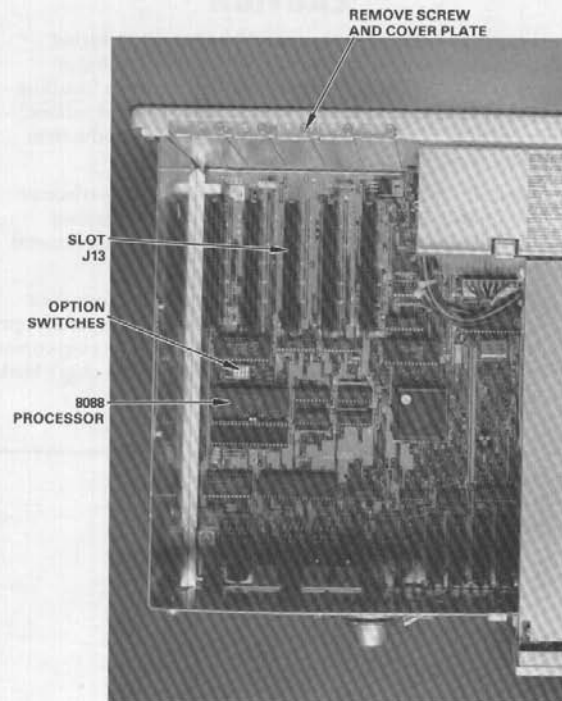


Figure 6. Tandy 1000SX Expansion Slots

5. Jot down the present setting for each of the motherboard's option switches. See Figure 6. This precaution is necessary in case you accidentally change one of the switches while installing the 286 Express Card.

CAUTION

The boards and components you will be handling during this procedure are easily damaged by rough handling or electrostatic discharge. Be extremely careful when handling them. Lay the boards on a non-conductive, padded surface when possible, and store or carry chips on non-conductive anti-static foam.

Be especially careful when working on a carpeted surface or when humidity is low, such as during the heating season. To avoid damage from static, always touch a grounded metal surface before touching any components.

6. Use the IC extraction tool as shown in Figure 7 to remove your computer's 8088 processor chip. Working slowly and carefully, pry up on one side, then the other, **little by little**, until the chip comes free. If you try to do too much too soon you'll bend the chip's leads, making it hard to reinsert later.

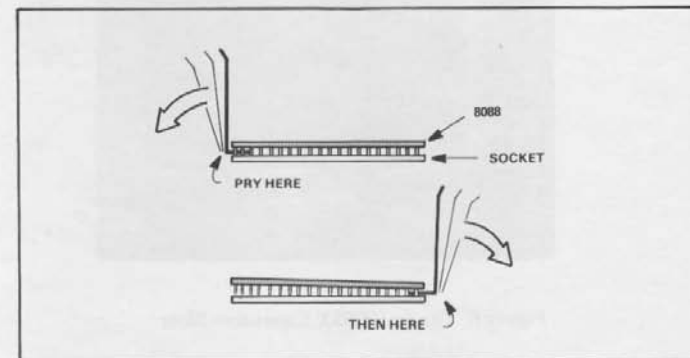


Figure 7. Using the IC Extraction Tool

7. Immediately plug the 8088 processor into the daughterboard as shown in Figure 8. Orient the processor so that the notch is pointing away from the I/O cable's connector. *Be certain that all pins are aligned with socket holes before pressing the chip into place.*

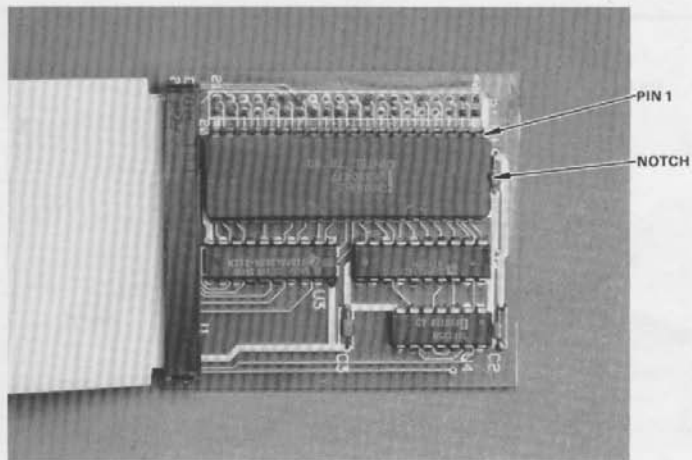


Figure 8. Plugging in 8088 Processor

8. If you are installing an 80287 math co-processor, plug it into the empty socket on the 286 Express Card shown in Figure 9.

Make sure that pin 1 on the 80287 math co-processor is matched up with pin 1 on the socket and that all pins are aligned before pressing the chip into place.

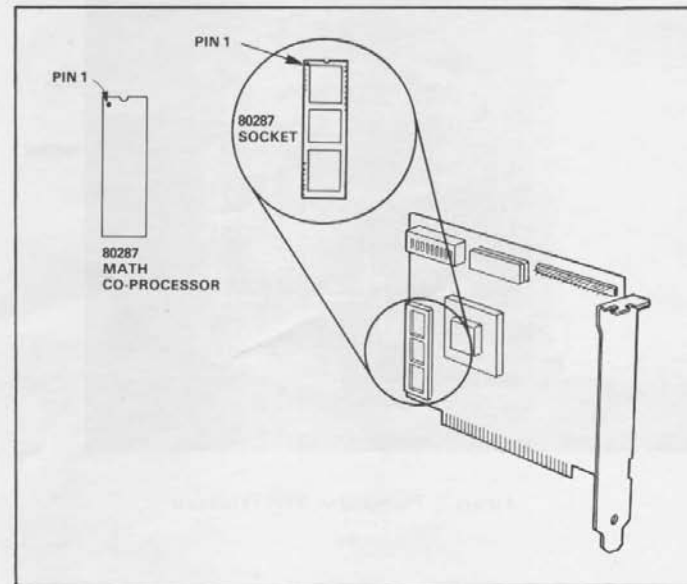


Figure 9. Installing 80287 in the 286 Express Card

Installation — Tandy 1000SX

9. One end of the I/O cable comes already attached to the daughterboard. *Carefully* plug the other end into the 8088 socket on your computer's motherboard. Figure 10 shows an empty socket and one with the cable installed. Note the location of pin 1.

Make sure that all pins are aligned before pressing the I/O cable's plug into the socket.

Note that pin 21 of the cable socket is clipped off at the factory; your cable is not defective.

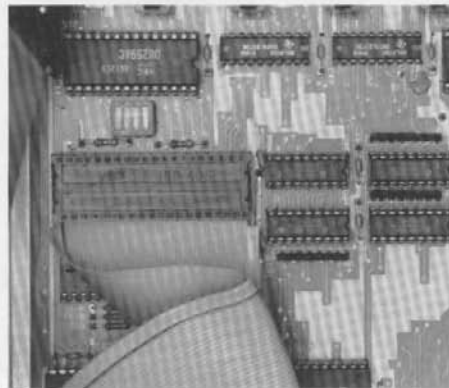
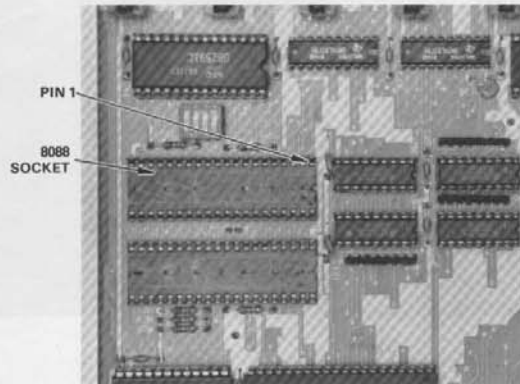


Figure 10. Plugging I/O Cable into Motherboard

Installation — Tandy 1000SX

10. Plug the daughterboard into the 286 Express Card as shown in Figure 11.

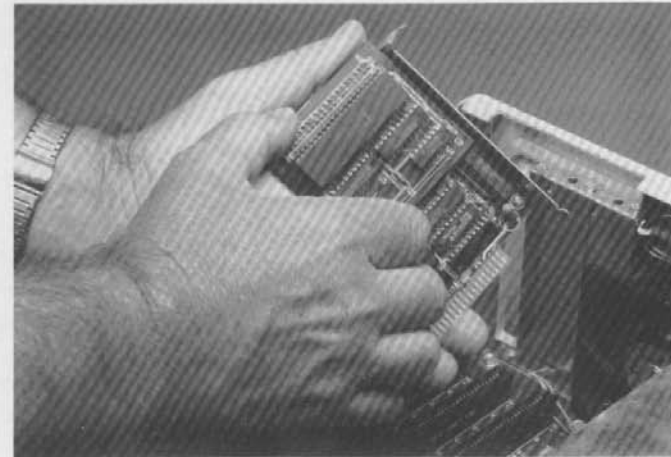


Figure 11. Plugging in Daughterboard

Installation — Tandy 1000SX

11. Carefully plug the 286 Express Card into the motherboard as shown in Figure 12.

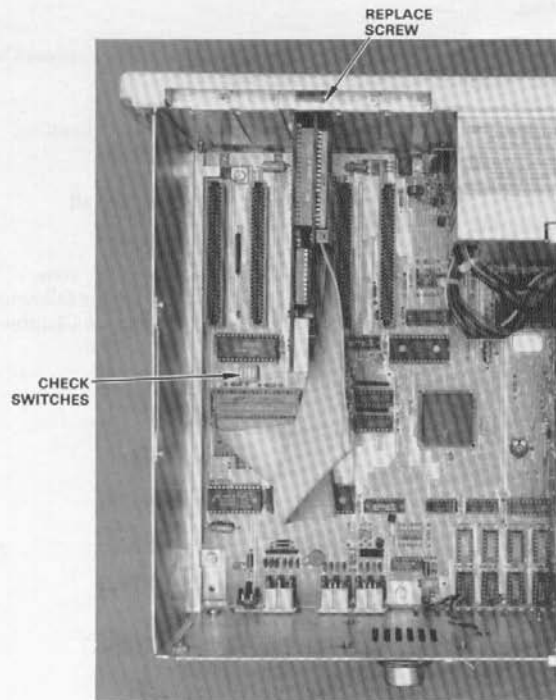


Figure 12. Plugging in 286 Express Card

Installation — Tandy 1000SX

12. Compare the present setting of the motherboard's option switches to the notes you made prior to installing the 286 Express Card. Restore any switch that was accidentally changed to its original setting.
13. Re-use the rear cover plate screw to attach the 286 Express Card to the back of your computer's chassis.
14. Slide the computer's cover back on and replace its mounting screws.
15. Reconnect the power cord, monitor, keyboard, and all peripherals.
16. Apply power. If you have done everything correctly, your computer should successfully boot up and display the following start up message. If your system doesn't boot up, see Chapter 7 — Troubleshooting.

286 Express(tm) GACD V x.xx
Configured for Tandy
(C) 1987 PC Technologies Inc.

System booted on 8088 CPU
[8087 installed]
[80287 installed]
Processor switching supported.
Cache size = 8 KB Cache fence = 640 KB
Board type = 7.22
x,xxx bytes used by the driver.
[Press ALT and Right-Shift to toggle the cache.]
[Press ALT and > to switch to the 80286.]
[Press ALT and < to switch to the 8088.]

Depending upon how your system is configured, the statements may not appear as shown, and those enclosed in brackets may not be displayed at all. For instance:

- The math co-processor statements should only be displayed if you have the associated co-processor installed.
- The cache fence should reflect the amount of memory set in switches 4 through 7.
- If you didn't list the CACHE parameter in the CONFIG.SYS file, the cache "Hot Key" message will not be displayed.
- If you didn't list the CPU parameter in the CONFIG.SYS file, the processor switching "Hot Key" messages will not be displayed.

286 Express Card (250-1035)

Settings

Faxback Doc. # 5603

PC Technologies, the manufacturer of this board is no longer in business. Phase, Inc. is available for service and parts. The card is supported only by Radio Shack. All cards have a 90 day warranty only! This warranty is honored only by Tandy.

NOTE: The daughter board AXX-7130 is no longer available.

Copying Files from Distribution Diskette

Before starting the installation, copy all of the files from the diskette that came with the 286 Express Card to your default hard disk directory, or to your system disk.

Creating or Modifying the CONFIG.SYS File

For the 286 Express Card to operate properly, the operating system must be configured to load the EXPRESS.SYS device driver at system start-up. You do this using the CONFIG.SYS file. If you do not already have a CONFIG.SYS file you must create one. If you already have a CONFIG.SYS file, add the line shown below as the first line in the file.

```
DEVICE = EXPRESS.SYS
```

Setting Option Switches

Switches 1, 2, and 10 - Clock Speed for Math Co-processor

S1	S2	S10	Definition
ON	ON	ON	Invalid Setting
ON	OFF	OFF	8 MHz Clock Speed 80287-8
OFF	ON	ON	5 MHz Clock Speed 80287-3
OFF	OFF	OFF	No Numeric Processor

Switch 3 - Computer Model

S3 Definition

ON 286 Express Card installed in 1000SX
 OFF 286 Express Card installed in 1000 or 1000A

Switches 4-7 Memory Limits for Caching

Memory	S4	S5	S6	S7
64K	-	-	-	-
128K	-	-	-	ON
192K	-	-	ON	-
256K	-	-	ON	ON
320K	-	ON	-	-
384K	-	ON	-	ON
448K	-	ON	ON	-
512K	-	ON	ON	ON
576K	ON	-	-	-
640K	ON	-	-	ON

LEGEND

- = SWITCH IS OFF (OPEN)
 ON = SWITCH IS ON (CLOSED)

Switch 8 Must be OFF

Switch 9 I/O Address

S9 Definition

ON I/O Address 03E0H
 OFF I/O Address 0100H

 Installation 1000SX

Insert board in middle slot J13.
 Remove 8088 processor chip.
 Plug 8088 processor chip into daughterboard.
 Plug I/O cable into 8088 socket of motherboard.
 Plug daughterboard into 286 Express Card.

 Installation 1000A

Insert board in slot J9.
 Remove 8088 processor chip.
 Plug 8088 processor chip into daughterboard.
 Plug I/O cable into 8088 socket of motherboard.
 Plug daughterboard into 286 Express Card.

 Installation 1000

Note: The daughterboard supplied with this product will not work with the original 1000. You need a special daughter-board (part # AXX-7130). (This board is no longer available.)

Insert board in slot J10.
 Remove 8088 processor chip.
 Plug 8088 processor chip into daughterboard.
 Plug I/O cable into 8088 socket of motherboard.
 Plug daughterboard into 286 Express Card.

 CONFIGURING THE 286 EXPRESS CARD

This manual tells you how to install the 286 Express Card in the Tandy 1000 SX, Tandy 1000 A, and Tandy 1000 computers.

COPYING FILES FROM DISTRIBUTION DISKETTE

Before starting the installation, copy all of the files from the diskette that came with the 286 Express Card to your "default" hard disk directory, or to your system diskette:

EXPRESS.SYS-----a device driver for the 286 Express Card that turns caching on and off and provides a way for the system to erase the 8K cache memory.

PCT.EXE-----a program that allows you to use keyboard commands or batch files to switch between your system's 8088 processor and the 286 processor. Also included are caching on or off and test hardware status.

README.BAT-----this file uses the remaining files on the distribution diskette (DEMO.EXE, PCTINFO.BAT, etc.) to demonstrate the power of the 286 Express Card.

NOTE: Source file CACHE.ASM is also provided on the distribution diskette. We have included this program to provide you with an example of how to code your own caching on/off routine.

CREATING OF MODIFYING THE CONFIG.SYS FILE

For the 286 Express Card to operate properly, the operating system must be configured to load the EXPRESS.SYS device driver at system start-up. You do this using the CONFIG.SYS file. We suggest that you configure your

system before you install the 286 Express Card. That way, your system will operate properly when you first turn it on following installation.

If you do not already have a CONFIG.SYS file, you must create one. You can either use a word processor or the EDLIN line editor that came with your operating system. If you already have a CONFIG.SYS file, add the line shown below as the first line in the file.

CONFIG.SYS File

```
DEVICE = EXPRESS.SYS [OFF] [88] [CPU] [CACHE] [ALT] other device drivers
```

The parameters enclosed in brackets may or may not be required depending upon your system configuration.

PARAMETER	PURPOSE
OFF	If this parameter is listed, the system boots, then turns caching off. If you omit this parameter, the 286 Express Card's memory caching feature is turned on immediately following boot-up. Normally, you will want to omit this parameter and leave caching enabled.
88	<p>If this parameter is listed, the system remains in the slower 8088 mode following boot-up. The only time you should want to remain in the 8088 mode is when you want to run a speed sensitive program immediately following boot-up.</p> <p>If you omit this parameter, your system boots in the 8088 mode, but is then automatically switched to the faster 80286 mode by the system driver. Normally, you will want to omit this parameter and switch to the faster 80286 processor following boot-up.</p>
CPU	Following boot-up, the "Hot Keys" (ALT< or ALT>) used to switch between processors are enabled when this parameter is listed. If this parameter is omitted, the processor switching "Hot Keys" are disabled and have no effect.
CACHE	Following boot-up, the "Hot Key" (ALT-Right Shift) used to enable or disable memory caching is enabled when this parameter is listed. If this parameter is omitted, the cache enable/disable "Hot Key" is disabled and has no effect.
ALT	<p>The standard I/O address (100h) the software uses to access the 286 Express Card is the correct one for most applications. If you have an optional board installed in your computer that already uses the 100h address, you must list the ALT parameter in the command line. This changes the address the software uses to 03E0h.</p> <p>If the ALT parameter is listed, you must also change the 286 Express Card's address by setting option switch 9 ON.</p>

If no parameters are listed, the default status is:

- * Caching enabled
- * 80286 enabled
- * Processor switching "Hot Key" disabled
- * Cache enable/disable "Hot Key" disabled
- * Standard I/O address (100h) used by 286 Express Card

SETTING OPTION SWITCHES

Before installing the 286 Express Card, you must set the option switches shown in Figure 3. These switches define the board's environment and describe the particular operating mode you have chosen.

Unfortunately, two different labeling schemes are used by switch manufacturers. The switches on your board will either be labeled "ON" or "OPEN". The two terms are opposite: OPEN is the same as OFF. If you need to translate the settings shown in this section, substitute "not OPEN" for ON in the following charts.

Note that an asterisk (*) next to a switch indicates the switch's "as shipped" setting.

SWITCHES 1,2, and 10--CLOCK SPEED FOR MATH CO-PROCESSOR

S1	S2	S10	DEFINITION
ON	ON	ON	Invalid Setting
ON	OFF	OFF	8 MHz Clock Speed (80287)
OFF	ON	ON	5 MHz Clock Speed (80287-3)
*OFF	*OFF	*OFF	No Numeric Processor

There are two types of 80287 math co-processors: 80287 or 80287-3. Either co-processor will work in the 286 Express Card as long as these switches are set properly. Determine which type you have by looking at the printing on the chip, then set these switches accordingly. (NOTE: a 6 MHz co-processor can be used in place of a 5 MHz co-processor if desired. Use the 5 MHz switch setting.)

SWITCH 3--COMPUTER MODEL

S3	DEFINITION
*ON	286 Express Card installed in Tandy 1000SX
OFF	286 Express Card installed in Tandy 1000 or 1000A

For Tandy computers, the model number is shown on a plate at the rear of the case. See Figure 2.

SWITCHES 4 THROUGH 7--MEMORY LIMITS FOR CACHING

Switches 4 through 7 let the 286 Express Card know how much memory you want to cover with the memory caching feature. Normally, you should set these switches to reflect the total amount of memory you have installed, since the 286 Express Card can provide caching for everything below the DOS 640K boundary.

(DTC/jlc-03/28/94)

[Privacy Policy](#)

286 Express Card (250-1035)

Installation

Faxback Doc. # 5602

TOOLS REQUIRED

- * Phillips screwdriver
- * Small flat-bladed screwdriver
- * IC extraction tool (provided)

INSTALLATION PROCEDURE FOR A TANDY 1000SX

1. Turn off the computer. Unplug your computer, monitor, and all peripherals. Also unplug all AC power cords from the wall outlet.
2. Remove the screws and set them aside. Slide the computer's cover forward to remove it.
3. Remove the bracket by lifting it straight up and off.
4. There are five expansion slots in the Tandy 1000 SX. You can install the 286 Express Card in any slot, but we suggest using the middle slot, the one labeled J13. Remove the screw and cover plate for this slot and set them aside.
5. Jot down the present setting for each of the motherboard's option switches. This precaution is necessary in case you accidentally change one of the switches while installing the 286 Express Card.

CAUTION: The boards and components you will be handling during this procedure are easily damaged by rough handling or electrostatic discharge. Be extremely careful when handling them. Lay the boards on a non-conductive, padded surface when possible, and store or carry chips on non-conductive anti-static foam.

Be especially careful when working on a carpeted surface or when humidity is low, such as during the heating season. To avoid damage from static, always touch a grounded metal surface before touching any components.

6. Use the IC extraction tool to remove your computer's 8088 processor chip. Working slowly and carefully, pry up on one side, then the other, little by little, until the chip comes free. If you try to do too much too soon you'll bend the chip's leads, making it hard to reinsert later.
7. Immediately plug the 8088 processor into the daughterboard. Orient the processor so that the notch is pointing away from the I/O cable's connector. Be certain that all pins are aligned with socket holes before pressing the chip into place.
8. If you are installing the 80287 math co-processor, plug it into the empty socket on the 286 Express Card shown in Figure 9.

Make sure that pin 1 on the 80287 math co-processor is matched up with pin 1 on the socket and that all pins are aligned before pressing the chip into place.

Tandy computers have the ability to sense the presence or absence of a math co-processor, so there are no switches to set, or jumpers to change.

9. One end of the I/O cable comes already attached to the daughterboard. Carefully plug the other end into the 8088 socket and one with the cable installed. Note the location of pin 1.

Make sure that all pins are aligned before pressing the I/O cable's plug into the socket.

Note that pin 21 of the cable socket is clipped off at the factory: your cable is not defective.

10. Plug the daughterboard into the 286 Express Card as shown in Figure 11.
11. Carefully plug the 286 Express Card into the motherboard.
12. Compare the present setting of the motherboard's option switches to the notes you made prior to installing the 286 Express Card. Restore any switch that was accidentally changed to its original setting.
13. Re-use the rear cover plate screw to attach the 286 Express Card to the back of your computer's chassis.
14. Slide the computer's cover back on and replace its mounting screws.
15. Reconnect the power cord, monitor, and keyboard.
16. Apply power. If you have done everything correctly, your computer should successfully boot up and display the following start up message. If your system doesn't boot up, see Chapter 7--Troubleshooting.

```
286 Express (tm) GACD V x.xx  
(C) 1987 PC Technologies, Inc.
```

```
System booted on 8088 CPU  
[8087 installed]  
[80287 installed]  
Processor switching supported  
Cache size = 8KB Cache fence - 640KB  
[Press ALT and Right Shift to toggle the cache.]  
[Press ALT < to change to the 8088 and ALT> to change to the 80286.]
```

Depending upon how your system is configured, the statements may not appear as shown, and those enclosed in brackets may not be displayed at all. For instance:

- * The math co-processor statements should only be displayed if you have the associated co-processor installed.
- * The cache fence should reflect the amount of memory set in switches 4-7.
- * If you didn't list the cache parameter in the CONFIG.SYS file, the cache "Hot Key" message will not be displayed.
- * If you didn't list the CPU parameter in the CONFIG.SYS file, the processor switching "Hot Key" message will not be displayed.

INSTALLATION PROCEDURE FOR A TANDY 1000A

1. Turn your computer off. Unplug your computer, monitor, and all peripherals. Also unplug all AC power cords from the wall outlet.
2. Remove the screws shown in Figure 13 and set them aside. Slide the computer's cover forward to remove it.
3. There are three expansion slots in the Tandy 1000A. See Figure 14. You can install the 286 Express Card in any slot, but we suggest using the outside slot, the one labeled J9. Remove the screw and cover plate for the desired slot and set them aside.

CAUTION: The boards and components you will be handling during this procedure are easily damaged by rough handling or electrostatic discharge. Be extremely careful when handling them. Lay the boards on a non-conductive, padded surface when possible, and store or carry chips on non-conductive anti-static foam.

Be especially careful when working on a carpeted surface or when humidity is low, such as during the heating season. To avoid damage from static, always touch a grounded metal object before touching any components.

4. Use the IC extraction tool as shown in Figure 15 to remove your computer's 8088 processor chip. Working slowly and carefully, pry up on one side, then the other, little by little, until the chip comes free. If you try to do too much too soon you'll bend the chip's leads making it hard to re-insert later.
5. Immediately plug the 8088 processor into the daughterboard as shown in Figure 16. Orient the processor so that the notch is pointing away from the I/O cable's connector. Be certain that all pins are aligned with socket holes before pressing the chip into place.
6. If you are installing an 80287 math co-processor, plug it into the empty socket on the 286 Express Card shown in Figure 17.

Make sure that pin 1 on the 80287 math co-processor is matched up with pin 1 on the socket and that all pins are aligned before pressing the chip into place.

Tandy computers have the ability to sense the presence or absence of a math co-processor, so there are no switches to set, or jumpers to change.

7. One end of the I/O cable comes already attached to the daughterboard. Carefully plug the other end into the 8088 socket on your computer's motherboard. Figure 18 shows the empty 8088 socket and how it should look after the cable is installed. Note the location of pin 1.

Make sure that all pins are aligned before pressing the I/O cable's plug into the socket.

Note that pin 21 of the cable socket is clipped off at the factory: your cable is not defective.

8. Plug the daughterboard into the 286 Express Card as shown in Figure 19.
9. Carefully plug the 286 Express Card into the motherboard as shown in Figure 20.
10. Re-use the rear cover plate screw to attach the 286 Express Card to the back of your computer's chassis.
11. Slide the computer's cover back on. As the cover is replaced, fit the I/O cable folds into the "channel" at the left side of the cover. See Figure 21.
12. Reconnect the power cord, monitor, and keyboard.
13. Apply power. If you have done everything correctly, your computer should successfully boot up and display the following start up message. If your system doesn't boot up, see Chapter 7--Troubleshooting.

```
286 Express(tm) GACD V x.xx
(C) 1987 PC Technologies, Inc.
System booted on 8088 CPU
[8087 installed]
[80287 installed]
Processor switching supported
Cache size = 8KB  Cache fence = 640KB
[Press ALT and Right Shift to toggle the cache.]
[Press ALT < to change to the 8088 and ALT > to change to the 80286.]
```

Depending upon how your system is configured, the statements may not appear as shown, and those enclosed in brackets may not be displayed at all. For instance:

* The math co-processor statements should only be displayed if you have the associated co-processor installed.

- * The cache fence should reflect the amount of memory set in switches 4-7.
- * If you didn't list the cache parameter in the CONFIG.SYS file, the cache "Hot Key" message will not be displayed.
- * If you didn't list the CPU parameter in the CONFIG.SYS file, the processor switching "Hot Key" message will not be displayed.

INSTALLING THE 286 EXPRESS CARD IN A TANDY 1000

INSTALLATION PROCEDURE

NOTE: The daughterboard supplied with this product will not work with Tandy 1000 computers. To use this product in a Tandy 1000, you must obtain a special daughterboard (AXX-7130) from your Radio Shack dealer.

1. Turn your computer off. Unplug your computer, monitor, and all peripherals. Also unplug all AC power cords from the wall outlet.
2. Remove the screws shown in Figure 22 and set them aside. Slide the computer's cover forward to remove it.
3. There are three expansion slots in the Tandy 1000. See Figure 23. You can install the 286 Express Card in any slot, but we suggest using the outside slot, the one labeled J10. Remove the screw and cover plate for the desired slot and set them aside.

CAUTION: The boards and components you will be handling during this procedure are easily damaged by rough handling or electrostatic discharge. Be extremely careful when handling them. Lay the boards on a non-conductive, padded surface when possible, and store or carry chips on non-conductive anti-static foam.

Be especially careful when working on a carpeted surface or when humidity is low, such as during the heating season. To avoid damage from static, always touch a grounded metal object before touching any components.

4. Use the IC extraction tool as shown in Figure 24 to remove your computer's 8088 processor chip. Working slowly and carefully, pry up on one side, then the other, little by little, until the chip comes free. If you try to do too much too soon you'll bend the chip's leads making it hard to re-insert later.
5. Immediately plug the 8088 processor into the daughterboard as shown in Figure 25. Orient the processor so that the notch is pointing away from the I/O cable's connector. Be certain that all pins are aligned with socket holes before pressing the chip into place.
6. If you are installing an 80287 math co-processor, plug it into the empty socket on the 286 Express Card shown in Figure 26.

Make sure that pin 1 on the 80287 math co-processor is matched up with pin 1 on the socket and that all pins are aligned before pressing the chip into place.

7. One end of the I/O cable comes already attached to the daughterboard. Carefully plug the other end into the 8088 socket on your computer's motherboard. Figure 27 shows the empty 8088 socket and how it should look after the cable is installed. Note the location of pin 1.

Make sure that all pins are aligned before pressing the I/O cable's plug into the socket.

Note that pin 21 of the cable socket is clipped off at the factory: your cable is not defective.

8. Plug the daughterboard into the 286 Express Card as shown in Figure 28.
9. Carefully plug the 286 Express Card into the motherboard as shown in Figure 29.
10. Re-use the rear cover plate screw to attach the 286 Express Card to the back of your computer's chassis.
11. Slide the computer's cover back on. As the cover is replaced, fit the I/O cable folds into the "channel" at the left side of the cover. See Figure 30.
12. Reconnect the power cord, monitor, and keyboard.
13. Apply power. If you have done everything correctly, your computer should successfully boot up and display the following start up message. If you system doesn't boot up, see Chapter 7--Troubleshooting.

```
286 Express(tm) GACD V x.xx  
(C) 1987 PC Technologies, Inc.
```

```
System booted on 8088 CPU  
[8087 installed]  
[80287 installed]  
Processor switching supported  
Cache size = 8KB Cache fence = 640KB  
[Press ALT and Right Shift to toggle the cache.]  
[Press ALT < to change to the 8088 and ALT > to change to the 80286.]
```

Depending upon how your system is configured, the statements may not appear as shown, and those enclosed in brackets may not be displayed at all. For instance:

- * The math co-processor statements should only be displayed if you have the associated co-processor installed.
- * The cache fence should reflect the amount of memory set in switches 4-7.
- * If you didn't list the cache parameter in the CONFIG.SYS file, the cache "Hot Key" message will not be displayed.
- * If you didn't list the CPU parameter in the CONFIG.SYS file, the processor switching "Hot Key" message will not be displayed.

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Chapter 6 Software

CPU Switching Software

PCT.EXE is a program that permits you to switch processors, turn caching on and off, and test a number of processor status conditions. PCT.EXE works with or without the EXPRESS.SYS driver.

When included in a batch file, PCT commands which query status set the ErrorLevel to either 0 (tested condition true) or 1 (tested condition false). This permits setting up conditional branch operations within the batch process.

When entered as command statements, PCT.EXE commands can be combined, as in "PCT 286 ON", which simultaneously activates the 286 Express Card's processor and turns caching ON.

Processor Switching

- PCT 286 Activates the 286 Express Card and its 80286 processor.
- PCT 88 Activates your system's original 8088 processor and deactivates the 286 Express Card.
- Typically, you will only want to run in the slower 8088 mode when you are running time-dependent software.
- PCT ALT Instructs the system to use the alternate I/O address. If the alternate I/O address is being used, the ALT parameter must always be included as part of other command statements. For example, you can't just type "PCT 286" to switch to the faster processor; you must type "PCT ALT 286".

Processor Status

- PCT 286? Displays a status message that tells which processor is presently active (e.g., "Now running on the 80286"). When this command is included in a batch file, the ErrorLevel is set to 0 if the 80286 is active.
- PCT 88? Displays a status message that tells which processor is presently active (e.g., "Now running on the 8088"). When this command is included in a batch file, the ErrorLevel is set to 0 if the 8088 is active.

Software

Cache Switching

PCT ON Turns memory caching ON.

PCT OFF Turns memory caching OFF.

Typically, you will only want to run in the slower non-cached mode when you are running software that won't tolerate memory caching.

Cache Status

PCT ON? Displays a status message that tells if memory caching is active. When this command is included in a batch file, the ErrorLevel is set to 0 if caching is ON.

PCT OFF? Displays a status message that tells if memory caching is inactive. When this command is included in a batch file, the ErrorLevel is set to 0 if caching is OFF.

Other System Status

- PCT N? Tests the equipment byte to see if a math co-processor is installed. When included in a batch file, the ErrorLevel is set to 0 if a math co-processor is present.
- PCT N?? Tests the equipment byte and the co-processor hardware and indicates if a math co-processor is installed. When included in a batch file, the ErrorLevel is set to 0 if a math co-processor is present.
- PCT G? Tests to see if the GACD compatible driver (EXPRESS.SYS) has been loaded and appended to DOS. When included in a batch file, the ErrorLevel is set to 0 if the driver is present.
- PCT ?? Displays the system startup message. This message provides the system status of caching, indicates which (if any) math co-processors are installed, and indicates which processor is presently active.
- PCT ? Lists all available options.

Using a “Hot Key” to Switch Processors

The EXPRESS.SYS driver included on the distribution diskette automatically enables the 80286 processor following boot-up unless you have entered the parameter 88 in the driver's command line.

The device driver also allows you to use “Hot Keys” on the keyboard to switch back and forth between modes. The processor “Hot Key” combinations are the ALT > or ALT < keys, pressed simultaneously.

The “Hot Keys” are normally disabled; you must list the CPU parameter as part of the CONFIG.SYS file's DEVICE statement to enable them. See Chapter 2.

Press	To
ALT >	Activate 80286 processor
ALT <	Activate 8088 processor

You may experience problems if you switch processors while in an application. Because of the potential for problems, we strongly suggest that you switch processors only at the DOS prompt.

Here is what causes the problem.

When an application loads, it reads the equipment byte for the current environment and sets a flag that indicates whether or not a math co-processor is present. If your system has the same environment on both sides (no math co-processors, or both an 80287 and an 8087), there is no problem. But if you have only one math co-processor and you switch environments from within the application, the equipment byte is not re-read, so the application will have incorrect information. If your application then attempts to use the non-existent math co-processor, it may “hang”, lose data, or provide inaccurate results.

Caching Software

Why You Turn Memory Caching On and Off

Some programs won't run with memory caching because they are operating faster than they expect to. Memory caching is a technique that avoids the performance penalty of having to access main memory for a piece of information your program needs. It involves anticipating the particular data or program code your application program is going to need again, and keeping it in the 286 Express Card's 8K byte cache memory. Then it is immediately available, resulting in substantially faster processing. Because of performance improvements, you will definitely want to run with memory caching enabled whenever you can. However, this is not always possible. If you find that some of your applications or utilities won't support memory caching, you have a number of choices, all of which are described below.

Using a “Hot Key” to Switch Caching

The EXPRESS.SYS driver included on the distribution diskette automatically turns caching on following boot-up unless you have entered the parameter OFF in the EXPRESS.SYS command line.

EXPRESS.SYS also includes a “Hot Key” routine that lets you turn caching on and off from the keyboard. The “Hot Key” combination is the ALT and right hand SHIFT keys, pressed simultaneously. Each time this key combination is detected, caching is toggled from active to inactive, or vice versa.

The “Hot Key” is normally disabled; you must list the CACHE parameter as part of the CONFIG.SYS file's DEVICE statement to enable it. See Chapter 2.

Using Program Code to Switch Caching

If you are developing applications software that will execute when the 286 Express Card is active, you may need to turn caching on or off at certain points in the program. We have provided a source code file (CACHE.ASM) on the distribution diskette that shows you the type of code needed.

Using a Batch File to Switch Caching

Sometimes caching must be turned off until a particular event occurs. For example, for some clock/calendar software, caching must be disabled until the clock has been set. Otherwise, there is a timing conflict: sometimes the clock gets set, and sometimes it doesn't. For problems like this, include PCT statements in a batch file as shown below to turn caching on and off.

Note that PCT statements should be included twice in the AUTOEXEC.BAT file: once to turn it off and again to turn it back on.

AUTOEXEC.BAT file

```
PCT OFF           (Turns caching OFF)
DOSTIME          (Sets the clock)
other commands
.
.
PCT ON           (Turns caching ON)
```

A Word about Device Drivers

When a Driver is Required

- If your system requires that an 8088 processor be used to perform the "warm boot"
- If you want to use "Hot Keys" to enable/disable cache or to switch processors
- If an EEMS (expanded memory) driver is installed
- If an alternate address is required for the 286 Express Card

When You Must Use EXPRESS.SYS

If you are using a version of DOS that is lower than 3.0, you must use the EXPRESS.SYS driver. Early versions of DOS do not support .EXE type files.

When You Can Use PCT.EXE

If you are using a version 3.0 DOS (or later), the PCT.EXE driver provides the same capabilities as EXPRESS.SYS.

Chapter 7 Troubleshooting

What to Do if Your Computer Won't Boot

1. If your computer fails to boot:
 - 1) Remove power by unplugging the AC power cord, then remove all access covers.
 - 2) Check to make sure the 8088 processor is oriented properly (not turned end-for-end) and that none of its pins are bent over. Also check the daughterboard and the I/O cable to make sure they are all plugged in properly.
 - 3) *On the Tandy 1000SX*, make sure the switches on the motherboard are set properly.
 - 4) Double-check the 286 Express Card's option switches to make sure they are set properly and that the rocker or slide for each switch is fully engaged. Especially check the math co-processor option switches (switches 1, 2, and 10) to make sure they are not all ON. This setting is invalid and prevents the system from booting.
 - 5) Replace covers and re-apply power.
2. Your computer should now boot up.

If you have double-checked your installation and the system will not boot up, contact your dealer or call PC Technologies' Technical Support department at 800/992-4616.

Software Timing Problems

Some software assumes that the computer's microprocessor is running at its standard 4.77 MHz clock speed. Since the 286 Express Card runs at 8 MHz, time-dependent software might not run properly, and in some cases not at all, when the 286 Express Card is active. However, the latest release of most software has been modified to eliminate any dependence on the microprocessor's clock speed and should run correctly. For example, if you are running Smartcomm II software, you need Version 2.1 or later.