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PCM-3810A PC/104 Solid-State Disk Module

Introduction

The PCM-3810A Solid-State Disk Module uses Flash, EPROM, or SRAM chips inserted into its standard 32-pin sockets to emulate one or two floppy disk drives. The PCM-3810A also supports one DOC® 2000 chip to emulate one HDD. The PCM-3810A's two banks of chips provide from 360 KB to 1.44 MB of disk storage space each, depending on the size and number of memory devices.

The PCM-3810A's banks are assigned drive labels (1st, 2nd, 3rd or 4th), or they can be individually disabled. One PCM-3810A drive can be set as the boot drive and copying the necessary boot files to it. The drive designation is purely internal to the module, so you do not need to make any changes to the BIOS setup. DOS will determine the final drive designation.

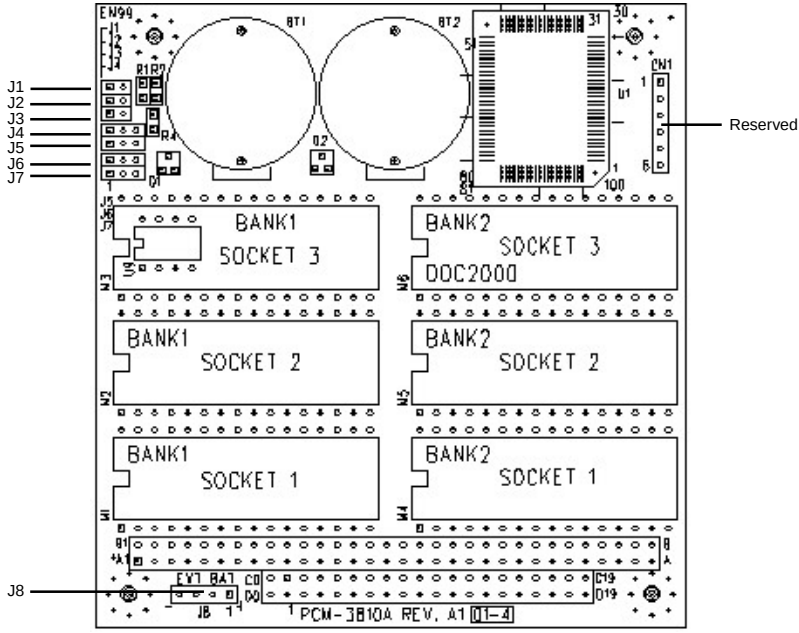
Specifications

- **Board size:** 96 x 90 mm (3.7" x 3.5")
- **Power:** +5 V @ 1 A maximum for normal applications
- **Batteries:** Two 3 V (190 mAHr) lithium back-up batteries
- **Operating temperature:** 0 ~ 60° C (32 ~ 140° F)

Features

- Emulates up to two floppy disk drives (1st, 2nd, 3rd or 4th) under DOS environment
- Disk sizes: 360 KB to 2.88 MB (2 banks linked together)
- Supports one DOC 2000 chip to emulate one HDD
- Drive designation: DOS drive
- 6 individual 32-pin memory sockets, divided into two banks: one bank for each emulated drive.
- Up to two PCM-3810A's can be installed in one PC
- Power-on auto-boot feature
- On-board Flash programming circuitry with easy-to-use menu driven programming utility software
- 2 Lithium back-up batteries (3 V, 190 mAHr) for 3 years of data retention (depending on memory configuration)
- On-board LED signals low battery voltage (< 2.5 V)
- Connector for external battery
- Battery status displayed when booting
- Each card occupies only 16 KB of system memory space

Component Layout



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Initial Inspection

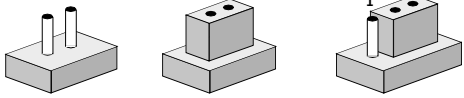
In addition to this user's manual, your shipping box should contain the following items:

- PCM-3810A Dual Flash/RAM/ROM disk card
- A software utility diskette

WARNING! *Discharge your body's static electric charge by touching the back of the grounded chassis of the system unit (metal) before handling the board. You should avoid contact with materials that hold a static charge such as plastic, vinyl, and styrofoam. The board should be handled only by its edges to avoid static damage to its integrated circuits. Avoid touching the exposed circuit connectors.*

Setting Jumpers

You configure the board to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip. To "open" a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case you would connect either pins 1 and 2 or 2 and 3.



The jumper settings are schematically depicted in this manual as follows:



A pair of needle-nose pliers may be helpful when working with jumpers.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

Generally, you simply need a standard cable to make most connections.

External Battery Connector (J8)

You can use an internal/external battery to provide the power for the PCM-3810A by setting J8.

Description	J8
Using Internal Battery Power	4 3 2 1
External Battery Connector	4 3 2 1

Battery Enable/Disable (J5, J6, J7)

The PCM-3810A's 3 V, 190 mAHr Lithium batteries supply power to SRAM chips to enable data retention when you turn off your system's power. You can enable or disable the backup supply for each bank independently by setting J5, J6, and J7 as shown in the following table:

Battery Backup		Enabled	Disabled
Bank 1 Socket 1 - 3		J6: 1 2 3	J6: 1 2 3
Bank 2	Socket 3	J5: 1 2 3	J5: 1 2 3
	Socket 1, 2	J7: 1 2 3	J7: 1 2 3

Note:
1. *If you install SRAM chips on the PCM-3810A, always set the "Battery backup" as "Enabled" to prevent battery power leakage.*
2. *If you install a DOC® 2000 chip on socket 3, bank 2, always set J5 as "disabled" to prevent battery power leakage in bank 2.*

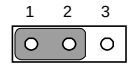
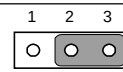
Memory Address Setup (J1, J2, J3)

You can set the PCM-3810A's memory address to ensure compatability with other boards installed in the system.

Memory Address	J1	J2	J3
Disable			
C800			
CC00			
D000			
D400			
D800			
DC00			
E000			

Chip Enabled (J4)

This setting allows you to enable the chip installed on socket 3, bank 2.

Chip Enabled	J4
DOC® 2000	
EPROM/SRAM/Flash	

Memory Device Selection

Memory Devices and Disk Sizes

The table below gives the number of chips required to emulate common floppy disk sizes. The Flash memory chips listed in the table below may be programmed on board.

Device Code	Manu-facturer	Single-chip size (KB)	360 KB	720 KB	1.44 MB	2.88 MB
27C010	ATMEL and AMD	128	x 3	x 6	-	-
27C040	ATMEL and AMD	512	x 1	x 2	x 3	x 6
581000P SRAM	Sony	128	x 3	x 6	-	-
584000 SRAM	Sony	512	x 1	x 2	x 3	x 6
29C010 Flash (+5 V)	ATMEL	128	x 3	x 6	-	-
28F010 Flash (+12 V)	Intel/ AMD	128	x 3	x 6	-	-
29C040	ATMEL	512	x 1	x 2	x 3	x 6

Installing Memory Devices

After you've configured the PCM-3810A, you should install your SRAMs, EPROMs, Flash memories, or one DOC® 2000 chip. These procedures are only intended as a supplement to the information your chip manufacturer has given you. If you are inexperienced in installing chips, you may want to read a good hardware reference book before you begin. One recommendation is by Winn L. Rosch, The Winn Rosch Hardware Bible (New York; Brady), 1989.

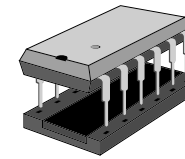
Warning! *Ground yourself when handling memory devices and insert them with as little force as possible!*

Make sure that you are properly grounded before handling memory devices or the board. You can discharge any static electricity you may have built up by touching the case (metal) of your computer before you begin installation. You should also avoid contact with materials that hold a static charge such as plastic, vinyl, and styrofoam. Avoid touching the exposed circuit connectors.

❖ Treat connectors gently

The legs of integrated circuits are delicate, and may bend before reaching the bases of sockets. Inspect each leg before you begin, test-fit it gently into the socket, and straighten any bent legs before you insert.

❖ Install memory chips with the correct orientation



Memory chips must be installed the correct way around. If this is not done the chip will be damaged. Each chip and it's corresponding socket will have a small ident (or spot) at it's top end. These must be aligned when the chip is inserted into the socket.

❖ Don't mix chips of different capacities

You should only install one type of chip (Flash, RAM, or ROM) in a single bank, and you should also install only chips of the same size.

Note: For bank 2, you can install one DOC 2000 chip on socket 3, and two EPROM/SRAM/Flash chips of the same type and size on sockets 1 and 2. Refer to page 5 for the "IC type" and the "DOC 2000 type" options for software configuration.

Static Random Access Memory (SRAM)

Memory chips are either volatile or nonvolatile. Volatile memories require a constant application of current in order to retain memory, provided by the PC or a backup battery, while nonvolatile memories require current only for write operations. SRAMs are volatile and do not require any external devices for programming or erasing. Instead, they can be formatted, read, and written to as if they were DOS-compatible mechanical drives.

Erasable Programmable Read-Only Memory (EPROM)

Unlike SRAMs, EPROM devices are nonvolatile. They do not require battery backups, and a power loss will never harm the data they store. They are the least expensive of the three types of memory your PCM-3810A will accept. However, they require use of the utility program for writing and formatting. In addition, whereas flash memories may be erased while installed in the PCM-3810A, EPROMs must be removed for use with an external UV EPROM eraser.

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Flash Memory

Flash memory, the newest memory type and was developed to eliminate the disadvantages of both SRAMs and EPROMs, and offer greater flexibility than either. They are nonvolatile, requiring no battery backup, and in some cases can be erased and reprogrammed while on the PCM-3810A board.

The PCM-3810A supports two different kinds of Flash memories, the ATMEL 29C010, 29C040 (both +5 V) memory, and the AMD/INTEL 28F010 (+12 V) memory. Advantages and disadvantages of each are summarized below.

ATMEL 29C010/29C040 (+5 V)

Advantages:	Can be read, written to, and formatted with normal DOS commands while still within their sockets. Offers greater reliability than SRAMs
Disadvantages:	Slower to format and write data to than SRAMs. More expensive than SRAMs

AMD/INTEL 28F010 (+12 V)

Advantages:	Does not need to be removed for erasing or reprogramming. Low cost
Disadvantages:	Can only be erased and reprogrammed with the PCM-3810A utility program

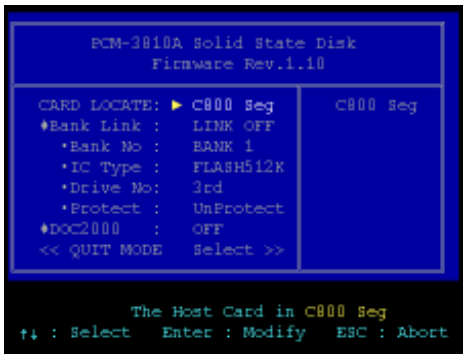
Software Configuration

This section details how to configure the card to match your application requirements.

Configuration

To configure the PCM-3810A with software, install the PCM-3810A into your computer system, turn on the computer, and boot up the computer. While your computer is booting up, press the "Alt" and "S" keys simultaneously. The main program screen will then appear with the following options:

The Card Locate" option

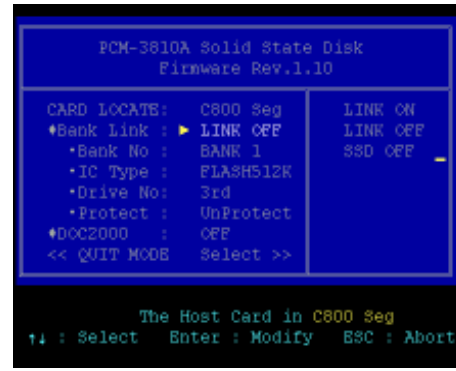


If you install more than one PCM-3810A in your system, and each PCM-3810A has its own memory address, the "card locate" function allows you to modify each PCM-3810A as follows:

1. Move the cursor (by pressing the "↑" or "↓" key) to "CARD LOCATE" and press "Enter".
2. Choose the memory address of the PCM-3810A card which you are going to modify.
3. Press "Enter".

You have now chosen the card you are going to modify. Move the cursor to the next option which you want to modify.

The "Bank Link" option

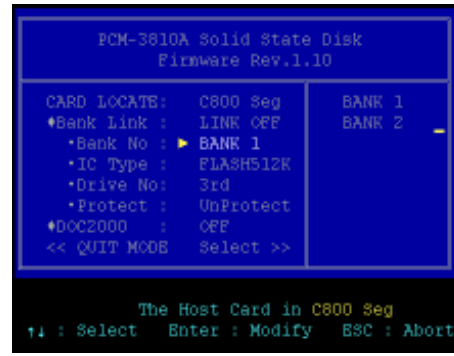


Each bank of the PCM-3810A emulates one FDD (up to 1.44 MB). The "bank link" function allows you to link the PCM-3810A's two banks together to form a single bank with larger memory capacity (2.88 MB). The "bank link" function also allows you to set the PCM-3810A as a memory card for your system. (But this does not emulate a FDD.)

1. Move the cursor (by pressing the "↑" or "↓" key) to "Bank Link" and press "Enter".
2. If you want to link the two banks of PCM-3810A as one bank, choose "LINK ON". If you want to separate the PCM-3810A's two banks, choose "LINK OFF".
3. If you want to set the PCM-3810A as a memory card for your system (but not emulate a FDD), choose "SSD OFF".

You have finished the "bank link" function setting. Move the cursor to the next option which you want to modify.

The "Bank No." option



The "Bank No." option allows you to choose the bank which you are going to modify.

1. Move the cursor (by pressing the "↑" or "↓" key) to "Bank No" and press "Enter".
2. Choose the bank which you are going to modify and press "Enter".

You have finished the "Bank No." function setting. Move the cursor to the next option which you want to modify.

The "IC Type" option

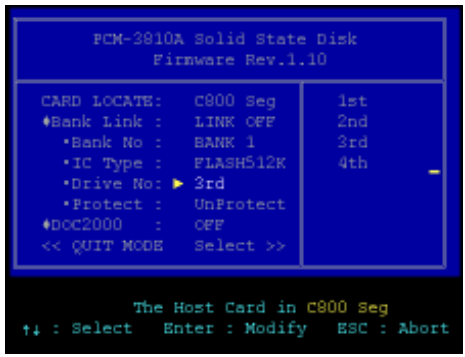


The "IC Type" option allows you to set the type of ICs which you are going to install or have installed on the bank you are modifying. If you want to install a DOC 2000 on the PCM-3810A, refer to the "DOC 2000" option.

1. Move the cursor (by pressing the "↑" or "↓" key) to "IC Type" and press "Enter".
2. Choose the type of IC (by pressing the "↑" or "↓" key) that you are going to install or have installed on the PCM-3810A. Then press "Enter".
3. If you choose "Bank OFF" and press "Enter", the bank you are modifying will be turned off, and you will be unable to make any further modifications. To turn on the bank again, choose one type of IC and press "Enter".

You have now finished the "IC Type" function setting. Move the cursor to the next option which you want to modify.

The "Drive No." option



You can set the bank you are modifying as the 1st, 2nd, 3rd or 4th FDD for your system.

1. Move the cursor (by pressing the "↑" or "↓" key) to "Drive No" and press "Enter".
2. Choose 1st (drive A:), 2nd (drive B:), 3rd (drive C:) or 4th (drive D:) for the bank you are modifying.
3. Press "Enter".

You have now finished the "Drive No." function setting. Move the cursor to the next option which you want to modify.

The "Protect" option



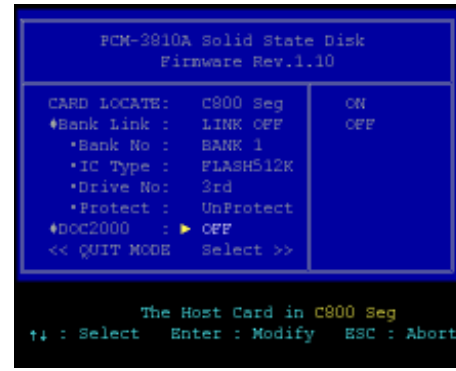
When you use the bank you are modifying to emulate a FDD, you can set the bank to "write enable" or "read only".

1. Move the cursor (by pressing the "↑" or "↓" key) to "Protect" and press "Enter".
2. If you want the bank you are modifying to be writable, choose "Unprotect". If you want the bank you are modifying to be read only, choose "Protect".

3. Press "Enter".

You have now finished the "Protect" function setting. Move the cursor to the next option which you want to modify.

The "DOC® 2000" option



This function allows you to install a DOC 2000 chip on the 3rd socket of bank 2 to emulate one HDD.

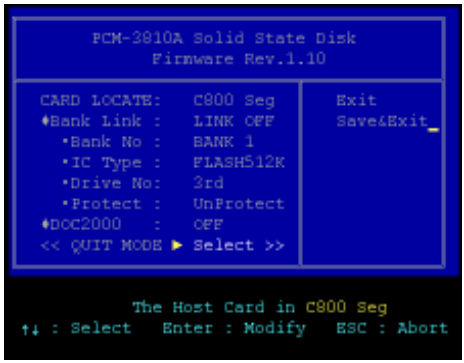
1. Move the cursor (by pressing the "↑" or "↓" key) to "DOC 2000" and press "Enter".
2. If you want to install a DOC 2000 chip on the 3rd socket of bank 2, choose "ON". Otherwise, choose "OFF".

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3. Press "Enter".

You have now finished the "DOC 2000" function setting (refer to the DOC 2000 User Manual for more detailed information). Move the cursor to the next option which you want to modify.

The "Quit Mode" option



After you have finished all of you modifications, move the cursor to "QUIT MODE" and press "Enter". If you want to save the modifications you have just made, choose "Save & Exit". If you want to abandon the modifications you have just made, choose "Exit".

You have now finished the PCM-3810A's firmware modifications.

Utility Software

The PCM-3810's utility software provides BIOS upgrade, BIOS backup, memory chips copy, and a memory chips test for the PCM-3810A.

Cardprog

This software provides BIOS backup and BIOS upgrade functions for the PCM-3810A.

DOS command:

```
Cardprog/win:[segment]/<switch>:[filename]
```

Switch options:

`S` -save BIOS image into a file (i.e. BIOS backup)

`W` -upgrade BIOS

Example 1 - BIOS backup:

```
C:\>cardprog /win:C800 /S:3810A.bin
```

Copy the BIOS of PCM-3810A (located in the C800 segment) to the file 3810.bin located in drive C:.

Example 2 - upgrade BIOS:

```
C:\>cardprog /win:C800 /W:3810Av30.bin
```

Upgrade the BIOS of PCM-3810A (located in the C800 segment) from the file 3810Av30.bin located in drive C:.

Cardfile

This software provides memory chips copy and test for the PCM-3810A.

DOS command:

```
Cardfile /win:[segment] /<switch>:[filename] /
d:[device] /n:[begin chip]-[end chip]
```

Switch options:

`S` -copy data from chips to files

`W` -write data from files to chips

`T` -test memory chips

Device options:

`erm128`	-EPROM	128K
`srm128`	-SRAM	128K
`flh128`	-Flash	128K
`erm512`	-EPROM	512K
`srm512`	-SRAM	512K
`flh512`	-Flash	512K

Begin chip/end chip options:

`1` -the first chip (located on socket 1, bank 1)

`2` -the second chip (located on socket 2, bank 1)

`3` -the third chip (located on socket 3, bank 1)

`4` -the fourth chip (located on socket 1, bank 2)

`5` -the fifth chip (located on socket 2, bank 2)

`6` -the sixth chip (locate on socket 3, bank 2)

Example 3 - copy data from chips to files:

```
C:\> cardfile /win:C800 /S:rom /d:srm128 /n:3-6
```

Copy the data in the PCM-3810A's SRAM chips 3, 4, 5, and 6 (located in segment C800) to files rom.3, rom.4, rom.5 and rom.6, respectively. Press “Enter” and the following message will appear on the screen:

```
CardFile Version 1.0 for Solid State Disk

_____________________________________________

Found the SSD Card in C800.....

write chip 3 to rom.3
write chip 4 to rom.4
write chip 5 to rom.5
write chip 6 to rom.6

_____________________________________________
```

Example 4 - write data from files to chips:

```
C:\> cardfile /win:C800 /w:rom /d:srm128 /n:3-6
```

Copy the data from rom.3, rom.4, rom.5, and rom.6 to the PCM-3810A's SRAM chips 3, 4, 5, and 6 respectively (located in segment C800). Press “Enter” and the following message will appear on the screen:

```
CardFile Version 1.0 for Solid State Disk

Found the SSD Card in C800.....

write rom.3 to chip 3

write rom.4 to chip 4

write rom.5 to chip 5

write rom.6 to chip 6
```

Example 5 - test memory chips:

Note: Before you execute the test command, copy the data in the chips being tested to other chips or files first. The data in the chips being tested will be overwritten by the test data once you execute the test command.

```
C:\> cardfile /win:C800 /t /d:flh128 /n:2-5
```

Test the PCM-3810A's Flash chips 2, 3, 4 and 5 (located in segment C800). Press “Enter” and the following message will appear on the screen:

```
Found The SSD Card in C800

write test data .....

write test data to chip 2

write test data to chip 3

write test data to chip 4

write test data to chip 5

check test data .....

check test data from chip 2

test ok

check test data from chip 3

test ok

check test data from chip 4

test ok

check test data from chip 5

test ok
```

Pin Assignments

All PC/104 modules follow the same pin assignments as shown in the table below:

PC/104 Bus signal assignments

Number	Row A	Row B	Row C	Row D
0	--	--	0 V	0 V
1	IOCHCHK	0 V	SBHE	MEMCS16
2	SD7	RESETDRV	LA23	IOCS16
3	SD6	+5 V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	-5 V	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ15
7	SD2	-12 V	LA18	IRQ14
8	SD1	ENDXFR	LA17	DACK0
9	SD0	+12 V	MEMR	DRQ0
10	IOCHRDY	(KEY)	MEMW	DACK5
11	AEN	SMEMW	SD8	DRQ5
12	SA19	SMEMR	SD9	DACK6
13	SA18	IOW	SD10	DRQ6
14	SA17	IOR	SD11	DACK7
15	SA16	DACK3	SD12	DRQ7
16	SA15	DRQ3	SD13	+5 V
17	SA14	DACK1	SD14	MASTER
18	SA13	DRQ1	SD15	0 V
19	SA12	REFRESH	(KEY)	0 V
20	SA11	SYSCLK	--	--
21	SA10	IRQ7	--	--
22	SA9	IRQ6	--	--
23	SA8	IRQ5	--	--
24	SA7	IRQ4	--	--
25	SA6	IRQ3	--	--
26	SA5	DACK2	--	--
27	SA4	TC	--	--
28	SA3	BALE	--	--
29	SA2	+5 V	--	--
30	SA1	OSC	--	--
31	SA0	0 V	--	--

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