Industrial PC Products

User's Manual

PCD-890
Dual Flash/RAM/ROM
Disk Card
User's Manual

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CHAPTER 1. INTRODUCTION

1.1. Description

The PCD-890 uses Flash, EPROM, or SRAM chips inserted into its standard 32-pin sockets to emulate one or two floppy disk drives. Up to two PCD-890s can be installed in your PC, for a total of four emulated drives. Advantages of the PCD-890 over mechanical disk drives include greater reliability, higher speed, and greater temperature resistance. The PCD-890's two banks of chips provide from 360 KB to 6 MB of disk storage space each, depending on the size and number of memory devices. The banks can be linked together to emulate one drive of up to 12 MB.

The PCD-890's banks are assigned drive labels using jumpers as either "1st", "2nd", "3rd", or "4th". If the PCD-890 is assigned to "1st" (or "2nd") FDD in your system, the physical floppy drive A:(or B:) will be replaced by the PCD-890's drive. The drive designation set by the PCD-890's jumpers is purely internal to the PCD-890; you do not need to make any changes to your BIOS. DOS will determine the final drive designation. The PCD-890's banks can be individually disabled, using jumpers or the utility program, if you should want to use the corresponding floppy drive. One PCD-890 drive can be set as the boot drive by setting its jumpers for drive "1st" and copying to it the necessary boot files.

The PCD-890's drive will not replace a hard drive in your system. The hard drive will remain active and keep its original drive label. DOS will assign the PCD-890's drive the next available drive label. For example, if you also have a hard drive installed, and your PCD-890's jumpers are set so that its banks are designated "3rd" and "4th", the hard drive will overrule the PCD-890 and take the drive label "C" and the PCD-890's drives will be redesignated as drives "D" and "E". Note that the PCD-890's utility program will continue to refer to each bank according to its jumper setting, **not** its DOS drive designation.

An on-board watchdog timer is included which protects your applications from system standstills by resetting the CPU if processing should come to a halt due to electromagnetic interference (EMI) or software bugs. This is particularly useful for stand-alone or unmanned applications.

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1.2. Features

- Emulates up to two floppy disk drives

- Disk sizes: 360 KB to 12 MB (both banks linked together)

- Drive designations: DOS drive 1st, 2nd, 3rd, or 4th

- 24 individual 32-pin memory sockets, divided into two banks—one bank for each emulated drive. Accepts 128Kx8 Flash/EPROM/SRAM, 512Kx8 EPROM/SRAM

- Up to two PCD-890's can be installed in one PC

- Fully software-compatible with physical floppy disk drives, it requires no special software development or drivers.

- Power-on auto-boot feature; user-defined password and user's prompt, excellent for OEM's

- On-board EPROM programming circuitry with easy-to-use menu driven programming utility software

- Lithium back-up battery (3.6 V, 1.8 AHr) for 5-years of data retention (depending on memory configuration)

- On-board LED signals low battery voltage (< 2.6 V)

- Connector for external battery

- Battery and watchdog timer status displayed when booting

- Each card occupies only 16 KB of system memory space

- Watchdog timer with selectable time-out period (100 msec or 1.6 seconds)

- Connector with pins for +5 V, +12 V, GND, PFO (Power Failure Output) and WDO (Watchdog Output) signals

1.3. Specifications

Board size: 13.3" (L) x 4.2" (W) (340 mm x 107 mm)

Power: +5 V @ 1 A maximum for normal applications,
+12 V @ 300 mA maximum for programming EPROMs

Battery: 3.6 V (1.8 AHr) lithium back-up battery

Operating temperature: 32 to 140°F (0 to 60°C)

1.4. Initial Inspection

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

- The PCD-890 Dual Flash/RAM/ROM disk card

- A software diskette, with utility programs for the PCD-890

    The PCD-890 was carefully inspected both mechanically and electrically before being shipped. It should be free of marks and scratches and in perfect working order on receipt. Check the unit for signs of shipping damage (damaged box, scratches, dents, etc). If there is any damage to the unit or it fails to meet specifications, notify our service department or your local sales representative immediately. Also, call the carrier immediately and retain the shipping carton and packing material for inspection by the carrier. We will then make arrangements to repair or replace the unit.

    Remove the card from its protective packaging by grasping the rear metal panel. Keep the anti-vibration packing. Whenever you remove the card from the PC, it should be stored in this package for protection.

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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.

CHAPTER 2. JUMPERS, SWITCHES AND CONNECTORS

This chapter describes the configuration of the majority of the PCD-890's options. Exceptions are memory and I/O addresses, discussed in Chapter 3. Many options can also be set using the utility program, described in Chapter 5.

Please take the time now to familiarize yourself with the PCD-890's layout, illustrated in Figures 2-1 and 2-2.
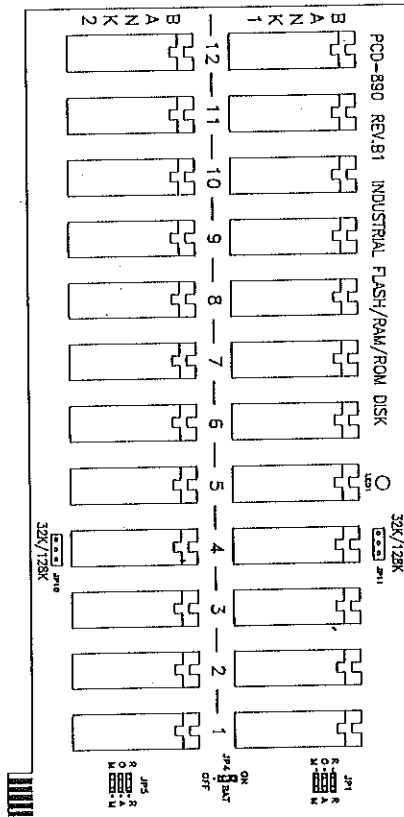
Figure 2-1
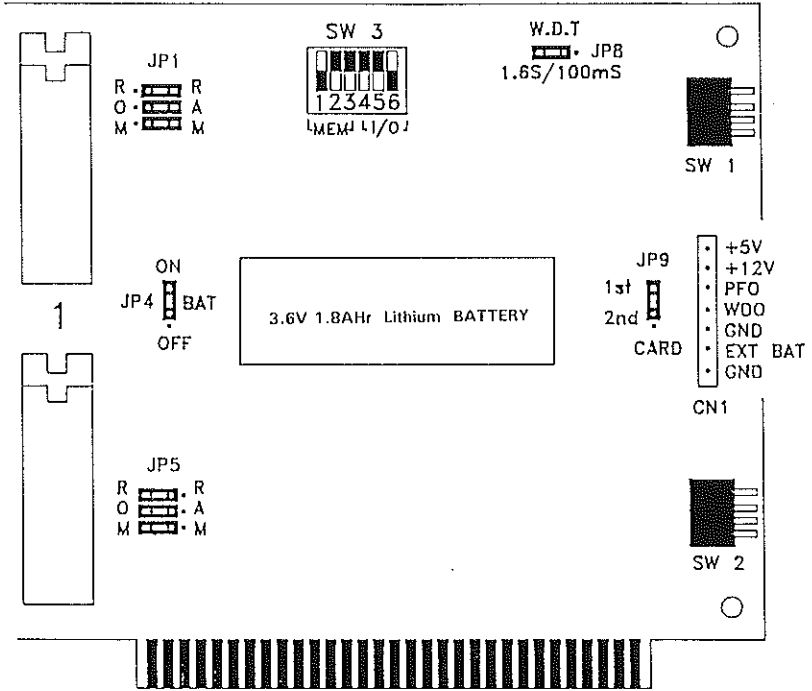
Figure 2-2

2.1. Jumper Setting

Most of the configuration for your PCD-890 is done by setting or removing jumper blocks on jumper pins. In the following diagrams the state of each jumper is indicated as follows:

> x x   =   Jumper pins closed
> o o   =   Jumper pins open

2.1.1. Memory Device Type (JP1 and JP5)

The PCD-890 has two banks for Flash/RAM/ROM chips, each of which consists of 12 32-pin sockets, numbered 1 through 12. Each bank must be filled with chips of the same type (i.e. all RAM chips, etc.), but the two banks may be different (e.g. bank one can hold RAM chips while bank two holds Flash memory chips), except when both banks are linked to emulate one large disk. Jumpers JP1 and JP5 select the type of chips installed in each bank, as shown in Table 2-1, below. Jumper JP1 corresponds to bank 1, JP5 to bank 2.

Flash/ROM					RAM				
R	x	x	o	R	R	o	x	x	R
O	x	x	o	A	O	o	x	x	A
M	x	x	o	M	M	o	x	x	M

Table 2-1

2.1.2. Memory Device Size (JP10 and JP11)

The size of the memory chips to be installed is set using jumpers JP10 and
JP11. Jumper JP11 corresponds with bank 1, and JP10 corresponds with bank
2. Set the jumpers as shown in the Table 2-2 below. For 32 KB chips, select
the first position; for 128 KB or larger chips, select the second position.

Jumper	Memory device size	Setting
JP11 (Bank 1)	32 K	x x o
	128 K or larger	o x x
JP10 (Bank 2)	32 K	x x o
	128 K or larger	o x x

Table 2-2

2.1.3. SRAM-backup Battery Enable/Disable (JP4)

The PCD-890 is equipped with a 1.8 Ahr, 3.6 V Lithium battery that supplies
power to SRAM chips for data retention when you turn off your system's
power. (The PCD-890 also provides a connection (at CN1) for an optional
external battery input. See Section 2.3 for information.)

JP4 is used to enable or disable the PCD-890's backup battery, as shown in Table 2-3, below:

JP4	
Battery enabled	Battery disabled
x ON x BAT o OFF	o ON x BAT x OFF

Table 2-3

Warning!: The battery must be disabled when both bank using EPROM or Flash memory devices, or when using an external battery, otherwise, the battery may be explode or be completely discharged.

The battery has a life expectancy of at least 5 years, depending on the number of SRAMs installed. The battery life expectancy calculation is shown below:

Battery Life Expectancy (BLE) = Battery capacity (in amp-hours) / maximum SRAM consumption.

Battery capacity: 1800 mAH = 1800 x 1000 μAH
SRAM consumption: 1 μA/chip
Maximum consumption: 30 μA (for 24 SRAM chips)

BLE = (1800 x 1000)μAH/30 μA = 60,000 hours = 2500 days = 6.8 years

2.1.4. Number of PCD-890s in System (JP9)

You can install up to two PCD-890s in your system at one time, allowing you to emulate up to four floppy drives. If you will be installing two cards, set Jumper JP9 to the second position on the second card. JP9 on the first card's should remain in the default position first position. See Table 2-4, below:

JP9			
1st card		2nd card	
x	1st	o	1st
x		x	
o	2nd	x	2nd

Table 2-4

See Chapter 3 for information on setting the two cards' memory addresses, etc.

2.1.5. Watchdog Timer Setting (JP8)

The PCD-890's watchdog timer changes its output status if CPU processing comes to a standstill because of EMI, power drops, or a software bug (such as an infinite loop). The timer outputs on the watch dog output (W.D.O.) pins of connector CN1, described in Section 2-3. You can set the watchdog to monitor the CPU at intervals of either 100 ms or 1.6 seconds. JP8 sets the timer interval. To use the timer, you must write a program that refreshes it periodically. Chapter 6 has a description of the watchdog timer's function and a sample program. See Table 2-5 for settings.

Watchdog Timer (JP8)	
Jumper setting	Time delay
x x o	100 msec
o x x	1.6 sec

Table 2-5

2.2. Switches SW1 and SW2

Switches SW1 and SW2 are used to enable and disable individual banks and set their write protection and drive designation.

2.2.1. Enabling and Disabling Banks

Each of the PCD-890's banks can be enabled or disabled by toggling switch number 4 on SW1 (bank 1) or SW2 (bank 2). Disabling each bank returns control to its corresponding floppy disk drive (if the floppy drive exists). Table 2-6 lists the settings for switch position 4 of each switch.

SW4 →

Position 4	Status
ON	Bank enabled
OFF	Bank disabled

Table 2-6

2.2.2. Write Protection

Hardware write protection for each bank is set with switch position 3 on SW1 (bank 1) or SW2 (bank 2). This prevents data stored on the PCD-890 from being changed. Banks can also be write protected using the utility program, as described in Chapter 5. Switch settings are shown in Table 2-7, below.

Position 3	Status
ON	Bank can be written to
OFF	Bank is write protected

Table 2-7

2.2.3. Bank Drive Designation

The PCD-890's banks can be assigned PCD-drive labels using jumpers as either "1st", "2nd", "3rd", or "4th". This assignment is purely internal to the PCD-890, how drives are designated by DOS depends on the current system configuration (i.e. how many floppy drives, how many hard drives).

Designate as "1st" or "2nd" FDD:

If a PCD-890 bank is assigned to "1st" or "2nd", DOS will reassign its DOS drive to the PCD-890 bank to replace the floppy. The floppy drive is not reassigned to another DOS drive. A PCD-890 bank can be individually enabled or disabled, using jumpers or the utility program, if you should want to use the corresponding floppy drive. One of the PCD-890 drives can be set as the boot drive by setting its jumpers for drive "1st" and copying to it the necessary boot files. Boot drive setup is described in section 2.2.4.

Designate as "3rd" or "4th" FDD:

DOS acts differently if there is a hard disk in your system. In this case DOS won't reassign its logical drive to the PCD-890 bank, instead the hard drive will keep its original DOS drive assignment and remains active. DOS will assign the PCD-890's drive to the next available DOS drive. For example, if you have a hard disk installed that is assigned to DOS drive "C", and your PCD-890's jumpers are set so that its banks are designated "3rd" and "4th", DOS will overrule the PCD-890 settings and leaves the "C" assignment to the hard disk. The PCD-890's drives will be redesignated as the next available DOS drives: "D" and "E".

Set positions 1 and 2 of switch banks SW1 or SW2 according to Table 2-8.

Position 1	Position 2	Bank drive name
ON	ON	1st
ON	OFF	2nd
OFF	ON	3rd
OFF	OFF	4th

Table 2-8

2.2.4. Setting Up an Auto-boot Drive

When designating one of the PCD-890's banks as an auto-boot drive, you will need to temporarily switch the drive designation of the bank from which you will boot to a letter different from "1st" to keep the computer from booting until it has been prepared and/or to allow you to use the floppy disk to load it with files. The drive letter you choose should be different from the other emulated drive designations.

You will need to add whatever DOS system files that will boot up and configure your system to the source diskette or hard disk directory described above. These files include COMMAND.COM and the two hidden system files (transferred using the SYS command). AUTOEXEC.BAT and CONFIG.SYS files may also be copied, as well as any DOS files required by your applications (ANSI.SYS, etc.).

When you are finished setting up the bank, simply change the bank's drive designation to "1st", and reboot.

2.3. External Connections (CN1)

Pin connector CN1 provides connections for an external battery input, power source (+5 V and +12 V), power failure output (P.F.O.), and watchdog timer output (W.D.O.) connections, as shown in Figure 2-2, below:

```
o    +5  V
o    +12  V
o    P.F.O.
o    W.D.O.
o    GND
o    EXT.  BAT.  (+)
o    EXT.  BAT. GND  (-)
```

Figure 2-2

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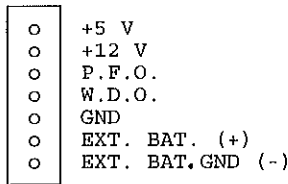
The CN1 connector's functions are described below:

- Power Failure Output (P.F.O): The PCD-890's P.F.O. normally outputs its signal at a high TTL level. If the on-board lithium battery's voltage falls below 2.6 V, the P.F.O.'s signal will output at a low TTL level. See also Section 2-4.

- Watchdog Timer Output: The W.D.O. also outputs at a high TTL level. If the watchdog timer is not refreshed within its 100 ms interval or 1.6 second, its signal will output at a low TTL level. The time delay is set with jumper JP8, as described in Section 2.1.5.

- External Battery: To connect an external backup battery to CN1, use the Ext. Bat. (+) and Ext. Bat. GND (-) connections on CN1.

2.4. Low-power Indicators

If your external battery's voltage drops below 2.6 V, the red LED midway along the top side of the PCD-890 will light (and remain lit), and a warning message will appear on your computer's screen every time you boot up. See also P.F.O., above.

CHAPTER 3. MEMORY DEVICE SELECTION

3.1. Memory Address (SW3)

You should set the PCD-890's memory address to avoid conflicts with your system board's memory addresses. To set the PCD-890's memory address, locate DIP switch SW3 and set the first three switches according to the specifications outlined in Table 3-1 (* indicates the default setting). If you are installing two PCD-890's, they must occupy the same memory address. Set their dip switch banks identically.

Memory Address Setting			
1	2	3	Address (Hex)
ON	ON	ON	C0000 - C3FFF
ON	ON	OFF	C4000 - C7FFF
ON	OFF	ON	C8000 - CBFFF
ON	OFF	OFF	CC000 - CFFFF
OFF	ON	ON	* D0000 - D3FFF
OFF	ON	OFF	D4000 - D7FFF
OFF	OFF	ON	D8000 - DBFFF
OFF	OFF	OFF	DC000 - DFFFF

* Factory default setting

Table 3-1

3.2. I/O Address (SW3)

Positions 4, 5, and 6 on SW3 set the PCD-890's I/O address to avoid conflicts with other installed boards. To set these switches, see Table 3-2, below.

I/O Address Setting			
4	5	6	Address
ON	ON	ON	200 - 207
ON	ON	OFF	*240 - 247
ON	OFF	ON	280 - 287
ON	OFF	OFF	2C0 - 2C7
OFF	ON	ON	300 - 307
OFF	ON	OFF	340 - 347
OFF	OFF	ON	380 - 387
OFF	OFF	OFF	3C0 - 3C7

* Factory default setting

Table 3-2

Working with two PCD-890's

If you are planning to use two PCD-890s in your computer, it is important that you give the second PCD-890 an I/O address different from that of the first to avoid firmware conflicts. For example, if you set the first PCD-890 to I/O address 240-247 (hex), then you might set the second PCD-890 to I/O address 280-287 (hex). However, both PCD-890s **must** occupy the same memory address (see Section 3.1, above).

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CHAPTER 4. MEMORY DEVICE SELECTION AND INSTALLATION

4.1. Memory Devices and Disk Sizes

Table 4-1 gives the number of chips required to emulate common floppy disk sizes. The EPROMs and Flash memory chips listed in Table 4-1 may be programmed on board. Some compatible SRAM and EPROM chips are listed in Tables 4-2 and 4-3, respectively.

Device Code	Manufacturer	Single-chip size (in KB)	360 KB	720 KB	1.2 MB	1.44 MB	2.88 MB	6 MB	12 MB
27C010 EPROM	ATMEL and AMD	128	x 3	x 6	x 10	x 12	x 24	-	-
27C040 EPROM	ATMEL and AMD	512	x 1	x 2	x 3	x 3	x 6	x 12	x 24
58256 SRAM	Sony	32	x 12	-	-	-	-	-	-
581000P SRAM	Sony	128	x 3	x 6	x 10	x 12	x 24	-	-
584000P SRAM	Sony	512	x 1	x 2	x 3	x 3	x 6	x 12	x 24
29C010 Flash (+5 V)	ATMEL	128	x 3	x 6	x 10	x 12	x 24	-	-
28F010 Flash (+12 V)	Intel/AMD	128	x 3	x 6	x 10	x 12	x 24	-	-

▓ Requires that banks one and two be linked

Table 4-1

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Maker	Chip Code	Size(in KB)
OKI	MSM51256 RS MSM51257LRS/GS	32 32
NEC	MPD43256A	32
TOSHIBA	TC55256PL/FL	32
FUJITSU	MB84F256 MB84256A MB841000	32 32 128
AKM	AKM62256LP AKM628428	32 128

Table 4-2 Some Compatible SRAMs

Maker	Code
HITACHI	HN27C1024G
NS	NMC27C010
NEC	MPD27C1001A
TOSHIBA	TCS71000D
FUJITSU	MBM27C1001
MITSUBISHI	M5M27C101K

Table 4-3 Some Compatible EPROMs (require external programmer)

4.2. Installing Memory Devices

After you've configured the PCD-890, you should install your SRAMs, EPROMs, or Flash memories. 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 Winn L. Rosch, The Winn Rosch Hardware Bible (New York; Brady), 1989.

● **Ground yourself when handling memory**

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 merely 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.

● **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.

4.3. Static Random Access Memory (SRAM)

Memory chips are either volatile or non-volatile. Volatile memories require a constant application of current in order to retain memory, provided by the PC or a backup battery, while non-volatile memories require current only for write operations. SRAMs are volatile, don't 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.

4.4. Erasable Programmable Read-Only Memory (EPROM)

Unlike SRAMs, EPROM devices are nonvolatile. They don't require battery backups, and a power loss will never harm the data they store. They're the least expensive of the three types of memory your PCD-890 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 PCD-890, EPROMs must be removed for use with an external UV EPROM eraser.

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4.5. Flash Memory

Flash memory, the newest memory type, 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 PCD-890 board.

The PCD-890 supports two different kinds of Flash memories, the ATMEL 29C010, a 128 KB, +5 V memory, and the AMD/INTEL 28F010, a 128 KB, +12 V memory. Advantages and disadvantages of each are summarized below.

ATMEL 29C010 (+5 V)

Advantages: Can be read, written to, and formatted with normal DOS commands while within a socket
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 PCD-890 utility program

CHAPTER 5. THE UTILITY PROGRAM

This chapter shows how to use the PCD-890's utility program to setup and program the Flash/RAM/ROM disk drives. Before you continue, make sure that you have correctly configured the jumpers and that the PCD-890 is fully installed in your system chassis and all external connections made. Prepare a source diskette or a directory on your hard disk to contain the application programs or data that you will write to the emulated drives.

The PCD-890's utility program is where you select, configure, and write-protect the Flash/RAM/ROM devices. Other functions allow you to select programs and data files and transform them into binary files which can then be loaded into EPROM or Flash memory chips using an external programmer (Make rom, F2), set a password to restrict access to the PCD-890's drives (F3), set a prompt to be displayed when accessing the drives (F4), or write programs and data to on-board EPROM or Flash memory chips (RomCopy, F5).

5.1. Configuration

Turn on and boot up your computer. To run the utility program, insert the utility disk in drive A (or go to the directory on your hard disk that contains the utility program files), type "890" and press the Enter key. The utility program's main screen will appear, shown in Figure 5-1.

```
╔════════════════════════════════════════════════════════════════════╗
║                      (C) 1993 ADVANTECH CO.,LTD.                     ║
║       PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.1  ║
╠════════════════════════════════════════════════════════════════════╣
║                                                                      ║
║               DEVICE TYPE      DISK SIZE       WRITE PROTECTION       ║
║                                                                      ║
║  1st FDD (A:)  PHYSICAL DISK    1.2MB DISK                            ║
║                                                                      ║
║  2nd FDD (B:)  128K EPROM/FLASH  1.44MB DISK    BOTH WRITE/READ       ║
║                                                                      ║
║  3rd FDD (C:)  NOT INSTALLED                                         ║
║                                                                      ║
║  4th FDD (D:)  NOT INSTALLED                                         ║
║  ════════════════════════════ MESSAGE ════════════════════════════  ║
║                                                                      ║
║   Press ENTER to select memory device !                             ║
║                                                                      ║
╚════════════════════════════════════════════════════════════════════╝
 ESC->Exit  ENTER->Select  F2->Make rom  F3->Password  F4->Prompt  F5->RomCopy
```

Figure 5-1

The main screen is used to configure the PCD-890. Use the arrow keys to select a particular configuration option and press the ENTER key until the setting is correct. Options are explained below:

> DEVICE TYPE selects the memory device type and size installed in the sockets for each enabled emulated drive. The following choices are available: 32 KB SRAM, 128 KB SRAM, 128 KB EPROM/FLASH, 512 KB SRAM, and 512 KB EPROM. The utility program will scan the system upon beginning. Any floppy disks will be labeled PHYSICAL DISK. If no drive is installed, it will read NOT INSTALLED.

> DISK SIZE selects the storage capacity of the resulting emulated disk, depending on the size and number of memory devices inserted in the PCD-890's banks. The following disk sizes may be emulated: 360 KB, 1.2 MB DISK, 720 KB, 1.44 MB, 2.88 MB, 6 MB, and 12 MB.

> WRITE PROTECTION determines whether disk can be written to. WRITE PROTECT should be selected to keep data from being changed. BOTH WRITE/READ should be selected before formatting or writing data to the disk.

For example, if you are using 12 128 Kbyte SRAMs to emulate a 1.44 MB disk drive (the factory default setting), and you want a 1.44 MB RAM disk drive, select 1.44MB (128KB*12) by pressing the Enter key until your choice appears in the window. To exit the program, hit the ESC key. The following message will appear: (R)eboot or (Q)uit. Hit "R" to save the configuration changes that you have made and reboot the computer, loading the new configuration into the PCD-890. Hit "Q" to quit the utility program without saving any changes to the PCD-890's configuration.

The main screen also provides access to the other utility program functions through the function keys. If you wish to use these functions and have made any configuration changes, you must exit the utility program and reboot the computer to enter the changes into the PCD-890 before proceeding. Functions are described in the following sections.

5.2. Formatting and Writing Data

5.2.1. SRAM and Atmel 29C010 (+5 V) Flash Devices

Emulated drives which use SRAM or Atmel 29C010 (+5 V) Flash memory devices may be formatted, read from and written to exactly as though they were normal floppy disk drives. Simply use the DOS FORMAT command on the corresponding drives, the DOS COPY command to load files onto the emulated drives, DELETE to remove them, the MD command to make directories, etc. After you have finished writing your programs and data to the emulated disk, you can write protect the disk using the utility program, as described in Section 4.2.1, above. The drive can now be made bootable by setting jumper SW1 or SW2 to designate it as drive A, as described in Section 2.2.3. Make sure that each emulated drive has a unique drive jumper setting. Note that SRAM devices require use of a backup battery for data retention, see Section 2.1.3..

5.2.2. EPROMs and AMD/Intel 28F010 (+12 V) Flash Devices

ROM disks using EPROMs or AMD/Intel 28F010 (+12 V) Flash devices are different from SRAMs or ATMEL 29C010 (+5 V) Flash devices. Instead of being formatted and written to using DOS commands, they must be programmed, either on board, or using an external programmer.

On-board Programming

The PCD-890's on-board programming circuitry can program three different devices on-board: the AMD/Intel 28F010 (+12 V) Flash memory and the 27C010 and 27C040 EPROM devices produced by ATMEL and AMD. Before being programmed, EPROM devices must be removed from the PCD-890 and erased using an external UV EPROM eraser.

First, make sure that the PCD-890 is completely configured using the utility program (according to Section 4.1, above), and that the configuration has been saved to the PCD-890 (by rebooting). Next, hit F5, RomCopy, and the front screen will appear (see Figure 5-2) showing two options: Filecopy and Diskcopy.

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Filecopy [1], discussed in depth in following sections, allows you to select files individually to be copied to your on-board chips. You will be asked to specify the emulated drive to which the files will be copied.

Diskcopy [2] copies the entire contents of a floppy drive at once. You will first be prompted to enter the source drive (the floppy) and the target drive (the PCD-890 bank to be copied to). Next, you will be asked to specify the type of memory device to be programmed, EPROM or Flash memory.

```
┌─────────────────────────────────────────────────────────────────┐
│              (C) 1992 ADVANTECH CO.,LTD.                          │
│     PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.0 │
├─────────────────────────────────────────────────────────────────┤
│                                                                   │
│                                                                   │
│         [1].FILECOPY                                              │
│                                                                   │
│         [2].DISKCOPY                                              │
│                                                                   │
│         Select (1/2) or [ESC] ? 1                                 │
│                                                                   │
│         Target disk drive (A/B/C/D) or [ESC] ?                    │
│                                                                   │
│                                                                   │
│   ══════════════════ MESSAGE ═══════════════════════             │
│                                                                   │
│                                                                   │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```
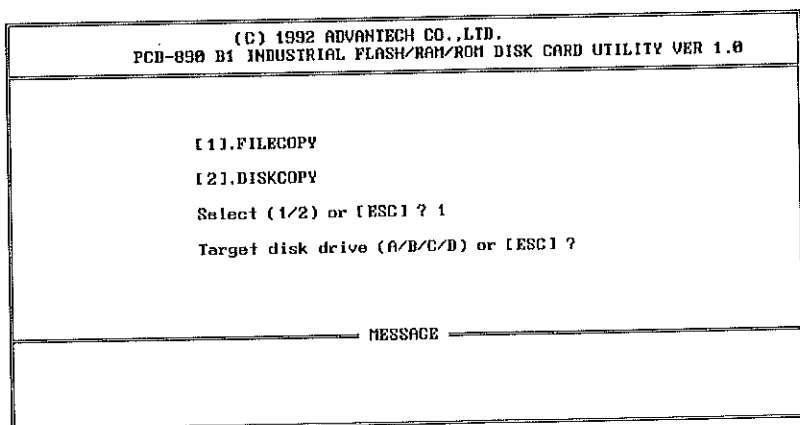
Figure 5-2 RomCopy: Front Screen

```
 Main
                 PCD-890 Software Utility version 1.00
             Target Files for ROM Drive
     <empty>                        [ Add Files   ]

                                    [ Remove File ]

                                    [ Remove All  ]

                                    ( • ) Bootable
                                    (   ) Non-Bootable

     ROM:\
     ROM Disk Drive Type: 1.44M
     Total space needed: 87 KByte

 Alt-X Exit   Alt-M Main Menu
```
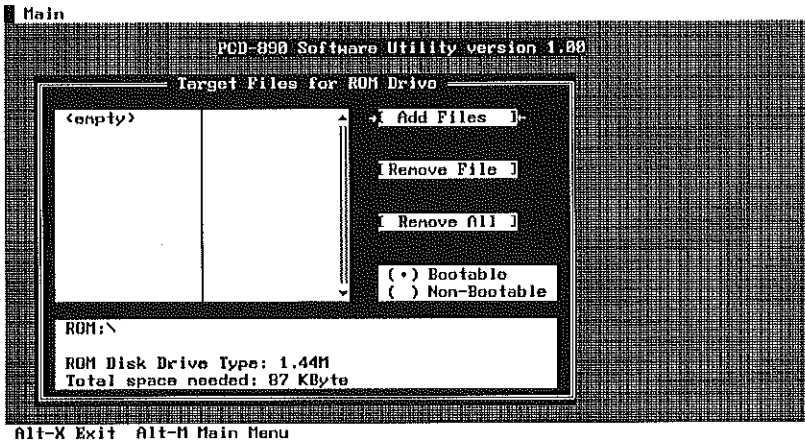
Figure 5-3 Target Files for ROM Drive

Filecopy: Selecting Files:

The Filecopy function begins with the main Filecopy screen, shown in Figure 5-3. Before selecting the files to be copied, it is necessary to specify the size of the emulated disk. This is done using "Select ROM Drive Size" (shown in Figure 5-4) in the Main Menu. The Main Menu, shown in Figure 5-5, is reached by pressing Alt-M (press and hold the "Alt" key, then press the "M" key). Now, select the files you wish to copy to the PCD-890. Files are added to the selection list, on the left side of Figure 5-5, by bringing up the Source Files window. This window is invoked by pressing the F6 key from the Main Menu.
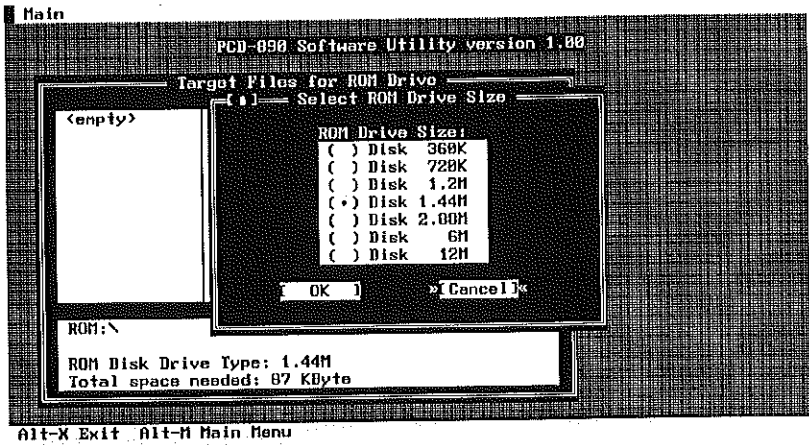
Figure 5-4 Filecopy: Select ROM Drive Size
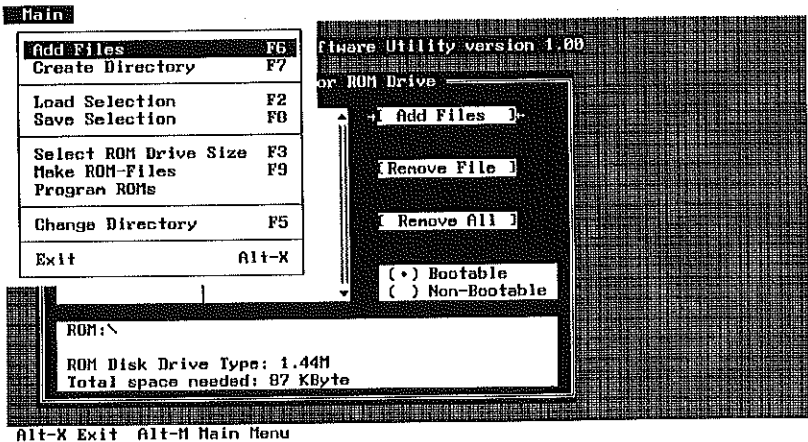
Figure 5-5 Filecopy: Main Menu

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The Source Files, shown in Figure 5-6, allows you to select files from a directory and add them to the selection list. The path is given at the bottom of the window. It can be changed by hitting the "Tab" key. Highlight the files you want to copy using the arrow keys and select them by pressing the spacebar. The total space required by the selected files shows at the bottom of the screen. To display only specific files, hit Alt-S for the Select Files field. Type in the files to be displayed using wildcards (* and ?). Selecting a subdirectory selects all the files in that subdirectory. Hit Alt-K to quit selecting and send the selected files to the selection list; hit Alt-C to quit this window without selecting files.

```
 Main
    ┌─[ ]────────── Source Files ──────────
    │  Select Files
 <empty>  │  DEBUG.EXE              │↓  →[   OK   ]←
    │  »Files
    │  »DEBUG.EXE      │ FORMAT.COM    [Cancel ]
    │   DISKCOMP.COM    GRAPHICS.COM
    │   DISKCOPY.COM    GRAPHICS.PRO
    │   EDIT.COM        GWBASIC.EXE
    │   EDIT.HLP        HIMEM.SYS
    │   EMM386.EXE      JOIN.EXE
    │   FDISK.EXE       LINK.EXE
    │   FIND.EXE        MEM.EXE
    │  ◄         ▐            ►
 ROM:\   │ C:\DOS\*.*
 ROM Disk │ DEBUG.EXE    20634      Apr 09,1991   12:00a
 Total spa│ Press SPACE-BAR to select files
    │ Selected Files Space: 0 KByte

Alt-X Exit   Alt-M Main Menu
```
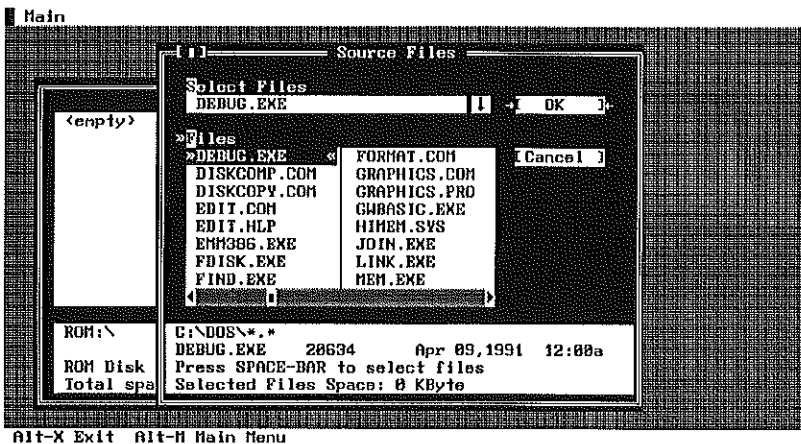
Figure 5-6 Filecopy: Source Files

Remove File (Alt-R), on the Target Files for ROM Drive (Figure 5-3), removes files from the selection list. Remove All (Alt-e) clears the selection list. The emulated drive can be made bootable by hitting Alt-B. System files required for booting must be copied to the directory containing the utility program. To exit this screen, type Alt-X (or hit ESC).

The directory from which files are selected can also be changed from the Main Menu by hitting F5. This brings up the Change Directory window, shown in Figure 5-7.
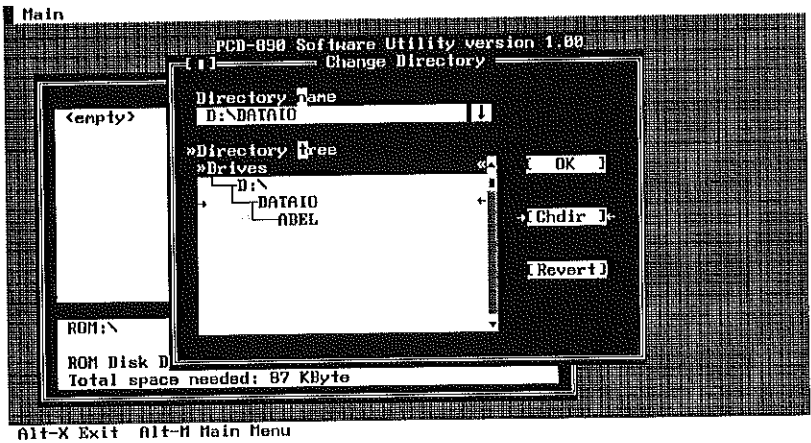
Figure 5-7 Filecopy: Change Directory

The Change Directory window allows you to select the directory from which to take the files by typing its name from the Directory name entry (Alt-n) or from the directory tree displayed below (Alt-t). The current directory is highlighted. Alt-C changes the directory, Alt-R moves one directory back towards the root. Press Alt-K when you are finished.

Directories can also be created on the PCD-890's ROM disks. This is done by bringing up the Create Directory dialogue box from the Main Menu, shown in Figure 5-8. Type the name of the directory to be created on the PCD-890's drive into the dialogue box.
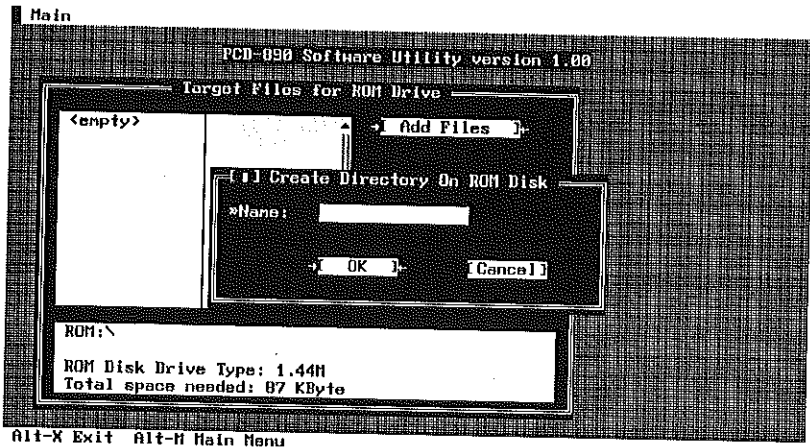
Figure 5-8 Filecopy: Create Directory

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A selection list of files can be saved for later use or recalled using the Save
Selection (F8) (shown in Figure 5-9) and Load Selection (F2) (shown in Figure
5-10) functions, respectively, from the Main Menu. Select the file to be loaded
by typing its path in the box provided, or use the cursor keys to highlight it
from the list below a select it using the spacebar. Saving a file is done in the
same way; just select the path to which it will be saved.
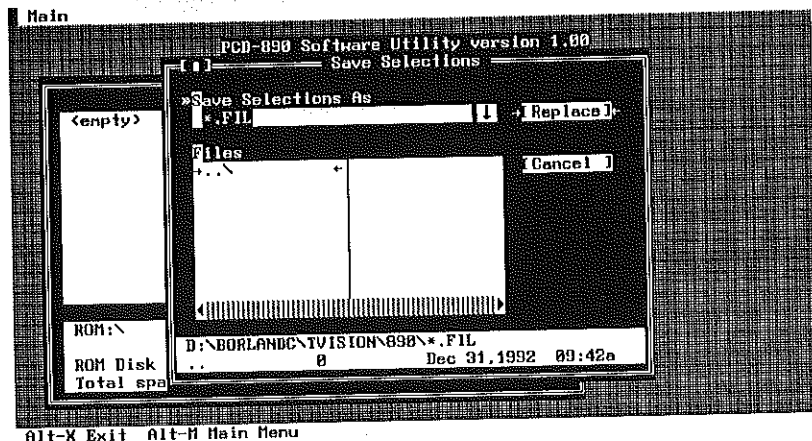
Figure 5-9 Filecopy: Save Selection

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```
 Main
┌──────────────────────────────────────────────────────────────────┐
│            PCD-890 Software Utility version 1.00                   │
│      ┌[■]────────── Load Selections ──────────                     │
│      │ »Load Selections From                                       │
│ <empty>│ *.FIL                         [↓] ►[  Open  ]►            │
│      │ Files                                                       │
│      │ +..\              ←            [ Cancel ]                   │
│      │                                                             │
│      │                                                             │
│      │                                                             │
│      │ ◄║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║║►                 │
│ ROM:\  │ D:\BORLANDC\TVISION\090\*.FIL                             │
│ ROM Disk│ ..          0         Dec 31,1992   09:42a               │
│ Total spa│                                                         │
└──────────────────────────────────────────────────────────────────┘
 Alt-X Exit  Alt-M Main Menu
```
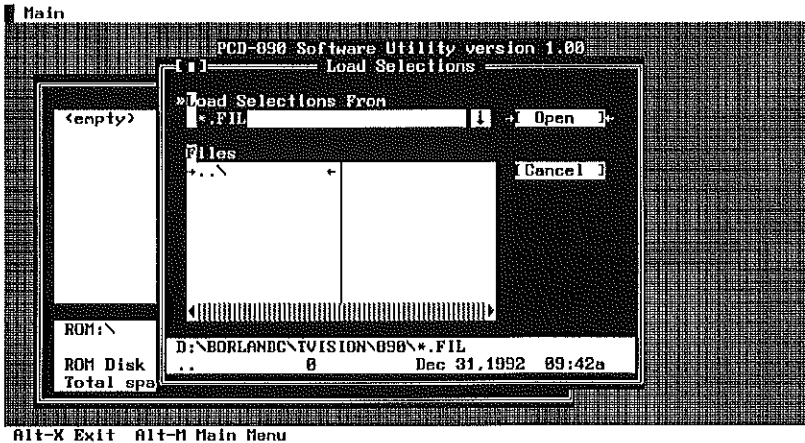
Figure 5-10 Load Selection List

Programming:

When you are satisfied with the list of files, go to the Main Menu and select either Program ROMs (P), to program the supported devices on-board, or select Make ROM-Files (F9), to transform the selected files into a series of binary files which will then be used by an external programmer to load each memory device.

Select Program ROMs and a window will appear (shown in Figure 5-11) requesting the specific memory device to be programmed. Hit the TAB key to select the correct device. The files will then be copied to the drive selected when you entered the Filecopy function.
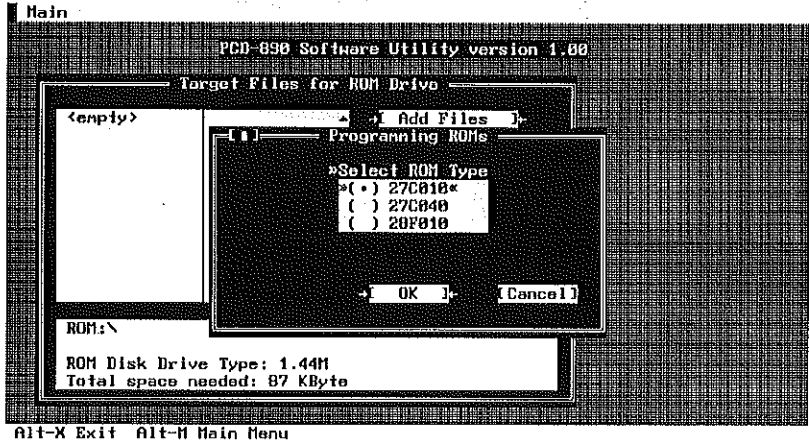
Figure 5-11 Filecopy:Programming ROMs

Select Make ROM-Files (F9) and a window will appear (shown in Figure 5-12) allowing you to specify the names which will be given to the sequence of binary files and the size of the memory devices to be programmed. Up to six characters may be entered for the filename, the last two digits will automatically numbered as the files are created (i.e. ROM1.001, ROM2.001, etc.).(shown in Figure 5-13)

Figure 5-12 Filecopy: Make ROM Files

Figure 5-13 Make ROM Function

Prepare an EPROM programmer that will support your EPROM or Flash device according to your programmer's specific instructions.

Load the data file for each device into your programmer. Then program each device in sequence (device #1 for socket #1 gets the file ROM1.BIN, etc.) until all the files have been transferred.

Once you have programmed all of your memory devices, insert them into the PCD-890 as described in the following chapter. Make sure to get the devices in the proper sockets, otherwise the data or programs will be scrambled.

5.3. The Make rom Function

An alternative method for producing binary files for an external programmer is to copy the required files a floppy disk and use the Make rom function (F2) from the main utility screen. This brings you to the screen shown in Figure 5-14.

```
┌──────────────────────────────────────────────────────────────────┐
│                    (C) 1993 ADVANTECH CO.,LTD.                     │
│        PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.1│
├──────────────────────────────────────────────────────────────────┤
│                                                                    │
│            Source disk drive (A/B) or [ESC] ? a                    │
│                                                                    │
│            ROM size  (1)->128KB  (2)->512KB (1/2) or [ESC] ? 1     │
│                                                                    │
│            Effective transfer (Y/N) :                              │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│════════════════════════════ MESSAGE ═════════════════════════════ │
│                                             ┌────────────────────┐ │
│                                             │ Total   sectors    │ │
│                                             │      2400           │ │
│                                             │ Current sector     │ │
│                                             └────────────────────┘ │
└──────────────────────────────────────────────────────────────────┘
```
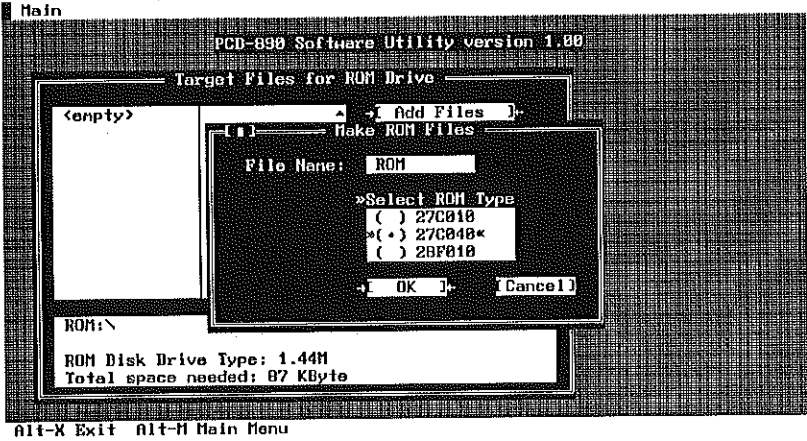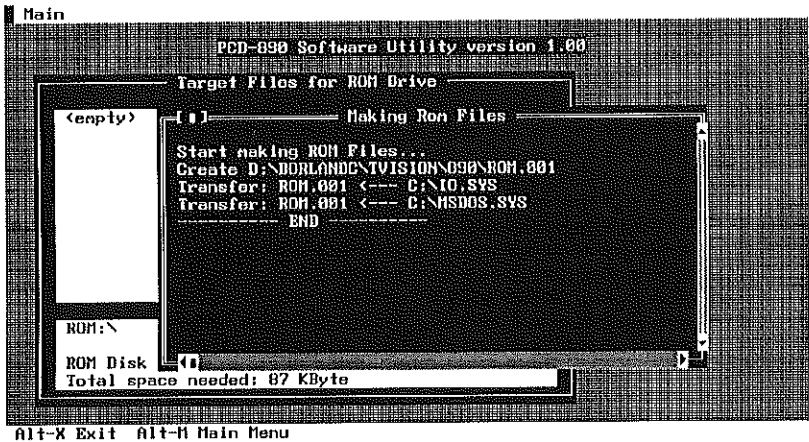
Figure 5-14

This screen asks for the drive letter for the source files and the size of the ROM devices. Next it asks if you want effective transfer. (Show in Figure 5-15)

```
                    (C) 1993 ADVANTECH CO.,LTD.
        PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.1

           Source disk drive (A/B) or [ESC] ? a

           ROM size  (1)->128KB  (2)->512KB (1/2) or [ESC] ? 1

           Effective transfer (Y/N) : y

ROM1.BIN  ║║║║║║║║║║║║║║║║║║     ROM7.BIN   ║║║║║║║║║║║║║║║║║║
ROM2.BIN  ║║║║║║║║║║║║║║║║║║     ROM8.BIN   ║║║║║║║║║║║║║║║║║║
ROM3.BIN  ║║║║║║║║║║║║║║║║║║     ROM9.BIN   ║║║║║║║║║║║║║║║║║║
ROM4.BIN  ║║║║║║║║║║║║║║║║║║     ROM10.BIN
ROM5.BIN  ║║║║║║║║║║║║║║║║║║     ROM11.BIN
ROM6.BIN  ║║║║║║║║║║║║║║║║║║     ROM12.BIN
═══════════════════════════ MESSAGE ═══════════════
                                            Total   sectors
                                                2400
Make Rom transfer successful. Need 10 pcs Roms     Current sector
                                                2400
```

                                                        - Press any key -

                              Figure 5-15

5.4. Setting Password and Prompt

The main screen of the utility program also includes functions which allow you to set a password which the user must enter in order to gain access to the computer on bootup, or enter a prompt which will be displayed upon bootup.

The password is set by pressing F3. A text window will appear where you can enter your desired prompt (up to 60 characters) as shown in Figure 5-16. Press ENTER when you are finished (or press ESC to cancel and return to the main screen).

If you should make a mistake when entering your password or if you forget the password, do the following:

1. First, turn of the computer and set JP9 to the 2nd position.
2. Reboot the system and run the PASSCLR.EXE utility to clear the old password, then enter a new one with the utility program.
3. Turn the computer off again, and set JP9 back to the 1st position.

```
┌──────────────────────────────────────────────────────────────────┐
│                  (C) 1993 ADVANTECH CO.,LTD.                       │
│       PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.1 │
├──────────────────────────────────────────────────────────────────┤
│                 DEVICE TYPE       DISK SIZE       WRITE PROTECTION │
│  1st FDD (A:)   PHYSICAL DISK      1.2MB DISK                      │
│                                                                    │
│  2nd FDD (B:)   128K EPROM/FLASH   1.44MB DISK    BOTH WRITE/READ  │
│                                                                    │
│  3rd FDD (C:)   NOT INSTALLED                                      │
│                                                                    │
│  4th FDD (D:)   NOT INSTALLED                                      │
│ ══════════════════════════════ MESSAGE ═══════════════════════════│
│                                                                    │
│    Enter Password : XXXXXXXXXX                                     │
│                                                                    │
└──────────────────────────────────────────────────────────────────┘
ESC->Exit  ENTER->Select  F2->Make rom  F3->Password  F4->Prompt  F5->RomCopy
```

Figure 5-16 Set password

The prompt is set by pressing F4. A blank will appear, as shown in Figure 5-17. Enter the text string (up to 60 characters) that you want to post on your monitor's screen when you first power-up your computer in this window. Press ENTER, and the new text string will appear on the screen the next time you reboot your computer (pressing ESC will quit return you to the main screen.

```
┌─────────────────────────────────────────────────────────────────┐
│                   (C) 1993 ADVANTECH CO.,LTD.                     │
│      PCD-890 B1 INDUSTRIAL FLASH/RAM/ROM DISK CARD UTILITY VER 1.1 │
├─────────────────────────────────────────────────────────────────┤
│              DEVICE TYPE       DISK SIZE       WRITE PROTECTION    │
│  1st FDD (A:)  PHYSICAL DISK    1.2MB DISK                         │
│                                                                   │
│  2nd FDD (B:)  128K EPROM/FLASH  1.44MB DISK   BOTH WRITE/READ     │
│                                                                   │
│  3rd FDD (C:)  NOT INSTALLED                                      │
│                                                                   │
│  4th FDD (D:)  NOT INSTALLED                                      │
│ ═══════════════════════════ MESSAGE ═══════════════════════════ │
│                                                                   │
│  Enter Prompt : XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX │
└─────────────────────────────────────────────────────────────────┘
 ESC->Exit  ENTER->Select  F2->Make rom  F3->Password  F4->Prompt  F5->RomCopy
```

Figure 5-17 Set Prompt

CHAPTER 6. WATCHDOG TIMER

A watchdog timer has been provided with the PCD-890. This device monitors CPU processing at intervals of every 100 ms or 1.6 seconds (as set by jumper JP8). If CPU processing comes to a halt, due to electromagnetic interference (EMI), power drops, or software bugs, the watchdog timer will change the output status of the W.D.O. at connector CN1 from TTL high to TTL low.

The watchdog timer is refreshed by writing to its I/O port (set in Section 3.2) at intervals less than the time delay (set in Section 2.1.5). A series of instructions should be added to your application program to refresh the watchdog timer. The byte_data can be any two digit hex value, i.e. any value from 00h to FFh. In order for the watchdog timer to operate properly. Your CPU's speed and your programming language will ultimately determine where in your program you insert these instructions. See the following examples for C language:

outportb (0x207, byte_data); if the card's I/O memory address is set 200 (hex)
outportb (0x247, byte_data); if the address is set to 240 (hex)

Watchdog Timer Refresh Program

Additions should be made to the application program so that it writes to the card's I/O port address at an interval shorter than the watchdog's preset timed interval. The watchdog's timing intervals have a tolerance of ±30% due to the uncertainty of the system's clock. So if you set the watchdog timer at a 1.6 second interval, program an instruction that will repeatedly refresh it within 1.0 second.

The following BASIC language example program writes to hex207:

```
10 REM EXAMPLE PROGRAM
20 OUTP &H207, DATA REM ENABLE AND REFRESH THE
WATCHDOG TIMER
30 GOSUB 1000 REM  TASK #1, 2 SEC
40 GOSUB 2000 REM  TASK #2, 3 SEC
60 GOTO 20
70 END
1000 REM SUBROUTINE #1, TAKES 2 SEC TO COMPLETE
```

41

.
.
.

1070 RETURN

2000 REM SUBROUTINE #2, TAKES 3 SEC TO COMPLETE

.
.
.

2090 RETURN

CHAPTER 7. CIRCUIT DIAGRAMS

In this chapter, the circuitry guidelines for the CN1 connector's external battery, P.F.O., and W.D.O. are given in detail. Figure 7-1 shows how to connect an external battery to the PCD-890.

Warning!: After connecting an external battery to CN1 the on-board battery must be turned off (by setting JP4 to OFF), otherwise, the internal battery may be discharged or possibly explode!
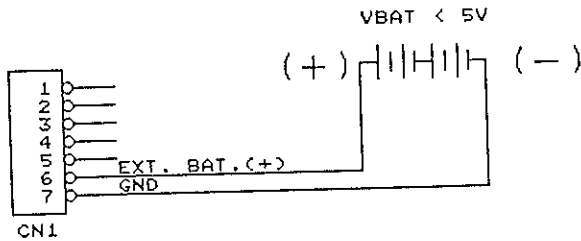
Figure 7-1

The following examples (Figures 7-2 and 7-3) show how to make use of the P.F.O. and W.D.O. for your own applications.

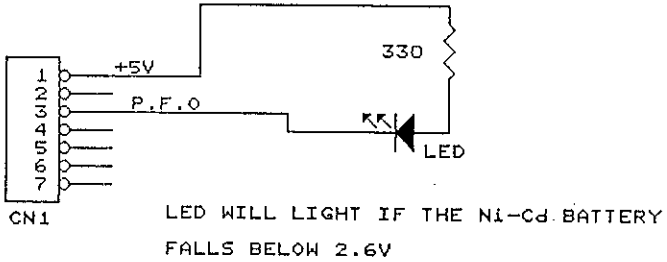EXAMPLE CIRCUITRY FOR THE P.F.O. CONNECTION

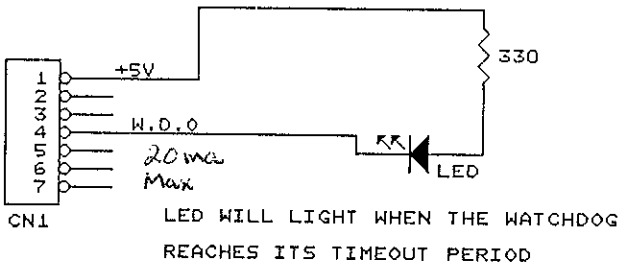Figure 7-2 Connecting an LED or Alarm to PFO

EXAMPLE CIRCUITRY FOR THE W.D.O. CONNECTION

Figure 7-3 Connecting an LED or Alarm WDO

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