CPC-2347 Series

PCI Bus 486 Mini Biscuit PC with VGA/LAN

User's Manual

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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Packing list

Before installing your board, ensure that the following materials have been received:

- 1 CPC-2347 all-in-one single board computer
- 1 CD-ROM including Ethernet utility programs, and SVGA utility programs and drivers for Windows 3.1/95/98/NT
- 1 warranty certificate
- This user's manual

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

Technical support and sales assistance

If you have any technical questions about the CPC-2347 or any other Advantech products, please visit our support website at:

http://www.advantech.com/support

For more information about Advantech's products and sales information, please visit:

http://www.advantech.com

Contents

Tables

Figures

General Information

This chapter provides background information for the CPC-2347.

Sections include:

• Card specifications

• Board layout

1.1 Introduction

Advantech's new Card-PC, the CPC-2347, a truly an all-in-one 486 processor-based single board computer comes equipped with 32M DRAM , an SVGA interface which supports CRT monitor with up to 4MB display memory, a 10/100 base-T Ethernet interface and a Compact Flash solid state disk socket. In addition, it is equipped with two RS-232 serial ports. One bi-directional printer port supports SPP, ECP and EPP modes, an IDE HDD interface and a floppy disk controller, as well as one PCI interface for functional expansion. With its industrial grade reliability, the CPC-2347 can operate continuously at temperatures up to 140 F (60 C). This compact unit offers all these functions within the space of a 2.5" hard disk drive (68mm * 100mm). The numerous features provide an ideal price/performance solution for high-end commercial and industrial applications where stability and reliability are essential. The Card-PC CPC-2347's power can be supplied through a SO DIMM socket or an on-board power connector, thus, the CPC-2347 can be embedded into the user's system board or used as a single board application.

The PCI bus, HDD, FDD and parallel interface are connected with user's system board by a SO DIMM socket. This form factor has the benefits of easy maintenance, the ability to replace a damaged card within 30 seconds, further more, the Card PC can easily upgrade from 486 to Pentium without changing the user's system board.

The CPC-2347 provides many useful functions in a tiny card, and reserves a small connector for other extension modules, such as the CPC-2520 VGA/LCD module. It provides more flexible functions according to user's different application. The CPC-2347 is compact; highly integrated; and easy to maintain, upgrade, and install. These features make it ideal for applications of small industrial controller, Panel PC, security system, Internet gateway, instruments, medical equipment, building automation and so on.

1.2   Specifications

- **CPU:** 486-66MHZ

- **BIOS:** 256KB FLASH BIOS

- **Super I/O Chipset:** Winbond W83977F

- **RAM memory:** 32MB EDO RAM on board.

- **Solid state disk:** Support one CompactFlash card as

  an emulated HDD

- **PCI/IDE/FDD/Parallel port (144 pins SODIM socket):**

  -I/O expansion: PCI bus.

  -GPIO

  -CF LED signal

  -Ethernet LED signals

  -Enhanced IDE hard disk drive interface: Support up to two hard
  disk drives. BIOS auto-detect.

  -Floppy disk drive interface/Multi-mode parallel port: FDD
  interface and parallel port share the same connector,
  either FDD or

  -Parallel port can be switched in BIOS setup.

  -FDD interface supports up to two floppy disk drives, 5.25"
  (360KB and 1.2MB) and /or 3.5" (720KB, 1.44MB and 2.88MB).

  -Parallel supports SPP, ECP and EPP.

- **VGA/LAN/Serial port/Keyboard/Mouse (40 pins FPC connector):** VGA with 64 bits windows accelerator:

  -Display memory: 4MB share memory architecture (UMA
  structure)

  -Display resolution: 1280 * 1024 @64K colors, 1024*768 @16M
  colors

*Note: Automatically disable internal VGA if an external add-in
VGA is plugged in the system*

- **10/100 Base T Ethernet interface:**

  -controller: RTL-8139, 10Mbps/100Mbps

- **Serial ports:** Two RS232 Serial ports

- **Keyboard & PS2 mouse:** supports standard PC/AT keyboard and PS/2 mouse

- **Power connector:** 4 pins 3.5" FDD power connector.

1.2.1 Mechanical and environmental

Power supply voltage: +5V (4.75V to 5.25V)

Max. Power requirements: +5V @ 1.6A

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

Board Size: 68mm x 100mm

Weight: 0.2 Kg

1.3   Board layout: dimensions
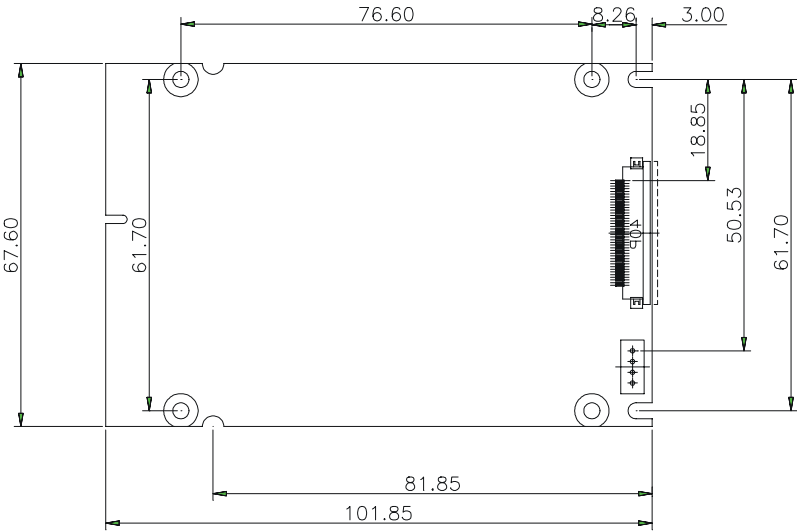
I N S T A L L A T I O N

This chapter explains the setup procedures of CPC-2347 hardware, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all safety precautions before you begin the installation procedure.

2.1   Jumpers and connectors

On-board connectors link to external devices such as hard disk drives, keyboards, floppy drives, and so on. In addition, the board has jumpers for configuring your board for specific applications.

The table below lists the function of each of the board's jumpers and connectors. Later sections in this chapter give detailed information on each jumper setting, and instructions for connecting external devices to your card.

Table 2-1: Jumpers and connectors

Name	Function
CN1	Power connector
CN2	I/O connector (LAN/VGA/RS-232/KB/mouse)
CN3	PCI connector
CN4	CompactFlash Socket
CN5	SODIMM gold finger (PCI/HDD/FDD/parallel/power)
J1	Clear CMOS

2.2 Board layout: jumper/connector locations
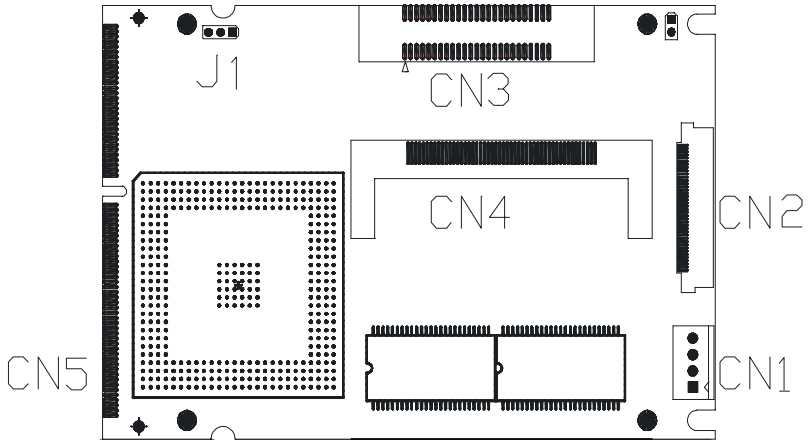
Figure 2-1: Board layout: jumper/connector locations

2.3 Safety precautions

Warning!   *Always completely disconnect the power cord from your chassis whenever you are working on it. Do not make connections while the power is on because sensitive electronic components can be damaged by the sudden rush of power. Only experienced electronics personnel should open the PC chassis.*

Caution!   *Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis.*

2.4 Setting jumpers

You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. 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.
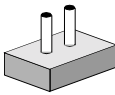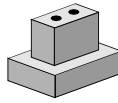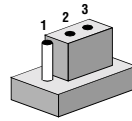
Open   **Closed**   **Closed 2-3**

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

Open   **Closed**   **Closed 2-3**

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.

2.4.1 Clear CMOS (J1)

This jumper is used to erase CMOS data and reset system BIOS information.

The procedure for clearing CMOS is:

1. Turn off the system.

2. Short pin 2 and pin 3.

3. Turn on the system. The CMOS is now cleared.

4. Turn off the system. Short pin 1 and pin 2.

5. Turn on the system. The BIOS is now reset to its default setting.

Table 2-2: Clear CMOS (J1)

Function	1-2	2-3
Protect*	Closed	Open
Clear CMOS	Open	Closed

* default setting

2.5   CompactFlash interface (CN4)

This socket accepts an IDE-compatible CompactFlash memory card.

The CompactFlash interface uses a primary IDE channel, which should be set as the master channel.

2.6 PCI/IDE/floppy drive/parallel port (CN5)

The CPC-2347 provides a +5 V PCI bus, one IDE channel (support two IDE devices), one parallel interface and one floppy interface (support two floppy drives). All these are provided via a 144-pin SODIMM gold finger (CN5), which can be plugged into a DODIMM socket on the user's system board. Users can choose suitable positions on their system board for their HDD, FDD or parallel connectors.

The floppy interface and parallel interface share the same pin assignment, so they cannot be used simultaneously. Users can select either an FDD or parallel port by referring to their BIOS setup manual.

Table 2-3: PCI/IDE/FDD/LPT port connector (CN5)

Pin	Signal	Bus	Pin	Signal	Bus
1	TRDY#	PCI	73	PAR	PCI
2	AD[29]	PCI	74	DEVSEL#	PCI
3	AD[31]	PCI	75	AD[30]	PCI
4	AD[26]	PCI	76	AD[28]	PCI
5	AD[27]	PCI	77	AD[24]	PCI
6	C/BE3#	PCI	78	AD[25]	PCI
7	STOP#	PCI	79	IRDY#	PCI
8	AD[17]	PCI	80	C/BE2#	PCI
9	C/BE1#	PCI	81	C/BE0#	PCI
10	AD[14]	PCI	82	AD[13]	PCI
11	CF1 LED	CompactFlash™ LED	83	VCC	POWER
12	VCC	POWER	84	PCICLK#1	PCI
13	VCC	POWER	85	PCICLK#2	PCI
14	GND	POWER	86	PCICLK#3	PCI
15	PCI_LOCK#	PCI	87	PCIRST#	PCI/IDE
16	AD[4]	PCI	88	AD[1]	PCI
17	AD[3]	PCI	89	AD[16]	PCI
18	AD[11]	PCI	90	AD[18]	PCI
19	AD[19]	PCI	91	AD[20]	PCI
20	AD[21]	PCI	92	AD[9]	PCI
21	AD[7]	PCI	93	AD[22]	PCI
22	AD[23]	PCI	94	AD[8]	PCI
23	AD[0]	PCI	95	LEDTX	LAN LED
24	VCC	POWER	96	LEDLNK	LAN LED
25	VCC	POWER	97	AD[10]	PCI
26	AD[2]	PCI	98	AD[15]	PCI
27	AD[6]	PCI	99	AD[5]	PCI
28	AD[12]	PCI	100	FRAME#	PCI
29	SERR#	PCI	101	PCIREQ#2	PCI
30	PCIREQ#	PCI	102	PCIREQ#0	PCI
31	PCIGNT#2	PCI	103	PCIGNT#0	PCI
32	PCIGNT#1	PCI	104	PCI_INT3	PCI
33	SIRQ	IDE	105	PCI_INT2	PCI
34	SACK#	IDE	106	PCI_INT1	PCI
35	SIOW#	IDE	107	PCI_INT0	PCI

36	SIOR#	IDE	108	SDRQ	PCI
37	LA17	IDE	109	LA19	PCI
38	LA18	IDE	110	VCC	POWER
39	VCC	POWER	111	VCC	POWER
40	VCC	POWER	112	SCE2-	IDE
41	VCC	POWER	113	SCE1-	IDE
42	VCC	POWER	114	SA_DD0	IDE
43	SA_DD2	IDE	115	SA_DD1	IDE
44	SA_DD6	IDE	116	SA_DD3	IDE
45	SA_DD4	IDE	117	SA_DD5	IDE
46	SA_DD10	IDE	118	SA_DD9	IDE
47	SA_DD8	IDE	119	SA_DD7	IDE
48	SA_DD14	IDE	120	SA_DD15	IDE
49	SA_DD12	ISA	121	GP3	GPIO
50	SA_DD11	ISA	122	GND	
51	SA_DD13	ISA	123	GND	
52	GND		124	GND	
53	GND		125	GND	
54	GND		126	GND	
55	GND		127	GND	
56	GND		128	GND	
57	IOCHRDY	IDE	129	GND	
58	GND		130	GND	
59	GND		131	GND	
60	GND		132	GP2	GPIO
61	PSTIN	RESET SWITCH	133	GP1	GPIO
62	IRRXH	FIR	134	CIRRX	IR
63	ERR-	PRT	135	AFD-	PRT
64	IRTX	IR	136	SLCTIN	PRT
65	IRRX	IR	137	INIT-	PRT
66	STB-	PRT	138	PTD1	PRT
67	PTD0	PRT	139	PTD3	PRT
68	PTD2	PRT	140	BUSY	PRT
69	GND		141	ACK-	PRT
70	PTD4	PRT	142	PTD5	PRT
71	PE	PRT	143	PTD6	PRT
72	PTD7	PRT	144	SLCT	PRT

2.6.1 PCI bus

Table 2-4: PCI bus - CN5 cross reference table (side A)

PCI bus		CN5	
Pin	Signal	Pin	Signal
A1	TRST	-	8.2 Kilo ohm pull LOW
A2	12 V	-	-
A3	TMS	-	8.2 Kilo ohm pull HIGH
A4	TDI	-	8.2 Kilo ohm pull HIGH
A5	5 V	-	-
A6	INTA#	-	NOTE
A7	INTC#	-	NOTE
A8	5 V	-	-
A9	RSVD1	-	N/C
A10	5 V	-	-
A11	RSVD3	-	N/C
A12	GND	-	-
A13	GND	-	-
A14	RSVD4	-	N/C
A15	RST#	87	PCFIRST#
A16	5 V	-	-
A17	GNT#	31	NOTE
A18	GND	-	-
A19	RSVD6	-	N/C
A20	AD30	75	AD30
A21	3.3 V	-	-
A22	AD28	76	AD28
A23	AD26	4	AD26
A24	GND	-	-
A25	AD24	77	AD24
A26	IDSEL#	-	NOTE
A27	3.3 V	-	-
A28	AD22	93	AD22
A29	AD20	91	AD20
A30	GND	-	-
A31	AD18	90	AD18

A32	AD16	89	AD16
A33	3.3 V	-	-
A34	FRAME#	100	FRAME#
A35	GND	-	-
A36	TRDY#	1	TRDY#
A37	GND	-	-
A38	STOP#	7	STOP#
A39	3.3 V	-	-
A40	SDONE	-	8.2 Kilo ohm PULL HIGH
A41	SBO#	-	8.2 Kilo ohm PULL HIGH
A42	GND	-	-
A43	PAR	73	PAR
A44	AD15	98	AD15
A45	3.3 V	-	-
A46	AD13	82	AD13
A47	AD11	18	AD11
A48	GND	-	-
A49	AD9	92	AD9
A50	-	-	-
A51	-	-	-
A52	C/BE0#	81	C/BE0#
A53	3.3 V	-	-
A54	AD6	27	AD6
A55	AD4	16	AD4
A56	GND	-	-
A57	AD2	26	AD2
A58	AD0	23	AD0
A59	5 V	-	-
A60	REQ64#	-	8.2 Kilo ohm PULL HIGH
A61	5 V	-	-
A62	5 V	-	-

PCI bus (Side B)		CN5	
Pin	Signal	Pin	Signal
B1	-12V	-	-
B2	TCK	-	-
B3	GND	-	-
B4	TDO	-	-
B5	5 V	-	-
B6	5 V	-	-
B7	INTB#	-	NOTE 1
B8	INTD#	-	NOTE 1
B9	PRSNT1#	-	0.1 uF cap. PULL LOW
B10	RSVD2	-	-
B11	PRSNT2#	-	0.1 uF cap. PULL LOW
B12	GND	-	-
B13	GND	-	-
B14	RSVD5	-	-
B15	GND	-	-
B16	CLK	-	NOTE 1
B17	GND	-	-
B18	REQ#	-	NOTE 1
B19	5V	-	-
B20	AD31	3	AD31
B21	AD29	2	AD29
B22	GND	-	-
B23	AD27	5	AD27
B24	AD25	78	AD25
B25	3.3 V	-	-
B26	C/BE3#	6	C/BE3#
B27	AD23	22	AD23
B28	GND	-	-
B29	AD21	20	AD21
B30	AD19	19	AD19
B31	3.3 V		

B32	AD17	8	AD17
B33	C/BE2#	80	C/BE2#
B34	GND	-	-
B35	IRDY#	79	IRDY#
B36	3.3 V	-	-
B37	DEVSEL#	74	DEVSEL#
B38	GND	-	-
B39	LOCK#	15	PCI_LOCK#
B40	PERR#	-	8.2 Kilo ohm PULL HIGH
B41	3.3 V	-	-
B42	SERR#	29	SERR#
B43	3.3 V	-	-
B44	C/BE1#	9	C/BE1#
B45	AD14	10	AD14
B46	GND	-	-
B47	AD12	28	AD12
B48	AD10	97	AD10
B49	GND	-	-
B50	-	-	-
B51	-	-	-
B52	AD8	94	AD8
B53	AD7	21	AD7
B54	3.3 V	-	-
B55	AD5	99	AD5
B56	AD3	17	AD3
B57	GND	-	-
B58	AD1	88	AD1
B59	5 V	-	-
B60	ACK64#	-	8.2 Kilo ohm PULL HIGH
B61	5 V	-	-
B62	5 V	-	-

Note 1: Refer to Table 2-5 "PCI Routing Table" and 2600-PCI.pdf in CD-ROM.

Table 2-5: PCI Rounting table

	PCI Slot 2	PCI Slot 3
INT_A	PCI_INIT1	PCI_INIT2
IDSEL	AD29	AD30
REQ#	PCI_REQ2#	PCI_REQ1#
GNT#	PCI_GNT#2	PCI_GNT#1
CLK	PCICLK2	PC2CLK3

2.6.2 IDE interface

Users can attach two IDE devices to the IDE channel, one drive must be set as the master and another as the slave. You may do this by setting the jumpers on the drives. Refer to the documentation that came with your drive for more information.

A jumper diagram usually appears on the top side of a hard disk drive.

2.6.3 IDE hard drive connector

Table 2-6: IDE hard drive connector

IDE connector Pin	Signal	CN5 Pin	Signal	IDE connector Pin	Signal	CN5 Pin	Signal
1	IDE RESET	87	PCFIRST#	2	GND	13	GND
3	DATA 7 (*2)	119	SA_HDD7	4	DATA 8 (*2)	47	SA_DD8
5	DATA 6 (*2)	44	SA_DD6	6	DATA 9 (*2)	118	SA_DD9
7	DATA 5 (*2)	117	SA_DD5	8	DATA 10 (*2)	46	SA_DD10
9	DATA 4 (*2)	45	SA_DD4	10	DATA 11 (*2)	50	SA_DD11
11	DATA 3 (*2)	116	SA_DD3	12	DATA 12 (*2)	49	SA_DD12
13	DATA 2 (*2)	43	SA_DD2	14	DATA 13 (*2)	51	SA_DD13
15	DATA 1 (*2)	115	SA_DD1	16	DATA 14 (*2)	48	SA_DD14
17	DATA 0 (*2)	114	SA_DD0	18	DATA 15 (*2)	120	SA_DD15
19	SIGNAL GND	-	GND	20	N/C	-	-
21	DMA REQUEST	108	SDRQ	22	GND	124	GND
23	IO WRITE (*2)	35	SIOW	24	GND	125	GND
25	IO READ (*2)	36	SIOR	26	GND	126	GND
27	IO CHANNEL READY	57	IOCHRDY	28	GND (*1)	127	GND
29	HDACK	34	SACK	30	GND	128	GND
31	IRQ	33	SIRQ	32	N/C	-	-
33	ADDR 1	38	LA18	34	N/C	-	-
35	ADDR 0	37	LA17	36	ADDR 2	-	-
37	HARD DISK SELECT 0 (*2)	113	SCE1-	38	HARD DISK SELECT 1 (*2)	112	SCE2-
39	IDE ACTIVE			40	GND	129	-
41	VCC	39	+5 V	42	VCC	40	+5 V
43	GND	122	GND	44	N/C	-	-

Note *1:   IDE pin 28 must connect a 470 ohms resistor to GND.

Note *2:   33 ohms damping resistors is recommended to connect near the IDE connector. Please refer to Fig. 2-2 below.

Note *3:   We do not recommend connection to the following IDE HDD models of Seagate: ST 31276A, ST 31720A, ST 32531A, ST 33240A or ST 34340A
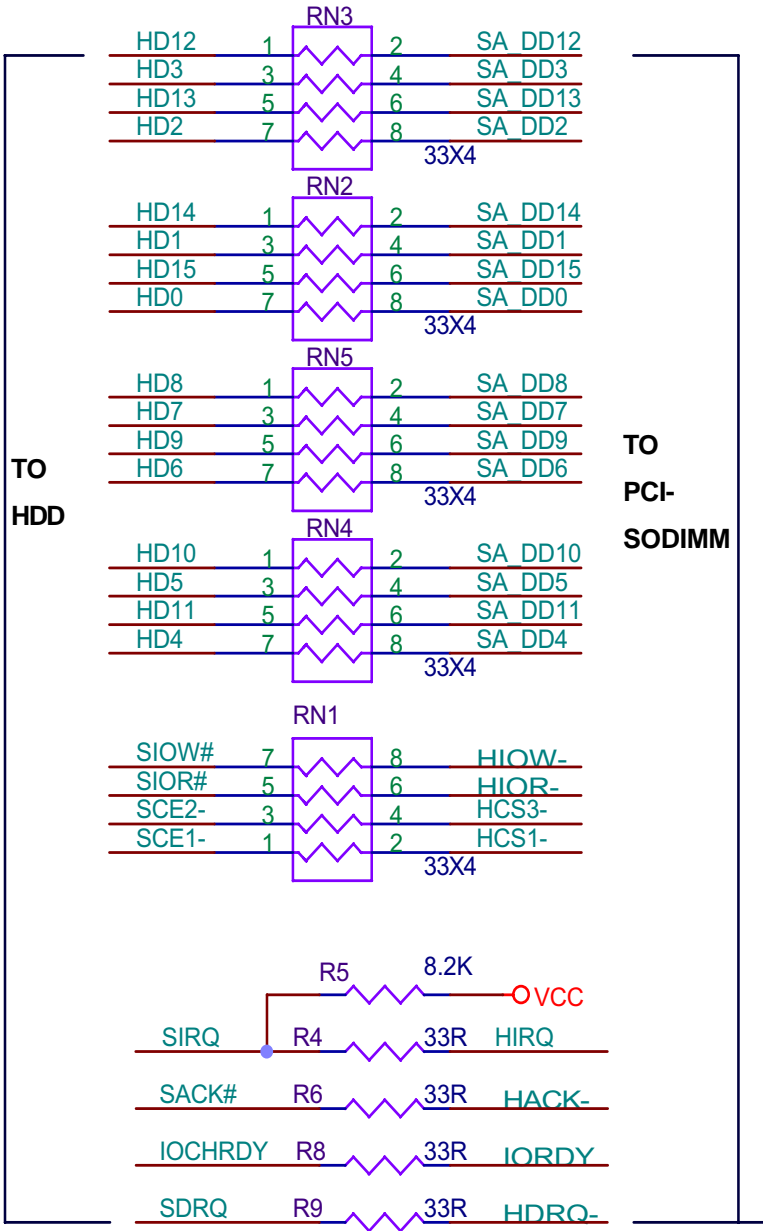
Figure 2-2: Damping resistor

2.6.4 Floppy drive

Users can attach up to two floppy disk drives to the CPC-2347 via a SODIMM socket. The CPC-2347 supports any combination of 5.25" (360 KB / 1.2 MB) and/or 3.5" (720 KB / 1.44/2.88 MB) drives.

The following table lists the pin assignments for the floppy disk connector:

Table 2-7: Floppy drive connector

FDD connctr. CN5				FDD connector		CN3	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	122	GND	2	High density	135	AFD-
3	GND	122	GND	4	N/C		
5	GND	123	GND	6	N/C		
7	GND	123	GND	8	Index	67	PTD0
9	GND	124	GND	10	Motor enable A	143	PTD6
11	GND	124	GND	12	Driver select B	141	ACK-
13	GND	125	GND	14	Driver select A	72	PTD7
15	GND	125	GND	16	Motor enable B	140	BUSY
17	GND	126	GND	18	Direction	137	INIT
19	GND	126	GND	20	Step pulse	136	SLCTIN
21	GND	127	GND	22	Write data	71	PE
23	GND	127	GND	24	Write enable	144	SLCT
25	GND	128	GND	26	Track 0	138	PD1
27	GND	128	GND	28	Write protect	68	PTD2
29	GND	129	GND	30	Read data	139	PTD3
31	GND	129	GND	32	Select head	63	ERR-
33	GND	130	GND	34	Disk change	70	PTD4

2.6.5 Parallel port

The parallel port is normally used to connect the CPU card to a printer through a DB25 connector. The CPC-2347 includes an on-board parallel port, accessed through a SO. DIMM golden finger. The parallel port is designated as LPT1 and can be disabled or changed to LPT2 or LPT3 in the BIOS setup manual.

Table 2-8: Parallel port connector

Printer port		CN5		Printer port		CN3	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	/STROBE	66	STB-	14	\AUTOFD	135	AFD-
2	DO	67	PTD0	15	ERR	63	ERR-
3	D1	138	PTD1	16	\INIT	137	INIT-
4	D2	68	PTD2	17	\SLCTINI	136	SLCTIN
5	D3	139	PTD3	18	GND	122	GND
6	D4	70	PTD4	19	GND	123	GND
7	D5	142	PTD5	20	GND	124	GND
8	D6	143	PTD6	21	GND	125	GND
9	D7	72	PTD7	22	GND	126	GND
10	\ACK	141	ACK-	23	GND	127	GND
11	BUSY	140	BUSY	24	GND	128	GND
12	PE	71	PE	25	GND	129	GND
13	SLCT	144	SLCT				

2.7 VGA/LAN/serial ports/keyboard/ mouse (CN2)

The CPC-2347 provides a VGA interface, a 10/100 Base-T Ethernet, two RS-232 serial ports, one keyboard and one PS2 mouse through a 40-pins FPC connector (CN4). Users can design their FPC cable for connecting CPC-2347's FPC connector to the user's system board. Users can choose suitable positions to layout VGA, LAN, COM port, Keyboard and mouse connector on user's system board.

Table 2-9: FPC connector (CN2)

Pin	Signal	Pin	Signal
1	GND	21	DSR2
2	KBVCC	22	RX2
3	EXT RESET	23	CD2
4	DDC1	24	TX2
5	DDC0	25	RI2
6	V SYNC	26	CTS2
7	H SYNC	27	RTS2
8	BLUE	28	DTR2
9	GREEN	29	KBVCC
10	RED	30	MSDT
11	KBVCC	31	KBDT
12	GND	32	KBCK
13	RI1	33	MSCK
14	CTS1	34	GND
15	RTS1	35	TPT-
16	DTR1	36	TPT+
17	TX1	37	GND
18	CD1	38	TPR-
19	RX1	39	TPR+
20	DSR1	40	GND

2.7.1 VGA interface

The VGA connector is a 15-pin D-SUB connector. Users can follow a transfer table to layout these VGA signals to a standard 15-pin D-SUB connector.
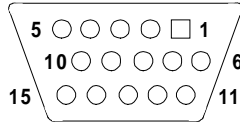

Table 2-10: VGA interface

VGA Pin	Signal	CN2 Pin	Signal	VGA Pin	Signal	CN2` Pin	Signal
1	RED	10	RED	9	Vcc	2	KBVCC
2	GREEN	9	GREEN	10	GND	1	GND
3	BLUE	8	BLUE	11	N/C	-	-
4	N/C	-	-	12	SDT	5	DDC0
5	GND	1	GND	13	H-SYNC	7	H SYNC
6	GND	1	GND	14	V-SYNC	6	V SYNC
7	GND	12	GND	15	SCK	4	DDC1
8	GND	12	GND				

2.7.2 Ethernet configuration

The CPC-2347 is equipped with a high performance 32-bit PCI-bus Fast Ethernet interface that are fully compliant with IEEE 802.3u 10/100Base-T specifications. Ethernet connector is a RJ-45 jack. User can follow a transfer table to connect Ethernet signals to a standard RJ-45 connector.
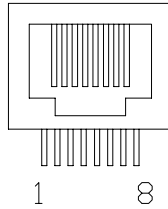
Table 2-11: Ethernet configuration

RJ-45 Pin	Signal	CN2 Pin	Signal	RJ-45 Pin	Signal	CN2 Pin	Signal
1	TD+	36	TPT+	2	TD -	35	TPT-
3	RD+	39	TPR+	4	NC	-	-
5	NC	-	-	6	RD-	38	TPR-
7	NC	-	-	8	NC	-	-

2.7.3 Keyboard and PS/2 mouse connector

The CPC-2347 provides a keyboard and PS2 mouse interface through a 40-pin FPC connector (CN4) for connection of PS/2 keyboard and PS/2 mouse.

In most cases, especially in embedded applications, a keyboard is not used. The standard PC/AT BIOS will report an error or fail during power-on self-test (POST) after a reset if the keyboard is not present. The CPC-2347's BIOS "Standard CMOS Features" allows you to select "Halt on" under the "All, but keyboard" or "All, but disk/key" selection. This allows no-keyboard operation in embedded system applications without the system halting under POST (power on self test).

Table 2-12: PS/2 keyboard connector

PS/2 Keyboard		CN2		PS/2 Keyboard		CN2	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	KB_Data	31	KBDT	4	Vcc	29	KBVCC
2	NC	-	-	5	KBCLK	32	KBCK
3	GND	34	GND	6	NC	-	-

Table 2-13: PS/2 mouse connector

PS/2 Mouse		CN2		PS/2 Mouse		CN2	
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	MDATA	30	MSDT	4	Vcc	29	KBVCC
2	NC	-	-	5	MCLK	33	MSCK
3	GND	34	GND	6	NC	-	-
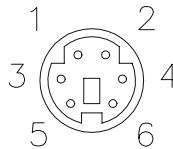
2.7.4 Serial ports

The CPC-2347 offers two serial ports: COM1 and COM2, both in RS- 232. These ports let you connect to serial devices (a mouse, printers, etc.) or a communication network.

You can select the address for each port (For example, 3F8H [COM1], 2F8H [COM2]) or disable it, using the BIOS Advanced Setup program. Different devices implement the RS-232 standard in different ways. If you are having problems with a serial device, be sure to check the pin assignments for the connector.

The IRQ and address range for both ports are fixed. However, if you wish to disable the port or change these parameters later, you can do this in the system BIOS setup. The table below shows the settings for the CPC-2347 board's ports:

Table 2-14: Serial port default settings

Port	Address	Default
COM1	3F8, 2F8, 3E8, 2E8	3F8/IRQ4
COM2	3F8, 2F8, 3E8, 2E8	2F8/IRQ3

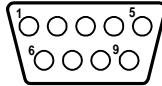The following table shows the pin assignments for the card's RS-232 port:

Table 2-15: COM1 RS-232 serial port connector

RS-232 Pin	Signal	CN2 Pin	Signal	RS-232 Pin	Signal	CN2 Pin	Signal
1	DCD	18	CD1	6	DSR	20	DSR1
2	RX	19	RX1	7	RTS	15	RTS1
3	TX	17	TX1	8	CTS	14	CTS1
4	DTR	16	DTR1	9	RI	13	RI1
5	GND	37	GND				

Table 2-16: COM2 RS-232 serial port connector

| RS-232 Pin	Signal	CN2 Pin	Signal	RS-232 Pin	Signal	CN2 Pin	Signal
1	DCD	23	CD2	6	DSR	21	DSR2
2	RX	22	RX2	7	RTS	27	RTS2
3	TX	24	TX2	8	CTS	26	CTS2
4	DTR	28	DTR2	9	RI	25	RI2
5	GND	40	GND				

2.8 Power supply connector (CN1)

In single board computer without carrier applications, user may connect a power directly to the CPC-2347 board through CN1. See the following table for its pin assignments:
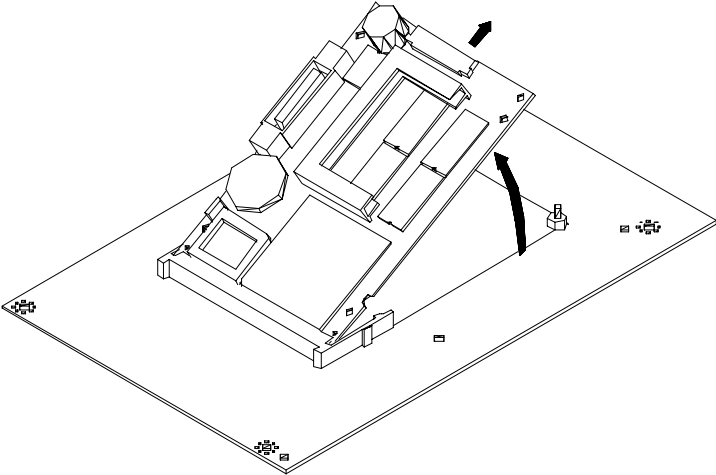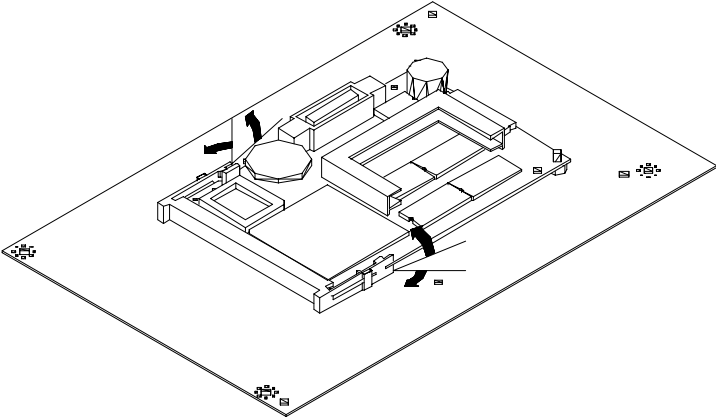
Table 2-17: Power supply connector (CN1)

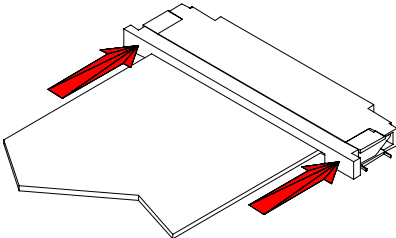| Pin	Function
1	NC
2	GND
3	GND
4	+5 V

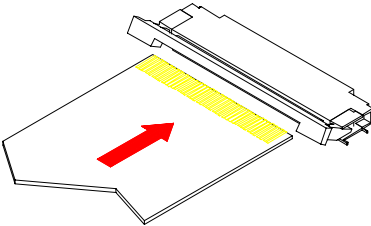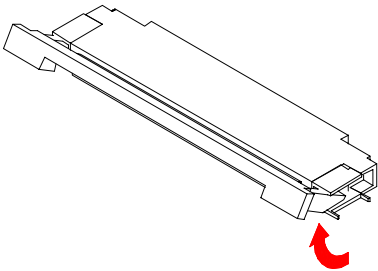# 2.9 Card installation
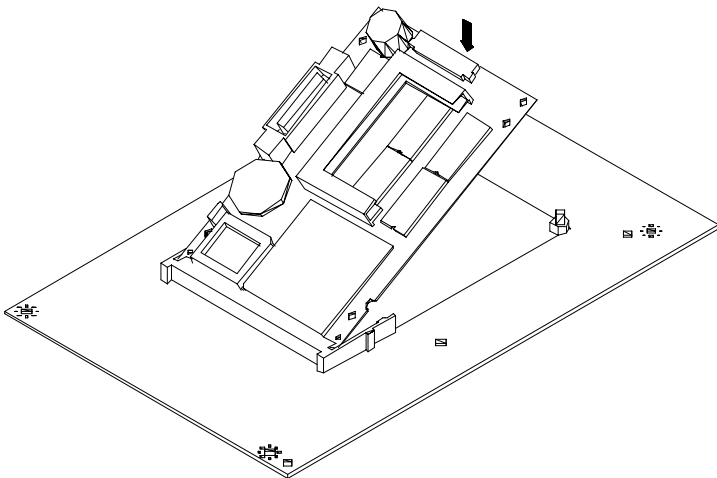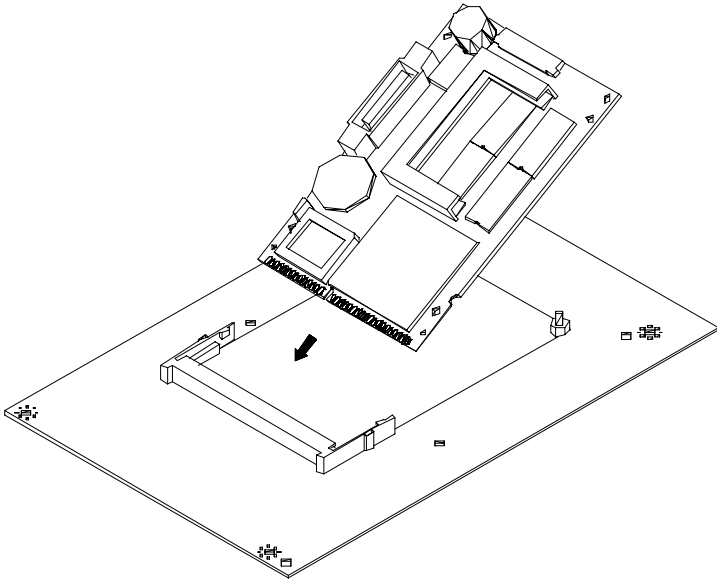
2.10 Card removal

2.11 FPC cable installation
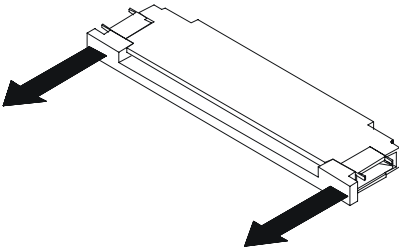
Award BIOS Setup

This chapter describes how to set the
BIOS configuration data.

3.1 General information

Award BIOS ROM has a built-in setup program that allows users to modify the basic system configuration. This type of information is stored in battery-backed-up RAM so that it retains the setup information when the power is turned off.

3.2 Starting Award BIOS setup

As POST executes, the following appears:

```
Hit <DEL> if you want to run SETUP
Press <DEL> to run AWARDBIOS setup.
```

Award BIOS main menu

The Award BIOS setup screen appears as follows:

Figure 3-1: Main menu

3.3   Standard CMOS features

Choose the "Standard CMOS Features" option from the main
menu, and the screen below will be displayed. This standard setup
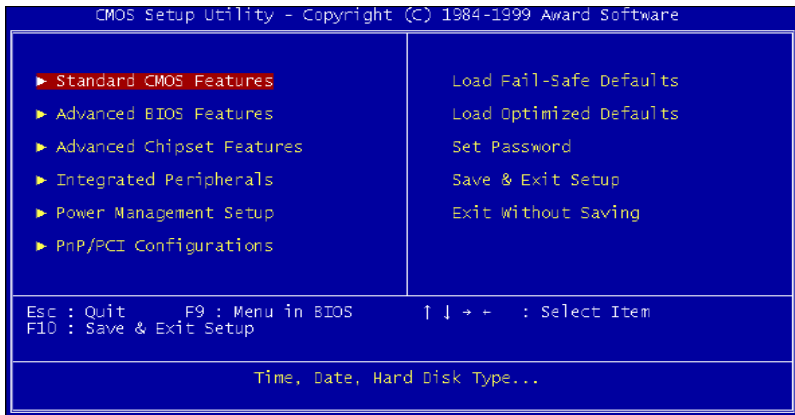menu allows users to configure system components such as date,
time, hard disk drive, floppy drive, display, and memory.
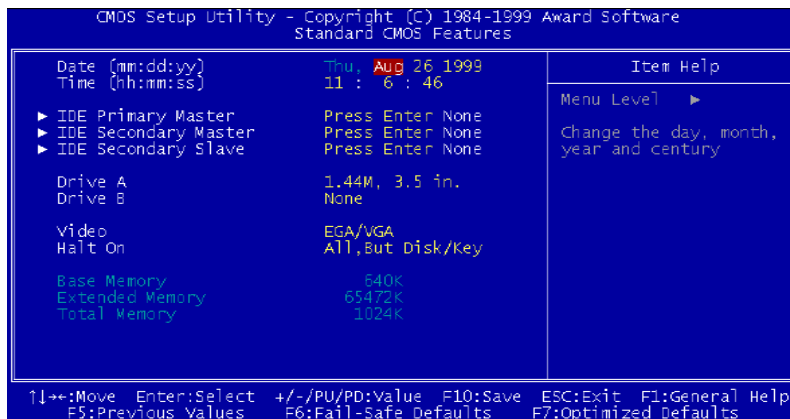
Figure 3-2: Standard CMOS setup screen

3.4 Advanced BIOS features

The screen below appears when choosing the "Advanced BIOS Features " item from the main menu. It allows the user to configure the CPC-2347 according to his particular requirements. Below are some major items that are provided in the Advanced BIOS FEATURES setup screen.

A quick booting function is provided for your convenience. Simply enable the Quick Power On Self Test item to save yourself valuable time.
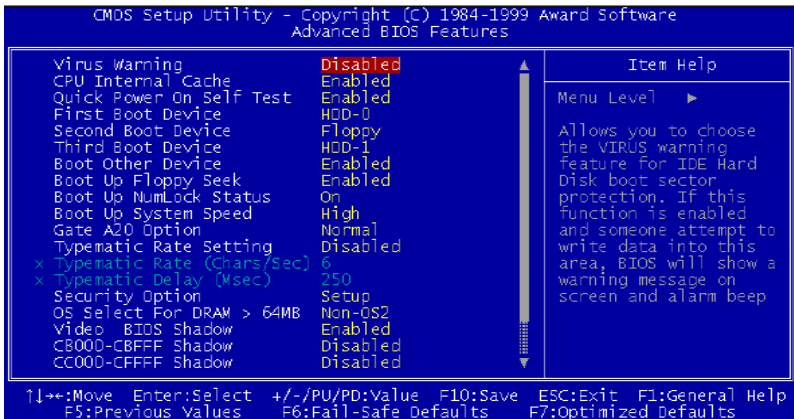
Figure 3-3: BIOS features setup screen

Virus Warning

While the system is booting up, and after boot-up, any attempt to write to the boot sector or partition table of the hard disk drive will halt the system. In this case, a warning message will be displayed. You can run the anti-virus program to locate the problem.

If Virus Warning is disabled, no warning message will appear if anything attempts to access the boot sector or hard disk partition.

Quick Power On Self Test

This option speeds up the Power-On Self Test (POST) conducted as soon as the computer is turned on. When enabled, BIOS shortens or skips some of the items during the test. When disabled, the computer conducts normal POST procedures.

Boot Sequence

This function determines the sequence in which the computer will search the drives for the disk operating system (i.e. DOS). The user can define boot sequences from following devices:

Floppy

HDD-0

SCSI

CDROM

HDD-1

HDD-2

HDD-3

Boot Up Floppy Seek

During POST, BIOS will determine if the floppy disk drive installed is 40 or 80 tracks. A 360 KB type drive is 40 tracks; while 720 KB, 1.2 MB, and 1.44 MB type drives are all 80 tracks.

Enabled BIOS searches the floppy drive to determine if it is 40 or 80 tracks. Note that BIOS cannot differentiate 720 KB, 1.2 MB, and 1.44 MB type drives as they are all 80 tracks.

Disabled BIOS will not search for the floppy drive type by track number. Note that there will not be any warning message if the drive installed is 360 KB.

Boot Up NumLock Status

The default is On.

On Keypad boots up to number keys.

Off Keypad boots up to arrow keys.

Gate A20 Option

Normal: The A20 signal is controlled by the keyboard controller or chipset hardware.

Fast (Default): The A20 signal is controlled by Port 92 or the chipset specific method.

Typematic Rate Setting

The typematic rate determines the characters per second accepted by the computer. The Typematic Rate setting enables or disables the typematic rate.

Typematic Rate (Chars/Sec)

BIOS fixes the following input values (characters/second) for typematic rate: 6.

Typematic Delay (msec)

Typematic delay is the time interval between the appearance of the first and second characters, when holding down a key. The input value is: 250 (msec).

Security Option

This setting determines whether the system will boot up if the password is denied. Access to Setup is, however, always limited.

System: The system will not boot, and access to Setup will be denied if the correct password is not entered at the prompt.

Setup: The system will boot, but access to Setup will be denied if the correct password is not entered at the prompt.

OS Select for DRAM > 64 MB

This setting is under the OS/2 system.

Video BIOS Shadow

This determines whether video BIOS will be copied to RAM, which is optional according to the chipset design. When enabled, Video BIOS

Shadow increases the video speed.

C8000-CBFFF Shadow / CC000-CFFFF Shadow

These determine whether optional ROM will be copied to RAM in blocks of 16 KB.

Enabled   Optional shadow is enabled.

Disabled   Optional shadow is disabled.

3.5   Advanced chipset features

By choosing the "Advanced CHIPSET FEATURES" option from the Main menu, the screen below will be displayed.

This sample screen contains the manufacturer default values for the CPC-2347.

This section allows you to configure the system based on the specific features of the installed chipset. This chipset manages bus speeds and access to system memory resources, such as DRAM and the external cache. It also coordinates communications between the conventional ISA bus and the PCI bus. It must be stated that these items should never need to be altered. The default settings have been chosen, because they provide the best operating conditions for your system.

Video Memory Size

The CPC-2347 adopts VGA share memory structure. Video memory size can be selected from 512 KB to 4096 KB. Onboard VGA video memory size should be "none", in order to release memory when the onboard VGA function is not used. VGA can be recovered by turning the power on and pressing the "INS" key until the display is recovered. Video memory size will be unchangeable and released automatically when the CPC-2520 LCD module is plugged into the CPC-2347.
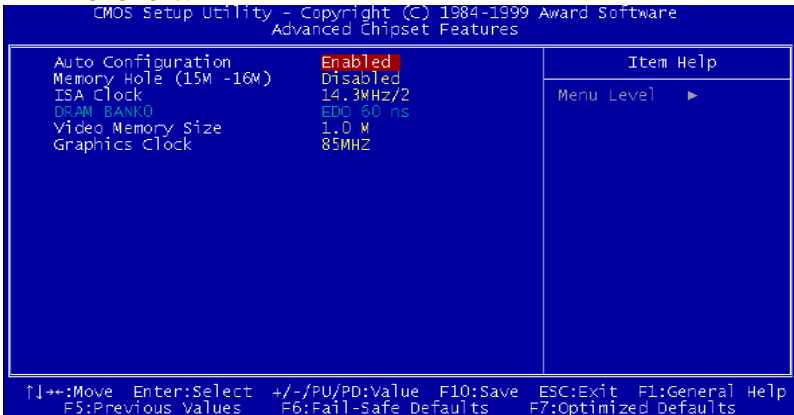

Figure 3-4: CHIPSET features setup screen

3.6 Integrated peripherals

```
        CMOS Setup Utility - Copyright (C) 1984-1999 Award Software
                          Integrated Peripherals
 ┌─────────────────────────────────────────────┬──────────────────────────┐
 │ On-Chip Local Bus IDE        Enabled         │      Item Help           │
 │ IDE Buffer for DOS & Win     Enabled         │                          │
 │ The 2nd channel IDE          Enabled         │  Menu Level   ▶          │
 │ IDE Primary Master PIO       Auto            │                          │
 │ IDE Secondary Master PIO     Auto            │                          │
 │ IDE Secondary Slave  PIO     Auto            │                          │
 │ IDE HDD Block Mode           Enabled         │                          │
 │ KBC input clock              8 MHz           │                          │
 │ Onboard FDC Controller       Enabled         │                          │
 │ Onboard Serial Port 1        3F8/IRQ4        │                          │
 │ Onboard Serial Port 2        2F8/IRQ3        │                          │
 │ Onboard Parallel Port                        │                          │
 │ Parallel Port Mode                           │                          │
 │ ECP Mode Use DMA             3               │                          │
 │ EPP Mode Select              EPP1.9          │                          │
 │ WDT Active when Power ON     Disabled        │                          │
 │                                              │                          │
 ├─────────────────────────────────────────────┴──────────────────────────┤
 │ ↑↓→←:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help │
 │     F5:Previous Values    F6:Fail-Safe Defaults   F7:Optimized Defaults  │
 └─────────────────────────────────────────────────────────────────────────┘
```
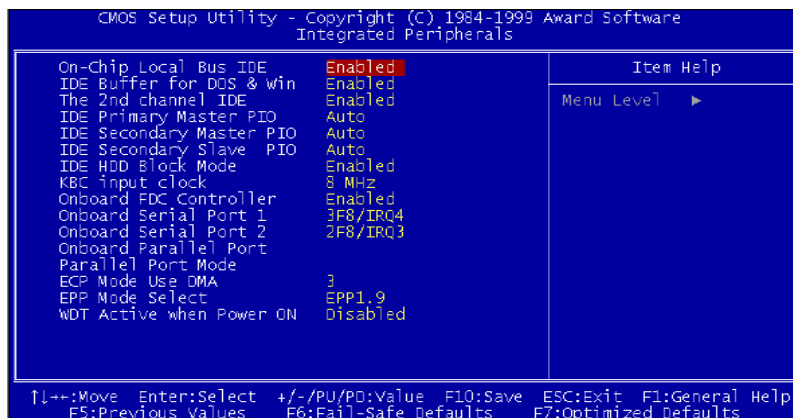
Figure 3-5: Integrated peripherals

Onboard FDC Controller

This option enables the floppy drive controller on the CPC-2347.

The settings are Enabled, or Disabled.

Onboard Serial Port 1/2

This option enables serial port 1/2 on the board and specifies the base I/O port address for serial port 1~2.

The settings are Disabled, 3F8h/IRQ4, 3E8h/IRQ4, 2E8h/IRQ3, and 2F8h/IRQ3.

Onboard Parallel Port

This option enables the parallel port on the CPC-2347 and specifies the parallel port's base I/O address. The settings are Disabled, 378/IRQ7, 3BC/IRQ7 and FDD. The default setting is 378/IRQ7.

The CPC-2347's floppy interface and parallel port share the same pin assignment. When "On board Parallel port" is setting to FDD, floppy drive will be enabled and printer port will be disabled. If "On board Parallel port" is setting to either Disabled, 378/IRQ7 or 3BC/IRQ7, printer port will be enable but floppy drive will be disable.

Parallel Port Mode

This option specifies the parallel port mode.

Setting	Description
SPP	The normal parallel port mode is used.
EPP	The parallel port can be used with devices that adhere to the Enhanced Parallel Port (EPP) specification.
EPP	This uses the existing parallel port signals to provide asymmetric bidirectional data transfer driven by the host device.
ECP	The parallel port can be used with devices that adhere to the Extended Capabilities Port (ECP) specification. ECP uses the DMA protocol to achieve transfer rates of approximately 2.5 Mbs. ECP provides symmetric bidirectional communications.

3.7 Power management setup

The power management setup controls the CPU card's "green" features. The following screen shows the manufacturer defaults.
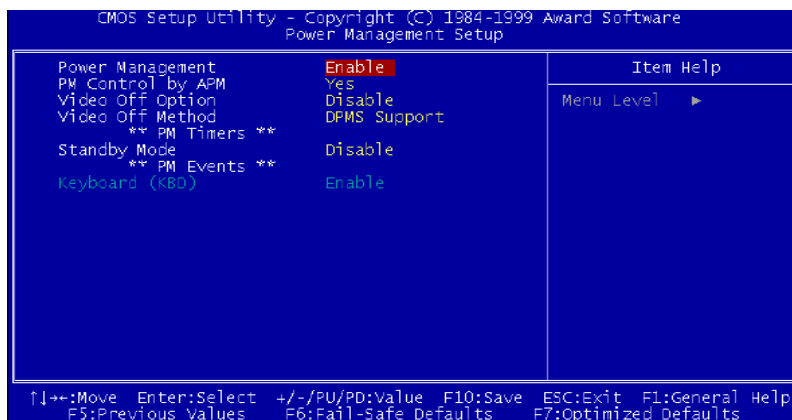

Figure 3-6: Power management setup screen

Power Management

Power management lets you set up your computer to save electricity when it is not inactive use by putting the system into progressively greater power saving modes. There are two selections for Power Management (Mode):

Disabled   Turns off PM

Enabled   Maximized power saving by activating maximum power saving settings after one minute of system inactivity.

When PM is set to Disabled, some items which are predefined will be unable to be changed.

Standby mode

This sets the period of system inactivity after which the system goes into Standby mode, the intermediate power saving state.

The settings range from 2 minutes to 16 minutes and can be set manually when power management is Enable. The default setting is Disabled. When the system goes into power saving mode, power management will skip to the next mode in the sequence if this is disabled.

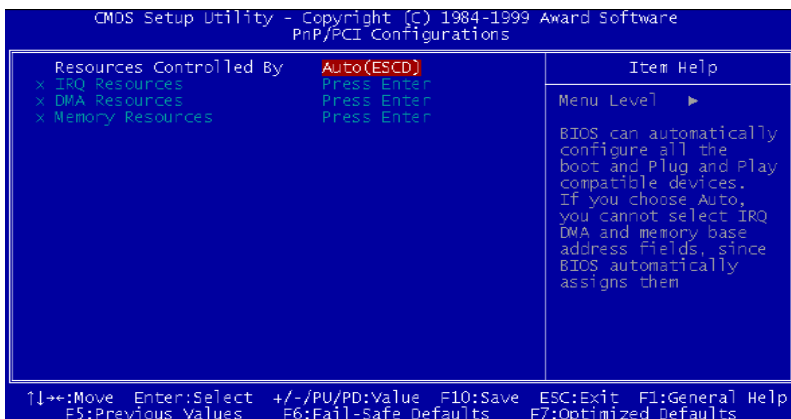# 3.8 PnP/PCI configuration setup

Figure 3-7: PCI configuration screen

Resources Control

When you choose Resources Control by Auto(ESCD), BIOS can automatically configure all the boot and plug and play compatible devices. IRQ, DMA and Memory resources will be unable to be changed.

When you choose Resources Control by Manual, IRQ, DMA, and Memory resource can be set up manually.

IRQ resources

These fields indicate whether or not the displayed IRQ for each field is being used by a legacy (non-PnP card). Two options are available: PCI/ISA PnP or Legacy. The first option, the default setting, indicates that the displayed IRQ is not used to determine if an ISA card is using that IRQ. If you install a legacy ISA card that requires a unique IRQ, you must set the field for that IRQ to "Legacy". Say for example that you install a legacy ISA card that requires IRQ10. You must then set "IRQ10" assigned to "Legacy".

DMA resources

These fields indicate whether or not the displayed DMA for each field is being used by a legacy (non-PnP card). Two options are available: PCI/ISA PnP or Legacy. The first option, the default setting, indicates that the displayed IRQ is not used to determine if an ISA card is using that IRQ. If you install a legacy ISA card that requires a unique DMA, you must set the field for that IRQ to "Legacy".

Memory resources

Memory length can be reserved as 8 KB, 16 KB, 32 KB or 64 KB and its address can be selected from C8000 to DC000. Reserved memory address will not be modified when "Reserved Memory Base" is N/A.

3.9   Load fail-safe defaults

Load Fail-safe Defaults indicates the most appropriate values for the system parameters for stability. These default values are loaded automatically if the stored record created by the setup program becomes corrupted and unusable.

3.10 Load optimized defaults

"Load Optimized Defaults" loads the values required by the system for maximum performance.

3.11 Password setting

To change the password:

1. Choose the "SET PASSWORD" option from the main menu and press <Enter>.

The screen will display the following message:

<div style="background:black;color:white;text-align:center;">Enter Password:</div>

Press <Enter>.

2. If the CMOS is good or if this option has been used to change the default password, the user is asked for the password stored in the CMOS. The screen will display the following message:

<div style="background:black;color:white;text-align:center;">Confirm Password:</div>

Enter the current password and press <Enter>.

3. After pressing <Enter> (ROM password) or the current password (user-defined), you can change the password stored in the CMOS.

The password must be no longer than eight (8) characters.

Remember, to enable the password setting feature, you must first select either SETUP or SYSTEM in "Security Option" item of "Advanced BIOS features".

3.12 Save & exit setup

If you select this and press <Enter>, the values entered in the setup utilities will be recorded in the CMOS memory of the chipset. The microprocessor will check this every time you turn your system on and compare this to what it finds as it checks the system. This record is required for the system to operate.

3.13 Exit without saving

Selecting this option and pressing <Enter> lets you exit the setup program without recording any new values or changing old ones.

Software Configuration

This chapter details the software configuration information. It shows you how to configure the card to match your application requirements.

Sections include:

• Ethernet interface configuration

4.1 Ethernet software configuration

The CPC-2347 on-board Ethernet interface supports all major network operating systems. To configure the medium type, to view the current configuration, or to run diagnostics, do the following:

1. Power the CPC-2347 on. Ensure that the RSET8139.EXE file is located in the working drive.

2. At the prompt type RSET8139.EXE and press <Enter>. The Ethernet configuration program will then be displayed.

3. This simple screen shows all the available options for the Ethernet interface. Just highlight the option you wish to change by using the Up and Down keys. To change a selected item, press <Enter>, and a screen will appear with the available options. Highlight your option and press <Enter>. Each highlighted option has a helpful message guide displayed at the bottom of the screen for additional information.

4. After you have made your selections and are sure this is the configuration you want, press ESC. A prompt will appear asking if you want to save the configuration. Press Y if you want to save.

The Ethernet Setup Menu also offers three very useful diagnostic functions. These are:

1. Run EEPROM test

2. Run Diagnostics on Board

3. Run Diagnostics on Network

Each option has its own display screen that shows the format and result of any diagnostic tests undertaken.

PCI Bus Ethernet Interface

This chapter provides information on Ethernet configuration.

- Introduction

- Installation of Ethernet driver for

    - MS-DOS and Windows 3.1

    - Windows 95

    - Windows NT

5.1   Introduction

The CPC-2347 is equipped with a high performance 32-bit Ethernet chipset which is fully compliant with IEEE 802.3 100 Mbps CSMA/CD standards. It is supported by major network operating systems. It is also both 100Base-T and 10Base-T compatible. The medium type can be configured via the RSET8139.exe program included on the utility disk.

5.2   Installation of Ethernet driver

Before installing the Ethernet driver, note the procedures below. You must know which operating system you are using in your CPC-2347, and then refer to the corresponding installation flow chart. Then just follow the steps described in the flow chart. You will quickly and successfully complete the installation, even if you are not familiar with instructions for MS-DOS or WINDOWS.
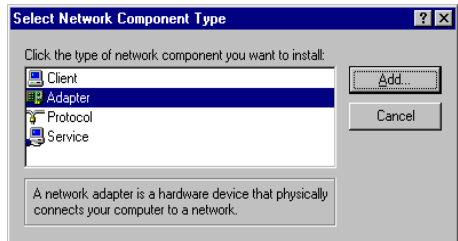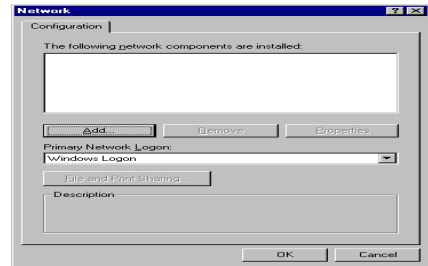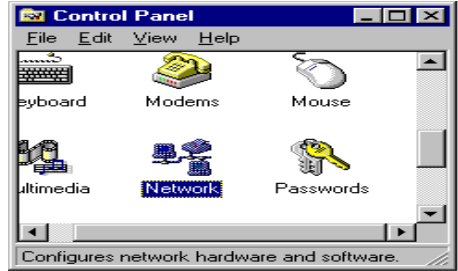
Note: *The windows illustrations in this chapter are examples only. You must follow the flow chart instructions and pay attention to the instructions which then appear on your screen.*

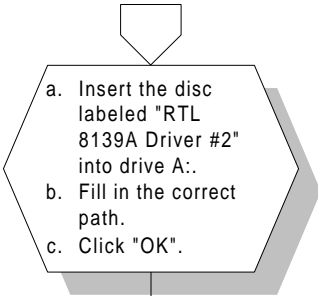### 5.2.1 Installation for MS-DOS and Windows 3.1

If you want to set up your Ethernet connection under the MS-DOS or Windows 3.1 environment, you should first check your server system model. For example, MS-NT, IBM-LAN server, and so on. Then choose the correct driver to install in your panel PC. The installation procedures for various servers can be found on the disk labeled: "RTL 8139A Driver #2".
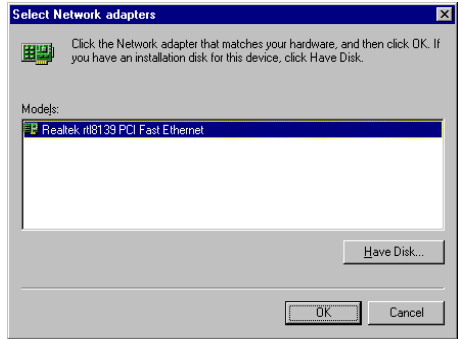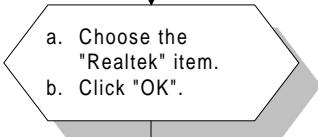
5.2.2 Installation for Windows 95

1.
a. Select "Start", "Settings", "Control Panel".
b. Double click "Network".

2.
a. Click "Add" and prepare to install network functions.

3.
a. Select the "Adapter" item to add the Ethernet card.

4.
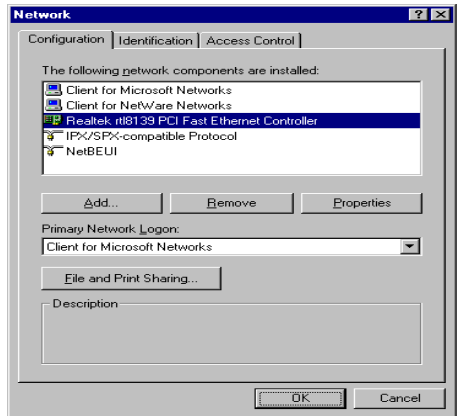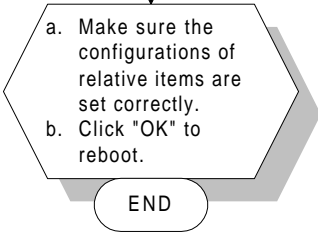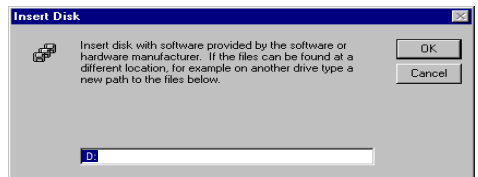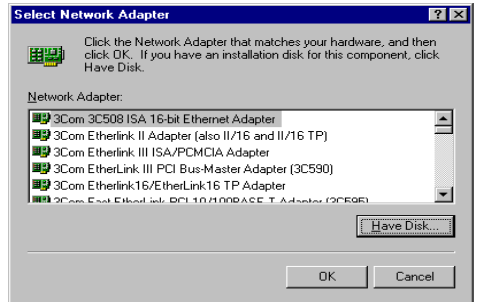a. Click "Have Disk" to install the driver.

5.

a. Insert the disc labeled "RTL 8139A Driver #2" into drive A:.

b. Fill in the correct path.

c. Click "OK".

Install From Disk

Insert the manufacturer's installation disk into the drive selected, and then click OK.

OK

Cancel

Copy manufacturer's files from:

A:\Win95\

Browse...

6.

a. Choose the "Realtek" item.

b. Click "OK".

Select Network adapters

Click the Network adapter that matches your hardware, and then click OK. If you have an installation disk for this device, click Have Disk.

Models:

Realtek rtl8139 PCI Fast Ethernet

Have Disk...

OK   Cancel

7.

a. Make sure the configurations of relative items are set correctly.

b. Click "OK" to reboot.

END

Network

Configuration | Identification | Access Control

The following network components are installed:

Client for Microsoft Networks
Client for NetWare Networks
Realtek rtl8139 PCI Fast Ethernet Controller
IPX/SPX-compatible Protocol
NetBEUI

Add...   Remove   Properties

Primary Network Logon:

Client for Microsoft Networks

File and Print Sharing...

Description

OK   Cancel

5.2.3 Installation for Windows NT

1.
a. Select "Start", "Settings", "Control Panel".
b. Double click "Network".

2.
a. Choose the "Adapters" label.
b. Click the "Add" button.

3.
a. Press "Have Disk".

4.
a. Type "D:".
b. Press "OK".

5.
a. Insert the disc labeled "RTL 8139A Driver #2" into drive A:.
b. Fill in the correct path.
c. Click "OK".

Install From Disk   ☒

🖳 Insert the manufacturer's installation disk into the drive selected, and then click OK.

[OK]
[Cancel]

Copy manufacturer's files from:

[A:\Winnt\   ▼]   [Browse...]

6.
a. Choose the "Realtek" item.
b. Click "OK".

Select Network adapters   ☒

🖳 Click the Network adapter that matches your hardware, and then click OK. If you have an installation disk for this device, click Have Disk.

Models:

🖳 Realtek rtl8139 PCI Fast Ethernet

[Have Disk...]

[OK]   [Cancel]

7.
a. Make sure the configurations of relative items are set correctly.
b. Click "OK" to reboot.

END

Network   ? ☒

Configuration | Identification | Access Control

The following network components are installed:

🖳 Client for Microsoft Networks
🖳 Client for NetWare Networks
🖳 Realtek rtl8139 PCI Fast Ethernet Controller
🖳 IPX/SPX-compatible Protocol
🖳 NetBEUI

[Add...]   [Remove]   [Properties]

Primary Network Logon:

[Client for Microsoft Networks   ▼]

[File and Print Sharing...]

Description

[OK]   [Cancel]

5.3 Further information

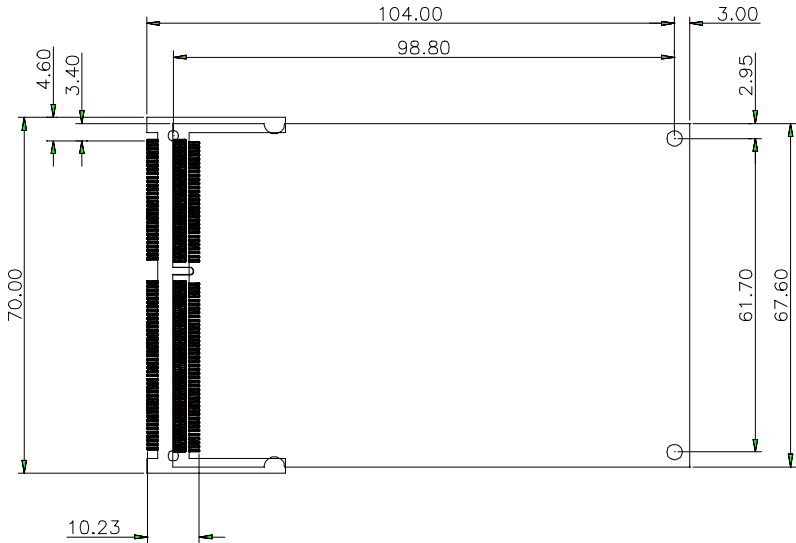Realtek website: **www.realtek.com.tw**

Advantech websites: **www.advantech.com**
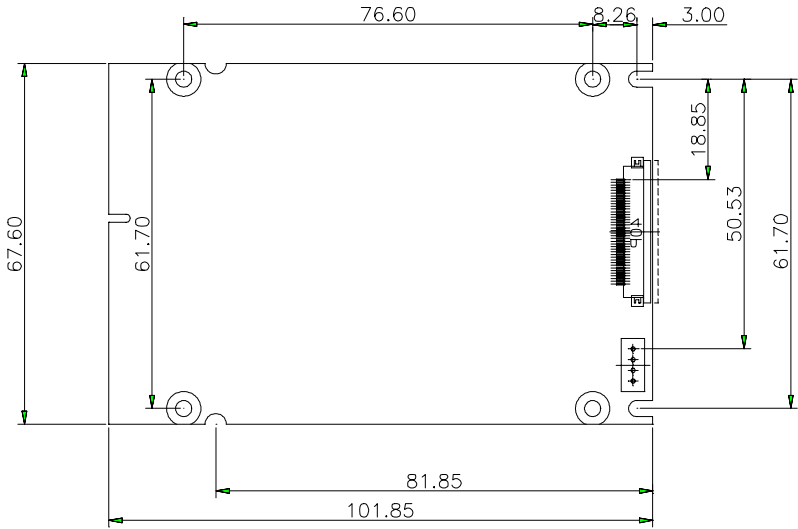 **www.advantech.com.tw**

Board Diagrams

This chapter shows diagrams of the CPC-2347's carrier board. It includes specifications for the FPC cable, SODIMM socket, and mechanical diagrams.
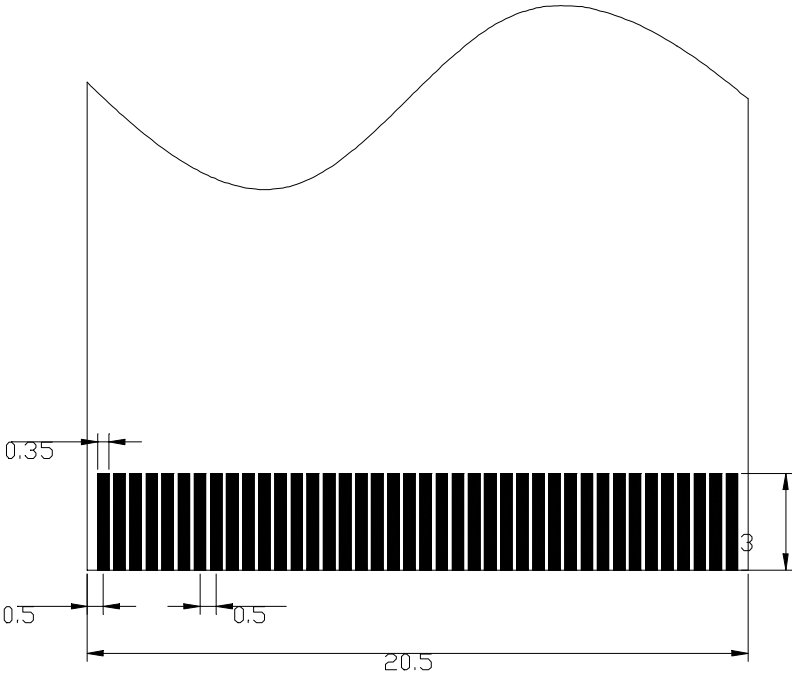
6.1 Board layout: SODIMM and screw hole locations

6.2 PCB layout: SODIMM mounting side

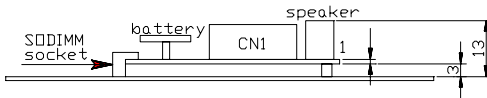# 6.3 Board layout: FPC connector (CN2)

6.4 FPC/FFC cable layout: (CN2; 40-pin FPC connector)

6.5 Height limits (side view)

*1: At least 3.0 mm height is needed between the carrier board's surface and the bottom of CPC-2347.Therefore, SODIMM socket must meet this requirement. Some suggested suppliers are listed below.

6.6 Component suppliers

Location	Model number	Supplier
CN5 SODIMM socket	C-390112	AMP
CN2 40-pin FPC connector	IL-FPR-40S-HF	JAE
CN3 50-pin PCI connector	245077050112861	ELCO

* Advantech's part number for the CN5 SODIMM socket is
1651500002.

6.7   SODIMM gold fingers (top view)
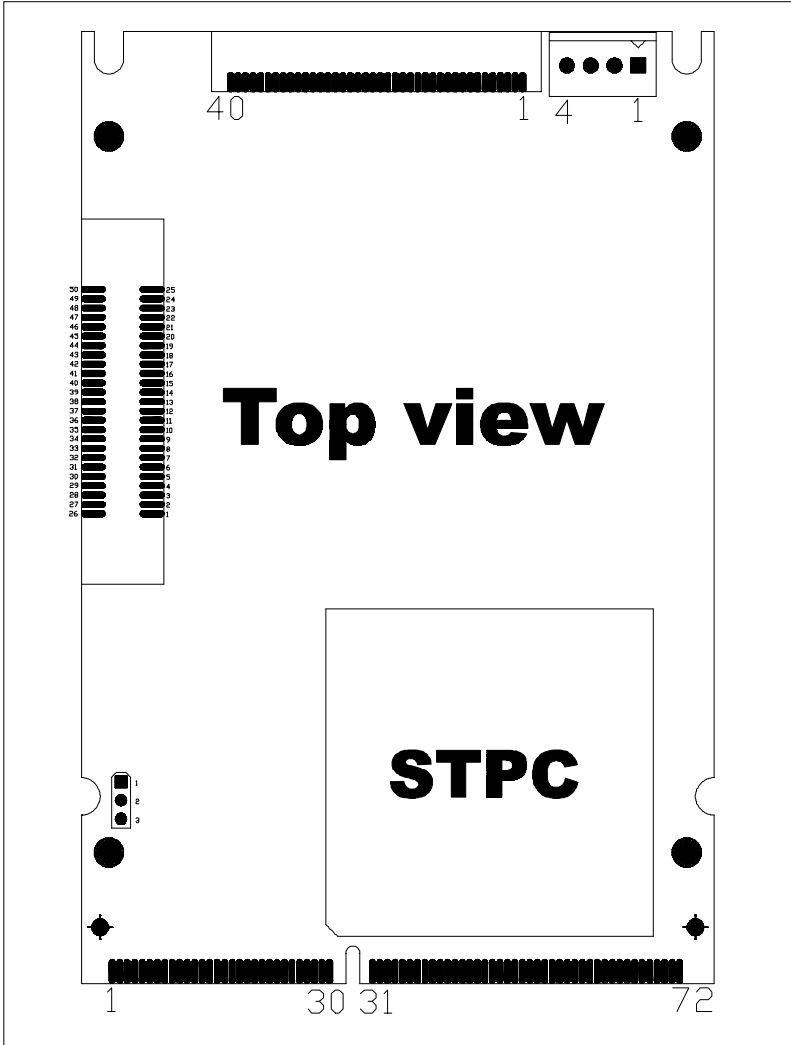
6.8 SODIMM gold fingers (bottom view)

Bottom view

144   103 102   73
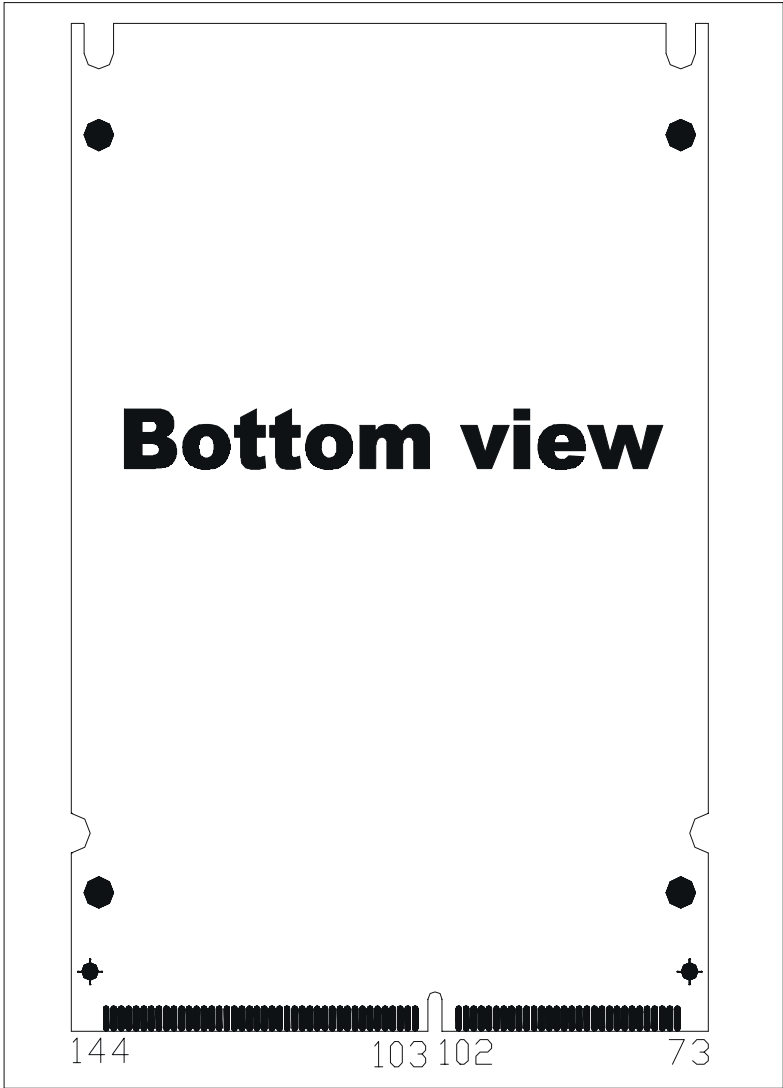
System Assignments

This appendix contains information of a detailed or specialized nature. It includes:

• System I/O ports

• DMA channel assignments

• Interrupt assignments

• 1st MB memory map

A.1 System I/O ports

Table A-1: System I/O ports

Addr. range (Hex)	Device
000-01F	DMA controller
020-021	Interrupt controller 1, master
022-023	Chipset address
040-05F	8254 timer
060-06F	8042 (keyboard controller)
070-07F	Real-time clock, non-maskable interrupt (NMI) mask
080-09F	DMA page register,
0A0-0BF	Interrupt controller 2
0C0-0DF	DMA controller
0F0	Clear math co-processor
0F1	Reset math co-processor
0F8-0FF	Math co-processor
1F0-1F8	Fixed disk
200-207	Game I/O
278-27F	Parallel printer port 2 (LPT 3)
2F8-2FF	Serial port 2
300-31F	Prototype card
360-36F	Reserved
378-37F	Parallel printer port 1 (LPT 2)
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display and printer adapter (LPT1)
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1

A.2 DMA channel assignments

Table A-2: DMA channel assignments

Channel	Function
0	Available
1	Available
2	Floppy disk (8-bit transfer)
3	Available
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available

A.3 Interrupt assignments

Table A-3: Interrupt assignments

Interrupt#	Interrupt source
IRQ 0	interval timer
IRQ 1	Keyboard
IRQ 2	Interrupt from controller 2 (cascade)
IRQ 8	Real-time clock
IRQ 12	PS/2 mouse (non-releasable)
IRQ 13	INT from co-processor
IRQ 14	Fixed disk controller (Primary)
IRQ 15	Fixed disk controller (Secondary)
IRQ 3	Serial communication port 2
IRQ 4	Serial communication port 1
IRQ 6	Diskette controller (FDC)
IRQ 7	Parallel port 1 (printer port)

Note: *The Ethernet function is auto-sensing.*

A.4 1st MB memory map

Table A-4: 1st MB memory map

Addr. range (Hex)	Device
F000h - FFFFh	System ROM
C800h - EFFFh	System ROM
C000h - C7FFh	Expansion ROM
B800h - BFFFh	CGA/EGA/VGA text
B000h - B7FFh	Unused
A000h - AFFFh	EGA/VGA graphics
0000h - 9FFFh	Base memory

Programming the Watchdog Timer

The CPC-2347 is equipped with a watchdog timer that resets the CPU or generates an interrupt if processing comes to a standstill for any reason. This feature ensures system reliability in industrial standalone or unmanned environments.

B.1 Programming the watchdog timer

The default configuration of the timer is enabled with system reset.

To enable the watchdog timer, you must make a program which **writes 1 to I/O port address 443 (hex)** at regular intervals. The first time your program reads the port, it enables the watchdog timer. After that, your program must **write 1 to port 443** at time intervals of less than 1.6 seconds. Otherwise, the watchdog timer will activate and reset the CPU. When you want to disable the watchdog timer, your program should **write 0 to port 443**.

If CPU processing comes to a standstill because of EMI or a software problem, your program's signals to I/O port address 443 of the timer will be interrupted. The timer will then automatically reset the CPU, and data processing will continue normally.

You must make your program so that it **writes 1 to I/O port 443** at an interval shorter than the timer's preset interval. The timer's intervals have a tolerance of ± 30%, so you should program an instruction that will refresh the timer about every second.

The following example shows how you might program the watchdog timer in BASIC:

```
10       REM  Watchdog timer example program
20       X=Out &H443,1 REM  Enable and refresh the
         watchdog
30       GOSUB 1000 REM  Task #1, takes 1 second to
         complete
40       X=Out &H443,1 REM  Refresh the watchdog
50       GOSUB 2000 REM  Task #2, takes 1 second to
         complete
60       X=Out &H443,0 REM  Disable the watchdog
70       END
1000     REM  Subroutine #1, takes 1 second to complete
  .
  .
  .
1070     RETURN
2000     REM  Subroutine #2, takes 1 second to complete
  .
  .
  .
2090     RETURN
```