



ICOP-6070

**PC/104 Embedded Vortex86™ CPU Module
w/2S/CRT/LCD/Ethernet/onboard 64MB DRAM**

User's Manual

(Revision 1.2b)

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Chapter 0

Startup

0.1 Packing List

Product Name	Function	Package
ICOP-6070	PC/104 Embedded Vortex86™ CPU Module	● ICOP-6070 PC/104 Embedded Vortex86™ CPU Module ● Manual & Drivers CD x 1 ● FDD cable x 1 ● HDD cable x 1 ● VGA cable x1 ● LAN cable x1 ● USB cable x1 ● RS232 cable x 2 ● Printer cable x 1 ● PS2 cable for Keyboard and Mouse x 2

0.2 Option Accessory

Product Name	Function	Package
ICOP-0094	IDE Exchange Kit	● IDE 44 pin (2.0mm Pitch) to IDE 40 pin (2.54mm Pitch), Board size:70 x 50 mm)

0.3 Specification

Features	ICOP-6070
Processor Chipset	DM&P(SiS)Vortex86™ System-on-Chip CPU-166MHz Real Time Clock with Lithium Battery Backup
Bus Interface	ISA and PC/104 Standard Compliant
Memory	Onboard 64MB SDRAM (optional 128MB)
BIOS	AMI BIOS
Multi I/O Chip	- Enhanced IDE interface - RS232 port x1 - RS232/485 port x1 - Parallel port x1 - FDD interface x1 - USB port x2
Video Display	- AGP Rev.2.0 Compliant - Shared system memory area up to 128MB. - Resolution up to 1,920Cx1,440 true colors - CRT/LCD display
LAN	- Realtek 8100B single chip - Full-duplex transfer mode, doubles effective bandwidth 16KB RAM buffer - NE2000 compatible with built-in 16KB RAM buffer - Throughput 10/100Mbps
Connectors	2.0mm 44-pin box header for IDE 2.0mm 10-pin box header for RS-232 x2 2 pin header for RS-485 2.0mm 26-pin box header for Printer 2.0mm 34-pin box header for FDD 2.0mm 10-pin box header for USB 2.0mm 10-pin box header for VGA 2.0mm 8-pin header for Ethernet 2.0mm 44-pin box header for LCD connector 5-pin box header for AT-KeyBoard connector 5-pin header for PS/2 Mouse - One 32-pin socket for for DiskOnChip

0.3 Specification ... continuation

Watchdog Timer	● Software Watchdog Timer ● Three 8254 Compatible Programmable 16-bit Counters. From 30.5μs to 512 seconds
DiskOnChip	One socket for DiskOnChip 8MB~256MB
Power Requirement	Single Voltage +5V @1.2 A
Board Weight	100g
Board Size	90mm X 96mm
Operating Temperature	-20°C ~ +60°C

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C h a p t e r 1

Introduction

1.1 Features

- PC/104 Embedded *Vortex86™* CPU Module (90 x 96 mm)
- DM&P *Vortex86™* System-On-Chip
- CRT and Flat Panel Display interface
- Onboard 64MB SDRAM (optional 128MB)
- Enhanced IDE devices and FDD interface
- One Bi-directional Parallel Port
- RS-232/485 interface
- Watchdog timer
- Socket for DiskOnChip
- Onboard Keyboard & Mouse connector
- Onboard Ethernet, compatible with NE2000
- Single voltage +5 V power connector
- Operating temperature from $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Board Support Package for Windows CE.NET and Windows XP Embedded
- Accept custom modification

1.2 Specifications

- **Embedded CPU:** DM&P *Vortex86™* System-on-Chip CPU – 166MHz, Realtime clock, and watchdog timer.
- **BIOS:** Y2K compliant AMI system BIOS
- **System Memory:** Onboard 64MB SDRAM (optional 128MB)
- **Bus Interface:** PC/104 ISA Bus Interface
- **Data Bus:** 64-bit
- **Bus Speeds:** PCI Bus – 33MHz
- **DMA Channels:** 7
- **Interrupt Levels:** 15
- **Enhanced IDE:** supports one port and up to two hard drives or Enhanced IDE devices of PIO mode 4. BIOS enabled/disabled
- **Watchdog Timer:** generates either a RESET, NMI or an IRQ when your application loses control over the system. Optionally the watchdog can trigger a user specified interrupt. The watchdog is configurable from 30.5µs to 512 seconds (in 30.5µs segments)
- **Real-time Clock:** included in *Vortex86™* SOC with onboard lithium battery backup for 10 years of data retention. CMOS data backup of BIOS setup and BIOS default.
- **Keyboard and Mouse Connectors:** Supports PS/2 Keyboard and mouse
- **Serial ports:** Supports high speed RS-232 port, high speed RS-232/485 port (jumper selectable).
- **Floppy Disk Drive Interface:** supports up to two floppy drives, 5¼" (360 KB or 1.2 MB) and 3½" (720 KB, 1.44 MB). BIOS enabled / disabled
- **Bi-directional Parallel Port:** supports SPP, EPP and ECP mode. BIOS enabled/disabled
- **Environmental and Power**
 - **Power Requirements:** single voltage +5 V @ 1.2A
 - **Board Dimensions:** 90 (L) x 96 (W) mm.
 - **Board Weight :** 100 g
 - **Extended Operating Temperature:** -20°C ~+60 °C

1.3 VGA Interface

- **Chipset:** DM&P *Vortex86™* SOC
- **Memory:** Shared system memory up to 128MB
- **System Bus:** 33-bit PCI bus
- **Panel Data Bus:** 24-bit
- **Display:** CRT and LCD Flat Panel

- **Compliance:**
 - AGP 2.0 / 4X Compliant / Fully DirectX 8 Compliant
 - Built-In DVI / DSTN / VIP interface
 - Cooperates with "Video Bridge" to support NTSC/PAL TV / Digital LCD Monitor / Secondary CRT Monitor output

- **Digital Output:**
 - Supports VESA Standard Super High Resolution Graphic Modes
 - 640x480 16/256/32K/64K/16M Colors 160 Hz NI

- **Supported Flat Panels:**
 - PVI 6.4" TFT LCD panel P/N: V16C6448AC
 - SHARP 6.4" TFT LCD panel P/N: LQ64D341 (HIROSE DF9BA-31P-1V)
 - NEC 6.5" TFT Color LCD panel P/N: NL6448BC20-08 (HIROSE DF9B-31P-1V)

1.4 DiskOnChip 2000 Flash Disk

Flash Disk DiskOnChip® 2000

- **Chipset:** DM&P *Vortex86™* SOC
- **Package:** Single Chip FlashDisk in 32-pin DIP JEDEC
- **Capacity:** 8-256 MByte capacity
- **Data Reliability:** ECC/EDC error correction
- **Memory Window:** 8 Kbyte

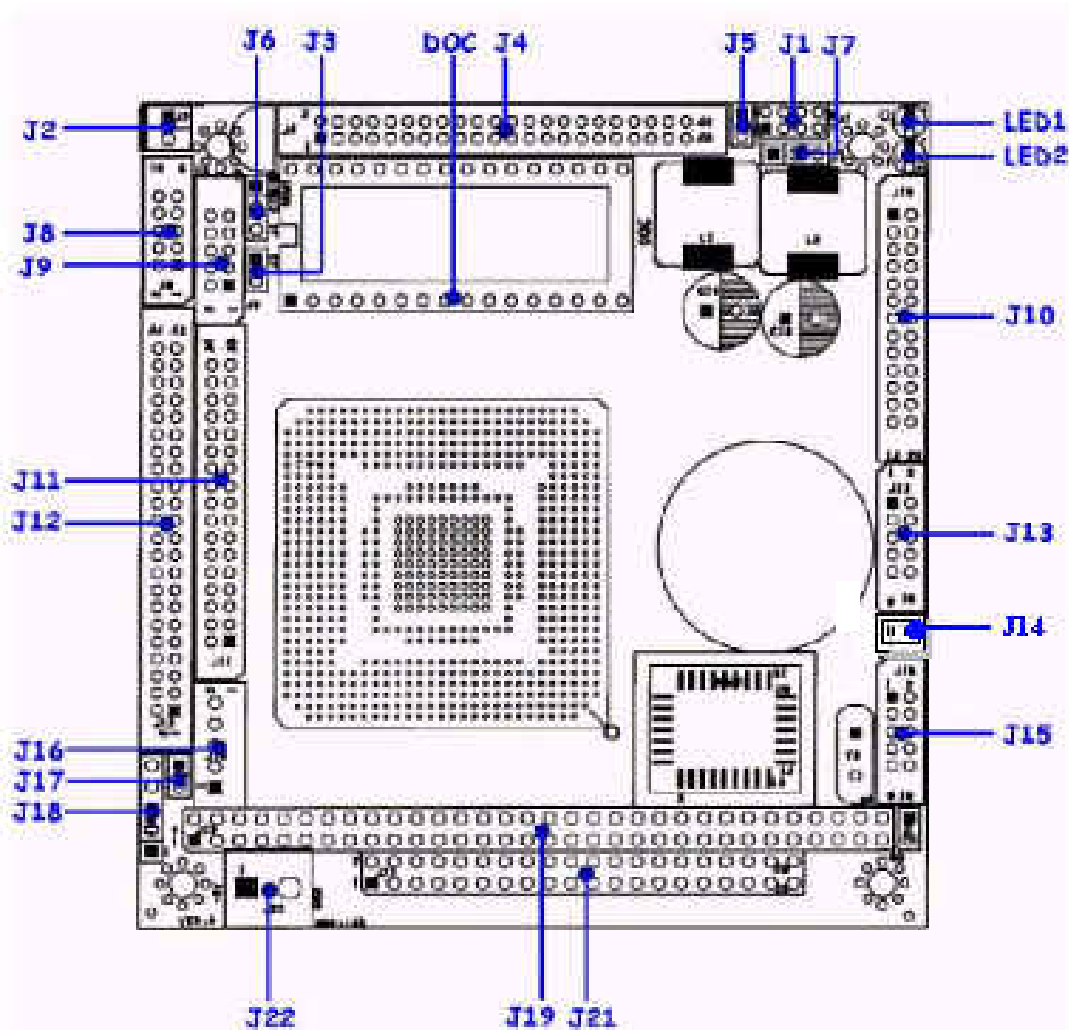
1.5 Network Interface

- **Chipset:** Realtek 8100B single chip
- **Type:** 10/100BASE-T
- **Transfer Mode:** Full duplex, doubles effective bandwidth
- **Buffer:** Built-in 16KB RAM Buffer.
- **Connectors:** 8-pin male header , pitch 2.0mm
- **Monitoring LEDs:** network ready indicator, network activity indicator
- **Compatibility:** NE2000

Chapter 2

Installation

2.1 Board Outline



2.2 Connectors & Jumpers Summary

SUMMARY

J1:	LAN Connection	Pin Header
J2:	RS485 Connection	Pin Header
J3:	RESET	Pin Header
J4:	IDE Connector	2.0 ØBox Header
J5:	IDE LED	Pin Header
J6:	LCD Volts Selection	Pin Header
J7:	RS232/485 Select	Pin Header
J8:	COM1 Connection	2.0 ØBox Header
J9:	COM2 Connection	2.0 ØBox Header
J10:	Printer Connector	2.0 ØBox Header
J11:	FDD Connector	2.0 ØBox Header
J12:	LCD Connector	2.0 ØBox Header
J13:	USB Connector	2.0 ØBox Header
J14:	CPU Fan connector	Molex Box Header
J15:	VGA Connector	2.0 ØBox Header
J16:	PS/2 Keyboard Connection	2.0 ØMolex Header
J17:	Speaker	Pin Header
J18:	PS/2 Mouse Connection	Pin Header
J19,J21:	PC104 Connector	Box Header
J22:	Power Connector	Pin Header
ROM1:	DOC Connector (DiskOnChip)	Pin Header

2.3 Pin Assignments & Jumper Settings

J1 : LAN Connection - 8-pin Header

	Pin #	Signal Name	Pin #	Signal Name
	1	TX+	2	TX-
	3	RX+	4	CT/CMT
	5	CT/CMT	6	RX-
	7	CT/CMT	8	CT/CMT

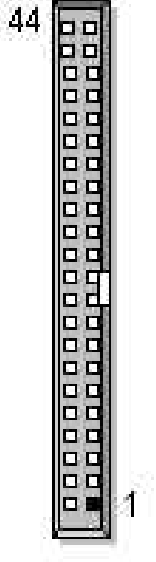
J2 : RS485 Connection- 2.54 Ø 2-pin Molex Header

	Pin #	Signal Name
	1	RS485+
	2	RS485-

J3 : RESET - 2-pin Header

	Pin #	Signal Name
	1	PWROK
	2	GND

J4 : IDE Connector - 2.0 Ø pitch 44-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	IDERST-	2	GND
	3	IDED7	4	IDED8
	5	IDED6	6	IDED9
	7	IDED5	8	IDED10
	9	IDED4	10	IDED11
	11	IDED3	12	IDED12
	13	IDED2	14	IDED13
	15	IDED1	16	IDED14
	17	IDED0	18	IDED15
	19	GND	20	NC
	21	IDEREQ	22	GND
	23	IDEIOW-	24	GND
	25	IDEIOR-	26	GND
	27	ICHRDY	28	GND
	29	IDACK-	30	GND
	31	IDEIRQ	32	NC
	33	IDESA1	34	CBLID
	35	IDESA0	36	IDESA2
	37	IDECS-0	38	IDECS-1
	39	DASP	40	GND
	41	VCC	42	VCC
	43	GND	44	NC

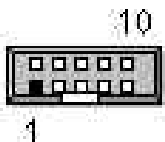
J5 : IDE LED - 2-pin Header

	Pin #	Signal Name
	1	VCC
	2	DASP

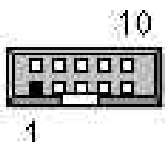
J7 : RS232/RS485 Select - 3-pin Header

	Pin #	Signal Name
	1-2	COM2 RS232
	2-3	RS485

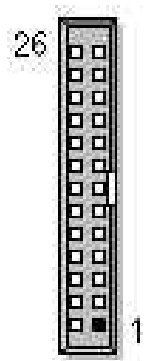
J8 : COM1 Connection (RS-232 Connector) - 2.0 Ø 10-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	DCD1	2	RXD1
	3	TXD1	4	DTR1
	5	GND	6	DSR1
	7	RTS1	8	CTS1
	9	RI1	10	NC

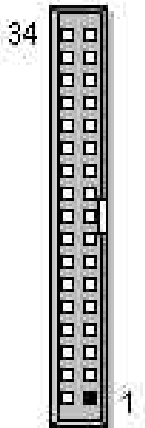
J9 : COM2 Connection (RS-232 Connector) - 2.0 Ø 10-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	DCD2	2	RXD2
	3	TXD2	4	DTR2
	5	GND	6	DSR2
	7	RTS2	8	CTS2
	9	RI2	10	NC

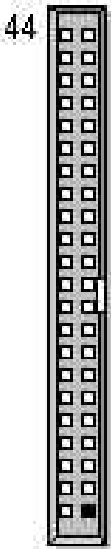
J10 : Printer Connector - 2.0 Ø 26-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	STB-	2	PD0
	3	PD1	4	PD2
	5	PD3	6	PD4
	7	PD5	8	PD6
	9	PD7	10	ACK-
	11	BISY	12	PE
	13	SLCT	14	AFD-
	15	ERR-	16	PRINIT-
	17	SLIN-	18	GND
	19	GND	20	GND
	21	GND	22	GND
	23	GND	24	GND
	25	GND	26	NC

J11 : FDD Connector - 2.0 Ø 34-pin Box Header (17x2)

	Pin #	Signal Name	Pin #	Signal Name
	1	GND	2	DENSEL
	3	GND	4	NC
	5	GND	6	NC
	7	GND	8	INDEX\
	9	GND	10	MTRO\
	11	GND	12	DS1\
	13	GND	14	DS0\
	15	GND	16	MTR1\
	17	GND	18	DIR\
	19	GND	20	STEP\
	21	GND	22	WD\
	23	GND	24	WG\
	25	GND	26	TR0\
	27	GND	28	WP\
	29	GND	30	RD\
	31	GND	32	HDSEL\
	33	GND	34	DSKCHG\

J12 : LCD Connector - 2.0 Ø pitch 44-pin Box Header

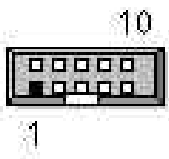
					SISSED	DSTN	DIGITAL	RGB
	Pin #	Signal Name	Pin #	Signal Name	CONN.		18-BIT	24-BIT
	1	LCDVCC	2	LCDVCC	VAD0	LD0	G2	G4
	3	VAD0	4	VAD1	VAD1	LD1	G3	G5
	5	VAD2	6	VAD3	VAD2	LD2	G4	G6
	7	VAD4	8	VAD5	VAD3	LD3	G5	G7
	9	VAD6	10	VAD7	VAD4	LD4		R0
	11	VAD8	12	VAD9	VAD5	LD5		R1
	13	VAD10	14	VAD11	VAD6	LD6	R0	R2
	15	GND	16	UD4	VAD7	LD7	R1	R3
	17	UD5	18	UD6	VAD8	UD0	R2	R4
	19	UD7	20	GND	VAD9	UD1	R3	R5
	21	VBD0	22	VBD1	VAD10	UD2	R4	R6
	23	VBD2	24	VBD3	VAD11	UD3	R5	R7
	25	VBD4	26	VBD5	VBD0			B0
	27	VBD6	28	VBD7	VBD1			B1
	29	VBD8	30	VBD9	VBD2		B0	B2
	31	VBD10	32	VBD11	VBD3		B1	B3
	33	GND	34	GND	VBD4		B2	B4
	35	PLDXCLK	36	VBGCLK	VBD5		B3	B5
	37	VADE	38	VBDE	VBD6		B4	B6
	39	AHSYNC	40	VBHSYNC	VBD7		B5	B7
	41	AVSYNC	42	VBVSYNC	VBD8			G0
	43	DISPOFF	44	VDDEN	VBD9			G1
					VBD10		G0	G2
					VBD11		G1	G3

J6: LCD Volts Selection - 3-pin Header

	Pin #	Signal Name
	1-2	+5V
	2-3	+3.3V

UD4	UD4		
UD5	UD5		
UD6	UD6		
UD7	UD7		
PLDXCLK	SHFCLK		
VADE	MOD/LDE		
VAHSYNC	LP/HYSNC		
VHVSNC	FLM/VYSNC		
DISOFF	ENBT		
VBGCLK		XCLK	XCLK
VBDE		DEN	DEN
VBHSYNC		HSYNC	HSYNC
VBVSYNC		VSNC	VSNC
VDDEN	VDDEN	VDDEN	VDDEN

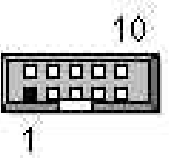
J13 : USB Connector - 2.0 Ø pitch 10-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	VCC	2	VCC
	3	-DATA1	4	-DATA0
	5	+DATA1	6	+DATA0
	7	GND	8	GND
	9	GND	10	GND

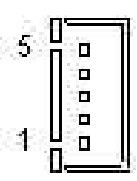
J14 : CPU FAN - 2-pin Molex Header

	Pin #	Signal Name
	1	VCC
	2	GND

J15 : VGA Connector - 2.0 Ø 10-pin Box Header

	Pin #	Signal Name	Pin #	Signal Name
	1	ROUT	2	GND
	3	GOUT	4	GND
	5	BOUT	6	GND
	7	HSYNC	8	GND
	9	VSYNC	10	GND

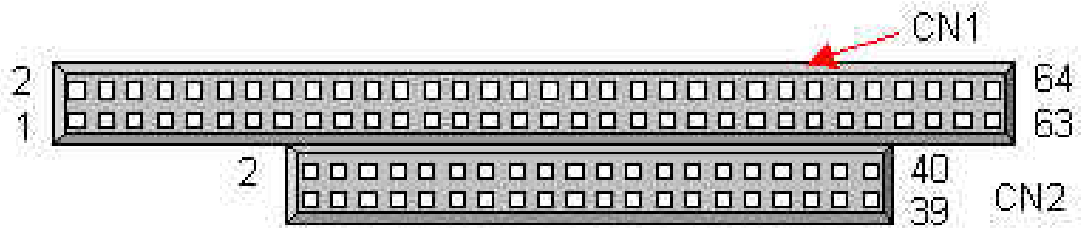
J16 : PS/2 Keyboard Connection - 5-pin Molex Header

	Pin #	Signal Name
	1	KBCLK
	2	KBDAT
	3	NC
	4	GND
	5	SB 5V (VCC)

J17 : Speaker - 2-pin Header

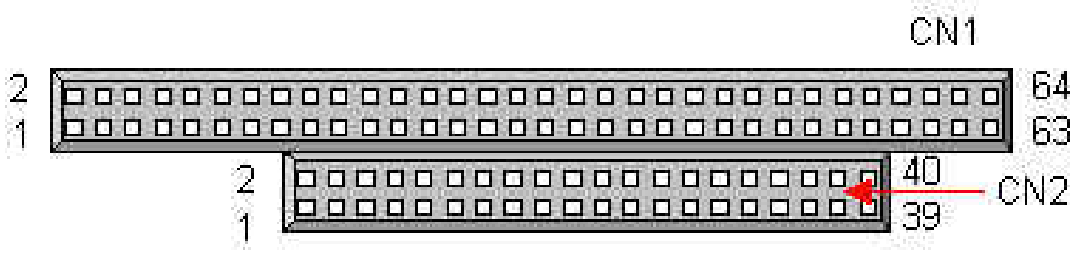
	Pin #	Signal Name
	1	SPKR
	2	VCC

J19 : PC/104 Connector - 64-pin Header Connector (CN1)



1	IOCHCHK *	2	GND
3	SD7	4	RESETDRV
5	SD6	6	+5V
7	SD5	8	IRQ9
9	SD4	10	-5V
11	SD3	12	DRQ2
13	SD2	14	-12V
15	SD1	16	ENDXFR *
17	SD0	18	+12V
19	IOCHRDY	20	(KEY)
21	AEN	22	SMEMW *
23	SA19	24	SMEMR *
25	SA18	26	IOW *
27	SA17	28	IOR *
29	SA16	30	DACK3 *
31	SA15	32	DRQ3
33	SA14	34	DACK1 *
35	SA13	36	DRQ1
37	SA12	38	REFRESH *
39	SA11	40	SYSCLK
41	SA10	42	IRQ7
43	SA9	44	IRQ6
45	SA8	46	IRQ5
47	SA7	48	IRQ4
49	SA6	50	IRQ3
51	SA5	52	DACK2 *
53	SA4	54	TC
55	SA3	56	SALE
57	SA2	58	+5V
59	SA1	60	OSC
61	SA0	62	GND
63	GND	64	GND

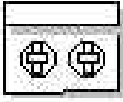
J21 : PC/104 Connector - 40pin Header Connector (CN2)

			
1	GND	2	GND
3	MEMCS16 *	4	SBHE *
5	IOCS16 *	6	LA23
7	IRQ10	8	LA22
9	IRQ11	10	LA21
11	IRQ12	12	LA20
13	IRQ15	14	LA19
15	IRQ14	16	LA18
17	DACK0 *	18	LA17
19	DRQ0	20	MEMR *
21	DACK5 *	22	MEMW *
23	DRQ5	24	SD8
25	DACK6 *	26	SD9
27	DRQ6	28	SD10
29	DACK7 *	30	SD11
31	DRQ7	32	SD12
33	+5V	34	SD13
35	MASTER *	36	SD14
37	GND	38	SD15
39	GND	40	(KEY)

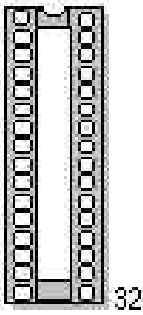
J18 : PS/2 Mouse Connection- 5-pin Header

	Pin #	Signal Name
	1	PMCLK
	2	PMDAT
	3	NC
	4	GND
	5	SB 5V (VCC)

J22 : Power Connector - 2-pin Header

	Pin #	Signal Name
	1	SB5V
	2	GND

ROM1(DiskOnChip): DOC Connector – 32-pin Grid hole DIP Socket

	Pin #	Signal Name	Pin #	Signal Name
	1	NC	2	NC
	3	NC	4	XA12
	5	XA7	6	XA6
	7	XA5	8	XA4
	9	XA3	10	XA2
	11	XA1	12	XA0
	13	XD0	14	XD1
	15	XD2	16	GND
	17	XD3	18	XD4
	19	XD5	20	XD6
	21	XD7	22	ROMCS1
	23	XA10	24	MDRCL
	25	XA11	26	XA9
	27	XA8	28	NC
	29	NC	30	NC
	31	MWTCL	32	VCC

2.4 DiskOnChip Flash Disk

2.4.1 Setup a DiskOnChip ® 2000 Flash Disk

Installation Instructions

1. Make sure the power of ICOP-6070 is turned OFF.
2. Plug the DiskOnChip 2000 device into its socket. Verify the mounting orientation of the DiskOnChip 2000 is correct (DiskOnChip 2000 pin 1 must be aligned with pin 1 of the socket).
3. Turn on the power of the system, and you may observe the messages displayed by the DiskOnChip 2000 when its drivers are automatically loaded into system's memory. Start Address is assigned and fixed at "0E0000 HEX".
4. If the DiskOnChip 2000 is the only disk in the system, it will appear as the first disk (drive C: in DOS).
5. If there are more disks besides the DiskOnChip 2000, the DiskOnChip 2000 will appear by default as the last drive.
6. If you want the DiskOnChip 2000 to be bootable: a - copy the operating system files into the DiskOnChip by using the standard DOS command (for example: sys d:) b - The DiskOnChip should be the only disk in the systems or should be configured as the first disk in the system (c:) using the DUPDATE utility

For more information on DiskOnChip2000 technology, visit M-Systems Web site – [http:// www.m-sys.com](http://www.m-sys.com) where you can find Utilities Manual, Data Sheets and Application Notes. In addition, you can find the latest DiskOnChip 2000 S/W Utilities.

2.5 Watchdog Timer

The watchdog timer uses a 32.768 KHz frequency source with a 24-bit counter. Its time range stretches from 30.5 ms to 512 sec. with a resolution of 30.5 ms. When the watchdog times out, a System RESET, NMI or IRQ can be invoked. Watchdog timer control and the 24-bit counter itself occupy 6 consecutive 8-bit address locations.

When functioning properly, the system resets the watchdog timer periodically to prohibit that it times out. If the watchdog timer times out, it will RESET the system, or generate and NMI or IRQ, depending on its configuration.

Watchdog or System Timer

Another great application is to generate a periodic IRQ signal. Under DOS environment, the 8254, system timer 0, will generate IRQ0 every 54.9 ms. The watchdog is like a system timer 0. It can be programmed to periodically generate a configurable IRQ. It may be clear that the selected IRQ, will no longer be available to the system.

Configuring the Watchdog Timer in the BIOS

The Vortex86 watchdog configuration register can be controlled by software or can be setup in the BIOS. To do so, go to BIOS Setup's "Advanced Chipset Setup"

Watchdog Function	= Enable/Disable
Watchdog Signal	= RESET, NMI or IRQ 3/4/5/6/7/9/10/11/12/14/15
Watchdog Timer	= 1/2/4/8/16/32/64/128/256/512 Seconds

The BIOS setup only offers a limited amount of time-out values. To obtain a more higher resolution of timeout values, refer to the next paragraph "Configuring the Watchdog Timer by Software". Note that in case of using the BIOS setup, the watchdog starts counting the moment it passes the BIOS setup. This means that if you set the time-out period to 1 second, the system will keep rebooting before being able to load operating system or software!

After you have finished configuring your watchdog timer, it reads "Timeout Status & Reset - INDEX 3CH" on page 23; and look at the example on page 24 to find out how to periodically resetting the timeout status to prevent the watchdog timer from invoking a RESET, NMI or IRQ.

Configuring the Watchdog Timer by Software

Chipset configuration registers

The Vortex86 configuration register INDEX 37H, 38H, 39H, 3AH, 3BH, 3Ch are used to control the watchdog functions and/or display its current status.

Enable/Disable watchdog - INDEX 37H

Bit	Value	Action
7	reserved	Do not modify the value of these bits!
6	0	Disable watchdog timer
	1	Enable watchdog timer
5-0	Other function	Do not modify the value of these bits!

Watchdog time out action - INDEX 38H

Bit	Value	Action
7-4	0000	No output signal
	0001	IRQ3
	0010	IRQ4
	0011	IRQ5
	0100	IRQ6
	0101	IRQ7
	0110	IRQ9
	0111	IRQ10
	1000	IRQ11
	1001	IRQ12
	1010	IRQ14
	1011	IRQ15
	1100	NMI
	1101	System RESET
	1110	No output signal
	1111	No output signal
3-0	Other function	Do not modify the value of these bits!

Watchdog timer - INDEX 39H, 3AH, 3BH

Index	3Bh	3Ah	39h
Bits	D7.....D0	D7.....D0	D7.....D0
counter	[VSB.....]		LSB]

For example

Index	3Bh	3Ah	39h	Time out
	00h	00h	01h	30.5µs
	00h	00h	02h	61µs
	00h	01h	00h	7.8 ms
	00h	02h	00h	15.6 ms
	01h	00h	00h	2 s
	02h	00h	00h	4 s
	FFh	FFh	FFh	512 s

Timeout Status & Reset - INDEX 3Ch

Bit	Value	Action
7	0	Timeout has not occurred
	1	Timeout has occurred
6	1	Reset timer
	0	Has no meaning
5-0		Other function, do not modify these bits

Programming the watchdog

To perform any operation on the Vortex86 configuration registers you always have to unlock first and lock the registers afterwards.

Unlock configuration register

```
mov al, 013h
out 22h, al
nop
nop
mov al, 0c5h
out 23h, al
nop
nop
```

Lock configuration register

```
mov al, 013h
out 22h, al
mov al, 000h
out 23h, al
```

Read the value of a configuration register

For example, read INDEX 3Ch :

Unlock configuration register

```
mov al, 03ch
out 22h, al
nop
nop
in al, 23h
nop
nop
push ax
```

Lock configuration register

pop ax ;AL - result

Write data to configuration register

For example, write 0FFh to INDEX 3Bh :

Unlock configuration register

mov al, 03bh

out 22h, al

nop

nop

mov al, 0ffh

out 23h, al

nop

nop

Lock configuration register

Watchdog Program Example

We use the following sequence to initialize the watchdog timer:

- (1) Unlock configuration register.
- (2) Disable watchdog timer by setting INDEX 37H Bit 6 to '0'.
- (3) Set the expected counter value to INDEX 3BH, 3AH, 39H.
- (4) Select timeout action from INDEX 38H Bit 7-4.
- (5) Enable watchdog timer by setting INDEX 37H Bit 6 to '1'.
- (6) Lock configuration register.

Example: Set timeout to 128 sec to generate a system RESET.

```
; Please use MASM to compiler the following program
; Execute under DOS environment
dosseg
. model small
. stack 100h
.code
main proc
    mov ax, 0c513h ; Unlock config. register
    call writechip
    mov ax, 03737h ; Disable watchdog timer
    call readchip
    and al, 10111111b
    xchg ah, al
    call writechip
    mov ax, 0403bh ; Set the expected counter
                    ; value
    call writechip ; to [400000h]
    mov ax, 0003ah ; 30.5*sec*400000h= 128 sec
    call writechip
    mov ax, 00039h
    call writechip
    mov ax, 03838h ; Select "system reset" as
                    ; timeout action
```

```

        call readchip
        and al, 00001111b
        or al, 11010000b
        xchg ah, al
        call writechip
        mov ax, 03737h ; Enable watchdog timer
        call readchip
        or al, 01000000b
        xchg ah, al
        call writechip
        mov ax, 00013h ; Lock config. register
        call writechip
        mov ax, 04c00h
        int 21h
        main endp
readchip proc
        out 22h, al
        nop
        nop
        in al, 23h
        nop
        nop
        ret
readchip endp
writechip proc
        out 22h, al
        nop
        nop
        xchg ah, al
        out 23h, al
        nop
        nop
        xchg ah, al
        ret
writechip endp
end main

```

Reset watchdog timer

Resets the watchdog timer periodically to prevent timeout.

```
mov ax, 0c513h ; Unlock configuration
                ; register
call writechip
mov ax, 03C3Ch ; Reset watchdog timer
                ; counter
call readchip
or al, 01000000 ; The counter is reset at
xchg ah, al ; out 23h, al
call writechip
mov ax, 00013h ; Lock configuration
                ; register
call writechip
```

(the above code uses readchip and writechip procedures)

Chapter 3

SVGA Setup

3.1 Introduction

The ICOP-6070 offers high performance/low cost *Vortex™* SoC (System on Chip) solution that integrates a x86 compatible processor, high performance North Bridge, advanced hardware GUI engine and Super-South bridge into a single chipset – this SoC design supports the now PC technology, USB, Legacy Removal, CIR, Memory Stick, Smart Card and Slotless Design for a variety of Industrial Applications covering automation, data acquisition, internet communication, and other information exchange devices. It also has a built-in VGA controller.

3.1.1 SoC Chipset

The embedded video uses the integrated Ultra-AGP™ VGA controller for Hardware 2D/video/Graphics Accelerators, this board supports conventional analog CRT monitor or flat panel. It is both AGP 4X / Fully DirectX 8 Compliant. It also provides Monitor / Secondary CRT Monitor output. This video SVGA controller supports conventional analog CRT monitor or flat panel. In addition, it also supports interlaced and non-interlaced analog monitors (color and monochrome VGA) in high-resolution modes while maintaining complete IBM VGA compatibility. Multiple frequency (multi-sync) monitors are handled as if they were analog monitors.

3.1.2 Display memory

The VGA controller can drive CRT displays or color panel displays with resolutions up to 1920 x 1440 at 256 colors (True colors). It supports Shared System Memory up to 128 MB.

3.2 Flat Panel BIOS Wiring

The ICOP-6070 offers high performance/low cost *Vortex™* SoC (System on Chip) solution that integrates a x86 compatible processor, high performance North Bridge, advanced hardware GUI engine and Super-South bridge into a single chipset – this SoC design supports the now PC technology, USB, Legacy Removal, CIR, Memory Stick, Smart Card and Slotless Design for a variety of Information Exchange applications. It also has a built-in VGA controller. Shown on next page are the -

Supported Flat Panels:

- PVI 6.4" TFT LCD panel P/N: V16C6448AC
- SHARP 6.4" TFT LCD panel P/N: LQ64D341 (HIROSE DF9BA-31P-1V)
- NEC 6.5" TFT Color LCD panel P/N: NL6448BC20-08 (HIROSE DF9B-31P-1V)

- PVI 6.4" TFT LCD panel P/N: V16C6448AC

TFT-LCD Panel Driving

Pin No.	Symbol	Function	Remark
1	GND	Ground (0V)	
2	CLK	Clock Signal for Sampling Image Digital Data	
3	Hsync	Horizontal Synchronous Signal	Note 5-1
4	Vsync	Vertical Synchronous Signal	Note 5-1
5	GND	Ground (0V)	
6	R0	Red Image Data Signal (LSB)	
7	R1	Red Image Data Signal	
8	R2	Red Image Data Signal	
9	R3	Red Image Data Signal	
10	R4	Red Image Data Signal	
11	R5	Red Image Data Signal (MSB)	
12	GND	Ground (0V)	
13	G0	Green Image Data Signal (LSB)	
14	G1	Green Image Data Signal	
15	G2	Green Image Data Signal	
16	G3	Green Image Data Signal	
17	G4	Green Image Data Signal	
18	G5	Green Image Data Signal (MSB)	
19	GND	Ground (0V)	
20	B0	Blue Image Data Signal (LSB)	
21	B1	Blue Image Data Signal	
22	B2	Blue Image Data Signal	
23	B3	Blue Image Data Signal	
24	B4	Blue Image Data Signal	
25	B5	Blue Image Data Signal (MSB)	
26	GND	Ground (0V)	
27	DENB	Disable	
28	VCC	DC +5.0V Power Supply	
29	VCC	DC +5.0V Power Supply	
30	R/L	Horizontal Image Shift-direction Select Signal	Note 5-2
31	U/D	Vertical Image Shift-direction Select Signal	Note 5-3

Note: The TFT-LCD panel display is compatible with four kinds of timing. They are VGA-480, VGA-400, VGA-350 and freedom mode. The polarization of Hsync and Vsync determine the timings.

	VGA-480	VGA-400	VGA-350	Freedom Mode
Hsync Polarization	Negative	Negative	Positive	Positive
Vsync Polarization	Negative	Positive	Negative	Positive

- SHARP 6.4" TFT LCD panel P/N: LQ64D341 (HIROSE DF9BA-31P-1V)

TFT-LCD panel driving

CN1 Used connector: DF9BA-31P-IV (Hirose Electric Co., Ltd.)

[illegible]

CNI pin arrangement from module surface
(Transparent view)

DF9B-31S-1V (")
DF9M-31S-1V (")

Pin No.	Symbol	Function	Remark
1	GND	—	—
2	CK	Clock signal for sampling each data signal	—
3	Hsync	Horizontal synchronous signal	【Note1】
4	Vsync	Vertical synchronous signal	【Note1】
5	GND	—	—
6	R0	R E D data signal(LSB)	—
7	R1	R E D data signal	—
8	R2	R E D data signal	—
9	R3	R E D data signal	—
10	R4	R E D data signal	—
11	R5	R E D data signal(MSB)	—
12	GND	—	—
13	G0	G R E E N data signal(LSB)	—
14	G1	G R E E N data signal	—
15	G2	G R E E N data signal	—
16	G3	G R E E N data signal	—
17	G4	G R E E N data signal	—
18	G5	G R E E N data signal(MSB)	—
19	GND	—	—
20	B0	B L U E data signal(LSB)	—
21	B1	B L U E data signal	—
22	B2	B L U E data signal	—
23	B3	B L U E data signal	—
24	B4	B L U E data signal	—
25	B5	B L U E data signal(MSB)	—
26	GND	—	—
27	ENAB	Signal to settle the horizontal display position	【Note2】
28	Vcc	+3.0V power supply	—
29	Vcc	+3.0V power supply	—
30	R/L	Horizontal display mode select signal	【Note3】
31	U/D	Vertical display mode select signal	【Note4】

- NEC 6.5" TFT Color LCD panel P/N: NL6448BC20-08 (HIROSE DF9B-31P-1V)

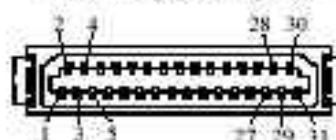
CN31 socket (LCD module side): DF9B-31P-1V (Hirose Electric Co., Ltd.)

Adaptable plug: DF9-31S-1V (Hirose Electric Co., Ltd.)

Pin No.	Symbol	Signal	Remarks
1	GND	Ground	
2	CLK	Dot clock	
3	Hsync	Horizontal synchronous	
4	Vsync	Vertical synchronous	
5	GND	Ground	
6	R0	Red data (LSB)	Least significant bit
7	R1	Red data	
8	R2	Red data	
9	R3	Red data	
10	R4	Red data	
11	R5	Red data (MSB)	Most significant bit
12	GND	Ground	
13	G0	Green data (LSB)	Least significant bit
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data (MSB)	Most significant bit
19	GND	Ground	
20	B0	Blue data (LSB)	Least significant bit
21	B1	Blue data	
22	B2	Blue data	
23	B3	Blue data	
24	B4	Blue data	
25	B5	Blue data (MSB)	Most significant bit
26	GND	Ground	
27	DE	Select of DE / Fixed mode	DE mode: Data enable signal, Fixed mode: Open
28	VCC	Power supply	
29	VCC	Power supply	
30	NC	Non connection	
31	DPSR	Select of scan direction	Normal scan: Low or Open, Reverse scan: High Note1.

Note1: See "4.8 SCANNING DIRECTIONS".

CN31: Figure of socket



Chapter 4

Network Interface

4.1 Introduction

The Realtek RTL-8100B 10/100Mbps Ethernet controller board supports both 10/100BASE-T and Coax 10Base-2 'BNC' connectors, and allows direct connection to your 10/100Mbps Ethernet based Local Area Network for full interaction with local servers, wide area networks such as the Internet.

I/O and IRQ settings can be done by software with the supplied utility software, or it can be set for Plug and Play compatibility. The controller supports : Full-Duplex Ethernet function to double channel bandwidth, auto media detection.

4.2 Software Support

- On-board EEPROM (93C46) programming
- Setup/Diagnostic program for DOS
- Help utility for easy installation
- RPL boot ROM for Novell Netware, Microsoft NT
- NDIS2 (DOS, OS/2, Lantastic, WFW3.11; K; K)
- NDIS3, NDIS4, NDIS5 for WIN95, 98, NT3.51, 4.0, 5.0, WFW3.11
- Netware 16-bit ODI driver for DOS, OS/2 and 32-bit ODI driver for Netware 3.x, 4.x, 5.0 Server
- Packet driver for UNIX Client
- SCO Unix driver
- Linux driver

All operating systems that support standard NE2000

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.