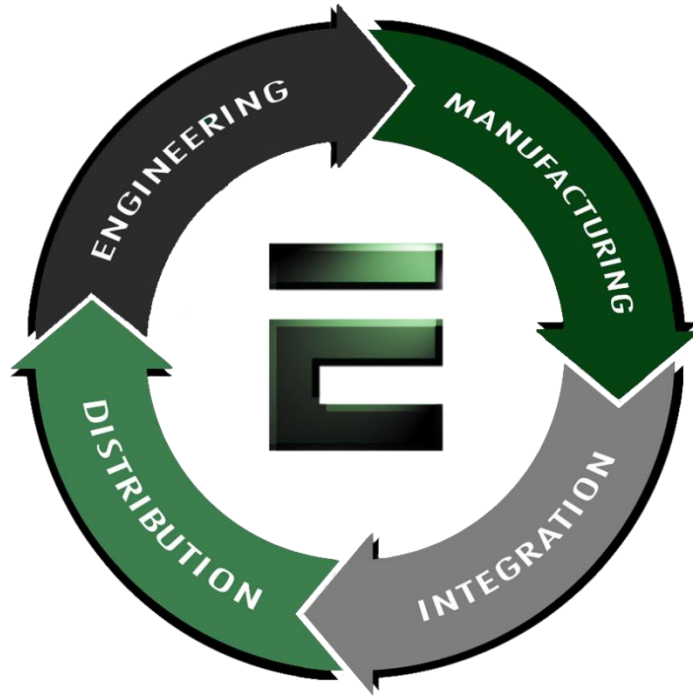


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ICOP-6025/6025V
ICOP-6024/6024V
ICOP-6020
ICOP-6022

Embedded 386SX CPU ISA Half Size SBC
Series

User's Manual

(Version 3.3)

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Chapter 0

Startup

0.1 Packing List

Product Name	Function	Package
ICOP-6025	Embedded 386SX ISA Half Size All-in-One SBC	<ul style="list-style-type: none">● ICOP-6025 Embedded 386SX CPU SBC● FDD cable x 1● HDD cable x 1● RS232 cable x 3● Printer cable with bracket x 1● AT KB / PS2 Mouse Y-cable x 1
ICOP-6025V	Embedded 386SX ISA Half Size All-in-One SBC with VGA/LCD	<ul style="list-style-type: none">● ICOP-6025V Embedded 386SX CPU SBC● Utility and Drivers Diskette x 1● FDD cable x 1● HDD cable x 1● RS232 cable x 3● Printer cable with bracket x 1● AT KB / PS2 Mouse Y-cable x 1● VGA cable x 1

Product Name	Function	Package
ICOP-6024	Embedded 386SX ISA Half Size All-in-One SBC	<ul style="list-style-type: none"> ● ICOP-6024 Embedded 386SX CPU SBC ● FDD cable x 1 ● HDD cable x 1 ● RS232 cable x 1 ● Printer cable with bracket x 1 ● AT KB / PS2 Mouse Y-cable x 1
ICOP-6024V	Embedded 386SX ISA Half Size All-in-One SBC with VGA/LCD	<ul style="list-style-type: none"> ● ICOP-6024V Embedded 386SX CPU SBC ● Utility and Drivers Diskette x 1 ● FDD cable x 1 ● HDD cable x 1 ● RS232 cable x 1 ● Printer cable with bracket x 1 ● AT KB / PS2 Mouse Y-cable x 1 ● VGA cable x 1

Product Name	Function	Package
ICOP-6020	Embedded 386SX ISA Half Size All-in-One SBC	<ul style="list-style-type: none"> ● ICOP-6020 Embedded 386SX CPU SBC ● FDD cable x 1 ● HDD cable x 1 ● Printer cable with bracket x 1 ● AT KB / PS2 Mouse Y-cable x 1
ICOP-6022	Embedded 386SX ISA Half Size All-in-One SBC	<ul style="list-style-type: none"> ● ICOP-6022 Embedded 386SX CPU SBC ● FDD cable x 1 ● HDD cable x 1 ● Printer cable with bracket x 1 ● AT KB / PS2 Mouse Y-cable x 1

0.2 Specifications

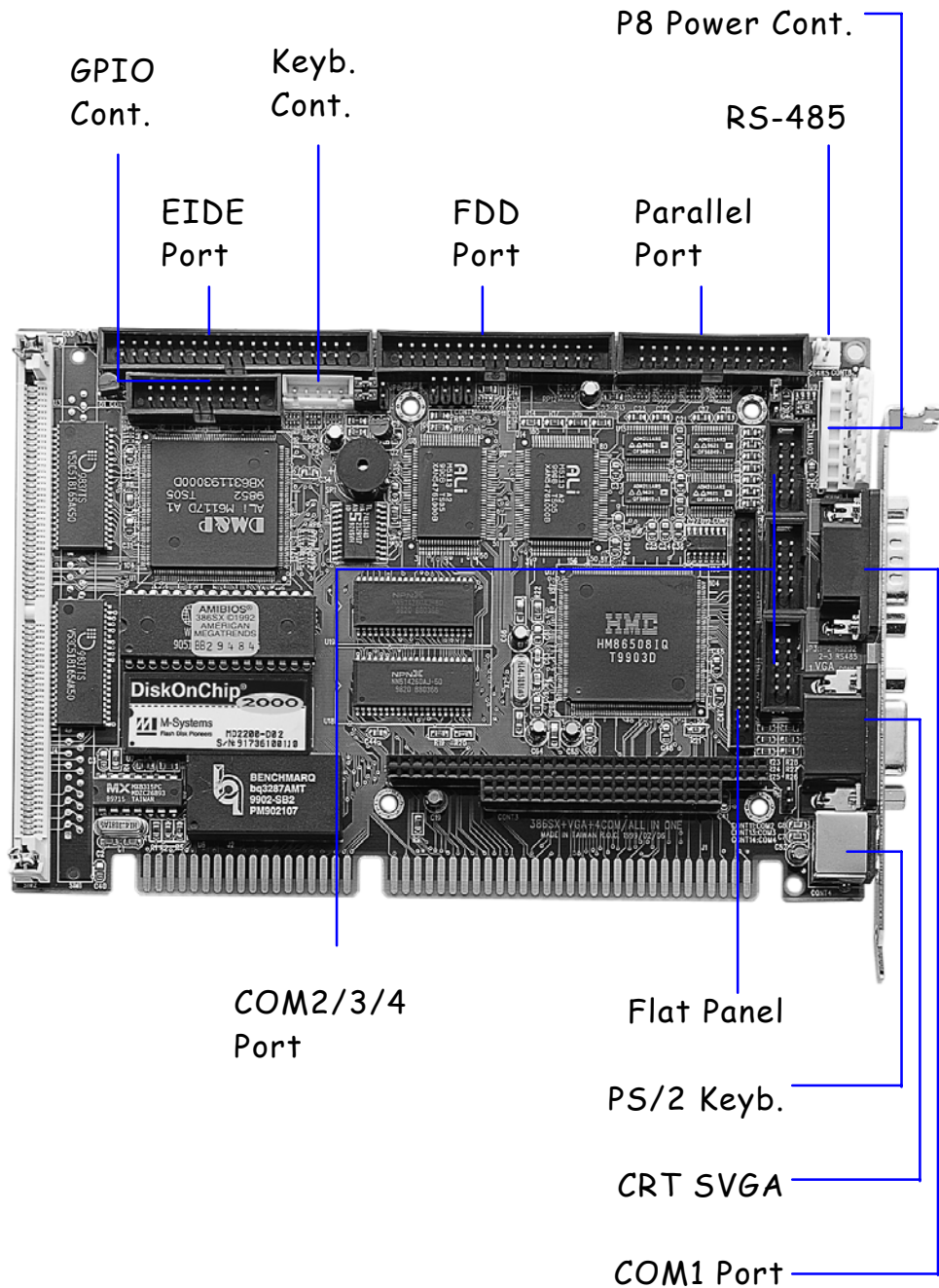
Features	ICOP-6025	ICOP-6025V
Chipset	DM&P(ALi) M6117D	
Processor	386SX-40 on-die	
Multi I/O Chip	ALi 5113	
BIOS	AMI BIOS	
Watchdog Timer	From 30.5µs to 512 seconds	
Bus Interface	ISA and PC/104 standard compliant	
Memory	4MB onboard, up to 20MB	
Memory Sockets	SIMM x 1	
DiskOnChip Socket	1	
Digital I/O	16 Bit	
Display	X	VGA/LCD
VGA CRT/LCD Chip	X	TOPRO TP65081Q
Enhanced IDE Port	1	
Floppy Connector	1	
Serial Port	RS232 X 4 (or RS232 X 3,RS485 X 1)	
Parallel Port	1	
Power Requirement	+5V @0.8A	
Board Weight	240g	
Board Size	185mm X 122 mm	
Operating Temperature	-20 ~ +60°C	

Features	ICOP-6024	ICOP-6024V
Chipset	DM&P(ALi) M6117D	
Processor	386SX-40 on-die	
Multi I/O Chip	ALi 5113	
BIOS	AMI BIOS	
Watchdog Timer	From 30.5 μ s to 512 seconds	
Bus Interface	ISA and PC/104 standard compliant	
Memory	4MB onboard, up to 20MB	
Memory Sockets	SIMM x 1	
DiskOnChip / EPROM / Flash Disk Socket	2	
Display	X	VGA/LCD
VGA CRT/LCD Chip	X	TOPRO TP65081Q
Enhanced IDE Port	1	
Floppy Connector	1	
Serial Port	RS232 X 2 (or RS232x1,RS485x1)	
Parallel Port	1	
Power Requirement	+5V @0.8A	
Board Weight	240g	
Board Size	185mm X 122 mm	
Operating Temperature	-20 ~ +60°C	

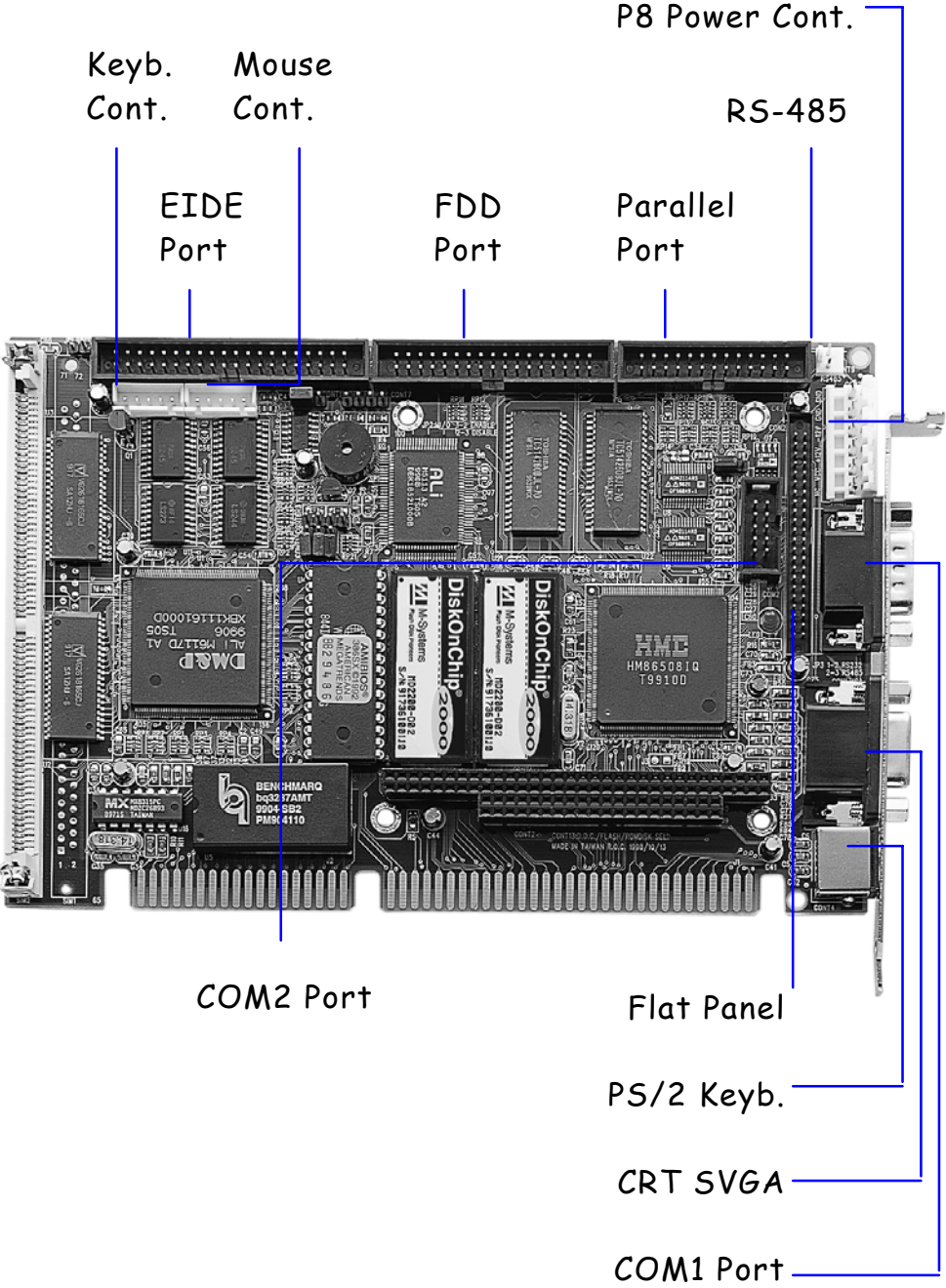
Features	ICOP-6020	ICOP-6022
Chipset	DM&P(ALi) M6117D	
Processor	386SX-40 on-die	
Multi I/O Chip	ALi 5113	
BIOS	AMI BIOS	
Watchdog Timer	From 30.5 μ s to 512 seconds	
Bus Interface	ISA and PC/104 standard compliant	
Memory	2MB up to 32MB	
Memory Sockets	SIMM X 2	
DiskOnChip / Flash Disk	1	2
EPROM	X	2
Digital I/O	16 bit	X
Display	X	
Enhanced IDE Port	1	
Floppy Connector	1	
Serial Port	RS232 X 2	RS232 X 2 (or RS232x1,RS485x1)
Parallel Port	1	
Power Requirement	+/-12V, +5V@0.6A	+/-12V, +5V@0.8A
Board Weight	240g	
Board Size	185mm X 122 mm	
Operating Temperature	-20 ~ +60°C	

0.3 Component Location

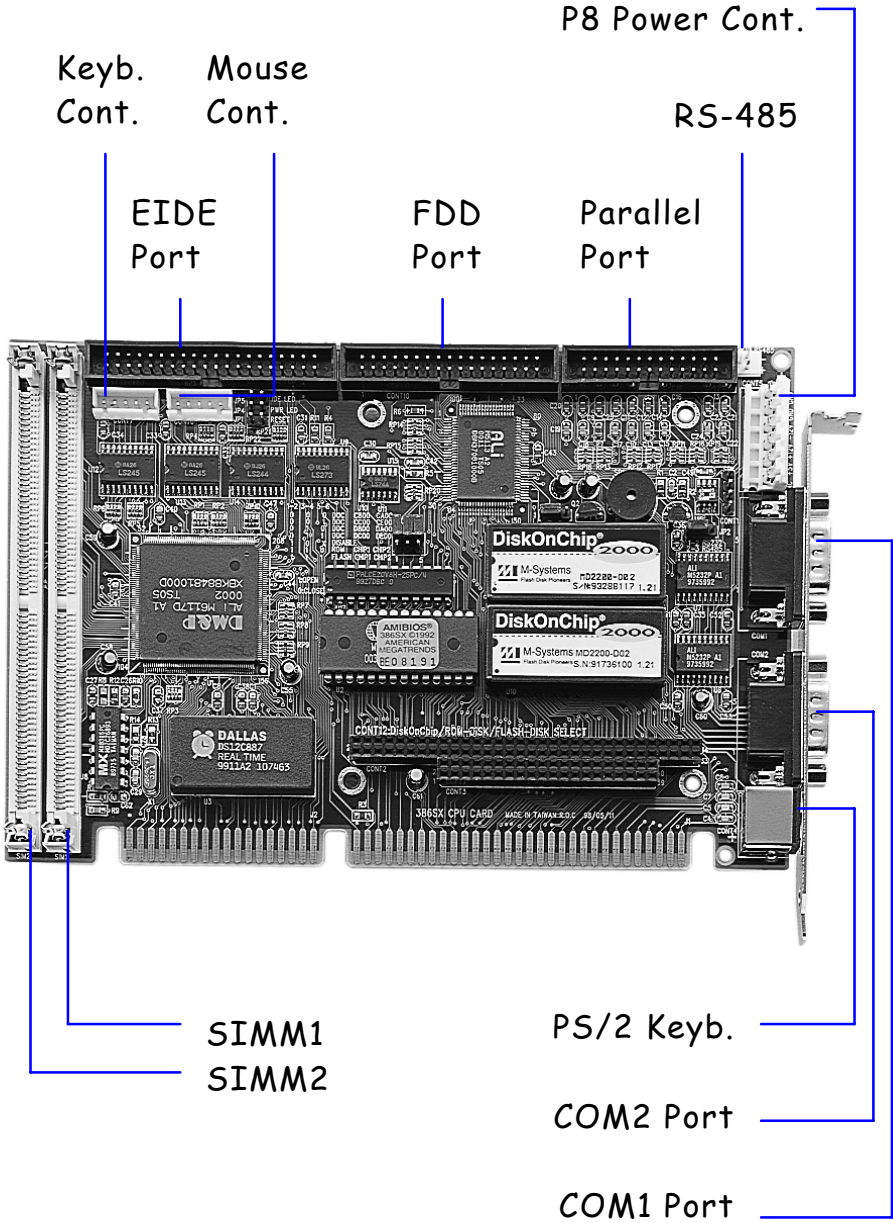
ICOP-6025V



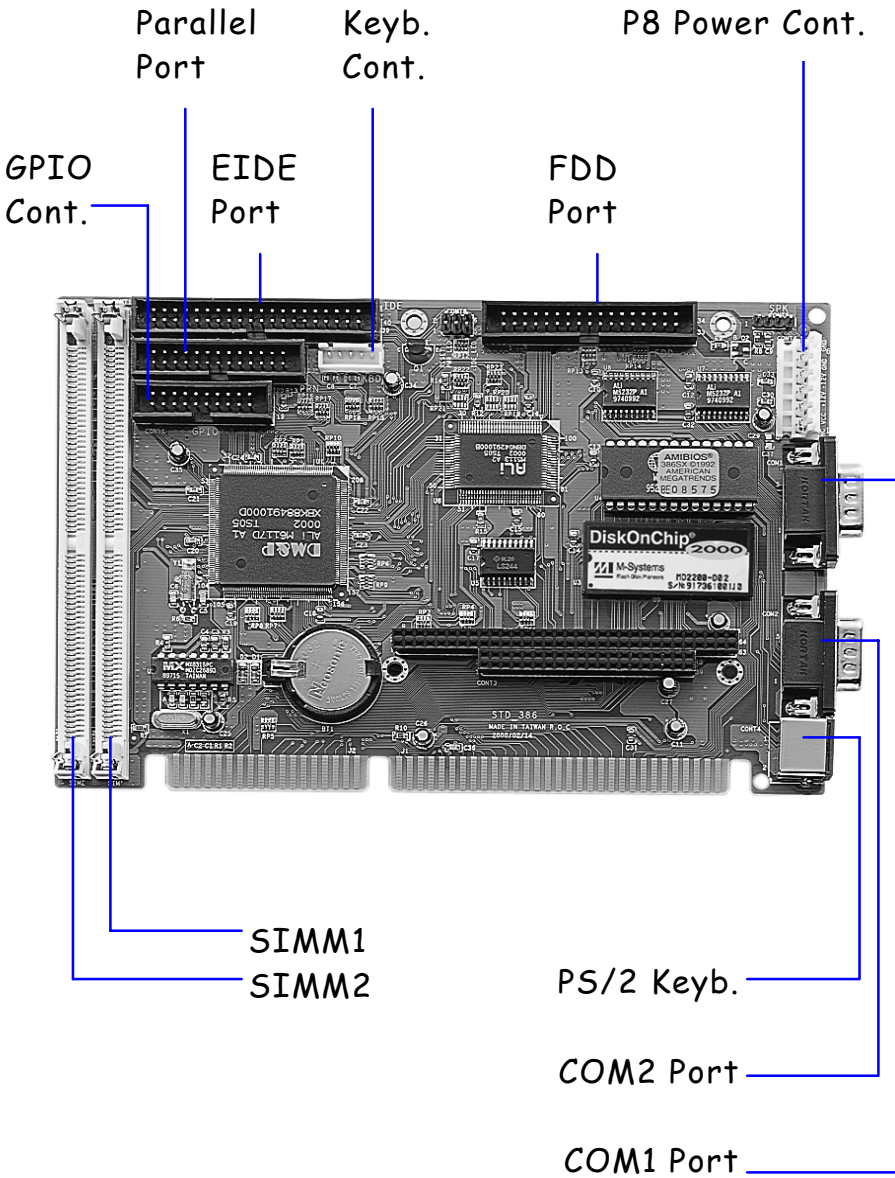
ICOP-6024V



ICOP-6022



ICOP-6020



Chapter 1

Introduction

1.1 Features

- Half-size (185x122 mm) Embedded CPU Single Board Computer
- ISA-bus interface with onboard PC/104 connector
- DM&P (ALi) M6117D Embedded CPU, 100% compatible with 386SX-40 CPU
- CRT and Flat Panel Display interface (note1)
- 4MB EDO RAM onboard and up to 20MB by expansion (note1)
- 2 MB up to 32 MB of EDO DRAM (note 2)
- Enhanced IDE devices and FDD interface
- One Bi-directional Parallel Port
- RS-232/485 interface and onboard DB-9 connector (note 3)
- Watchdog timer
- 16-bit GPIO connector on-board (note 4)
- Socket for Flash or DiskOnChip (note 3)
- Onboard Keyboard, Mouse connector
- Single voltage +5 V power connector
- Operating temperature from -20 • +60•
- Flexible OEM/ODM design

Note 1: only for ICOP-6024, ICOP-6025 series

Note 2: only for ICOP-6020, ICOP-6022 series

Note 3: please refer catalog for detail specification of each board

Note 4: only for ICOP-6025 series

1.2 Specifications

- **Embedded CPU:** DM&P(ALi) M6117D is an implementation of an INTEL compatible 386SX-40 CPU, realtime clock, a watchdog timer and ALi's M1217B chipset

- **BIOS:** Y2K compliant AMI system BIOS

- **DRAM Memory:** 4MB EDO DRAM onboard (ICOP-6024/6025 series)

- **Bus Interface:** ISA and PC/104

- **Data Bus:** 16-bit

- **Bus Speed:** PC/104 - 8 MHz

(Above values are defaults, bus speeds are programmable up to 16 MHz)

- **DMA Channels:** 7

- **Interrupt Levels:** 15

- **Enhanced IDE:** supports one port and up to two enhanced IDE (PIO mode 4) hard drives

- **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 M6117D 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 different type connectors of AT Keyboard and PS/2-mouse

High Speed Multi I/O

- **Chipset:** ALi 5113 or SMS CFDC37C669

- **Serial ports:** supports high speed RS-232 port, high speed RS-232/485 port (jumper selectable). Both with 16C550 UART and 16 byte FIFO

- **Floppy Disk Drive Interface:** supports up to two floppy drives, 5¼" (360 KB or 1.2 MB) and 3½ " (720 KB, 1.44 MB)

- **Bi-directional Parallel Port:** supports SPP, EPP and ECP mode

Environmental and Power

- **Power Requirements:**

Single voltage +5 V (**ICOP-6025/6025V/6024/6024V**)

Voltage +5 V, +/-12V (**ICOP-6020/6022**)

- **Board Dimensions:** 185 (L) x 122 (W) mm.
- **Board Weight:** 240 g
- **Extended Operating Temperature:** -20~+60 °C

1.3 VGA Interface

(ICOP-6025V, ICOP-6024V)

- **Chipset:** TOPRO TP65081Q
- **Memory:** 1 MB onboard
- **System Bus:** 16-bit ISA bus
- **Panel Data Bus:** 24-bit
- **Display:** CRT and Flat Panel Mono/TFT/DSTN/EL
- **Supported Flat Panels:**

NEC NL-6448AC30-10 TFT 9.4" 640X480

NEC NL-6448AC30-03 TFT 9.4" 640X480

NEC NL-6448AC33-10 TFT 10.4" 640X480

NEC NL-6448AC33-13 TFT 10.4" 640X480

NEC NL-6448AC33-18 TFT 10.4" 640X480

NEC NL-8060BC31-09 TFT 12.1" 800X600

NEC NL-8060AC31-02 TFT 10.4" 800X600

NEC NL-8060AC31-01 TFT 10.4" 800X600

SHARP LQ10D42 TFT 10.4" 640X480

SHARP LQ10D421 TFT 10.4" 640X480

SHARP LQ12531 TFT 12.1" 800x600

SHARP LM64C35P MONO 10.4" 640X480

Planar EL640.480-AA1 EL color 10.4" 640X480

1.4 DiskOnChip 2000 Flash Disk

Flash Disk DiskOnChip ® 2000

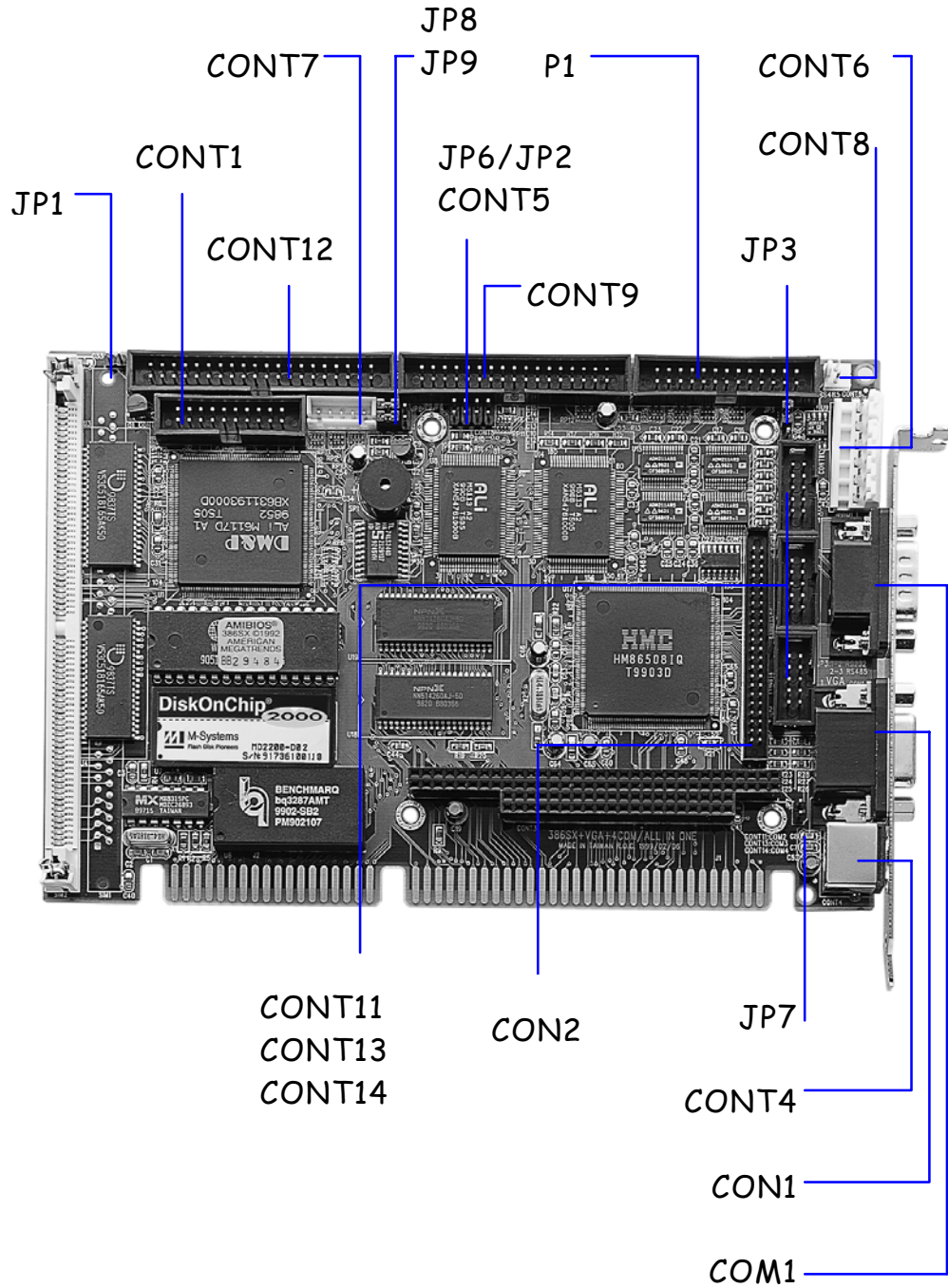
- **Package:** Single Chip Flash Disk in 32-pin DIP JEDEC
- **Capacity:** 1-144 MByte capacity
- **Data Reliability:** ECC/EDC error correction
- **Memory Window:** 8 KByte

Chapter 2

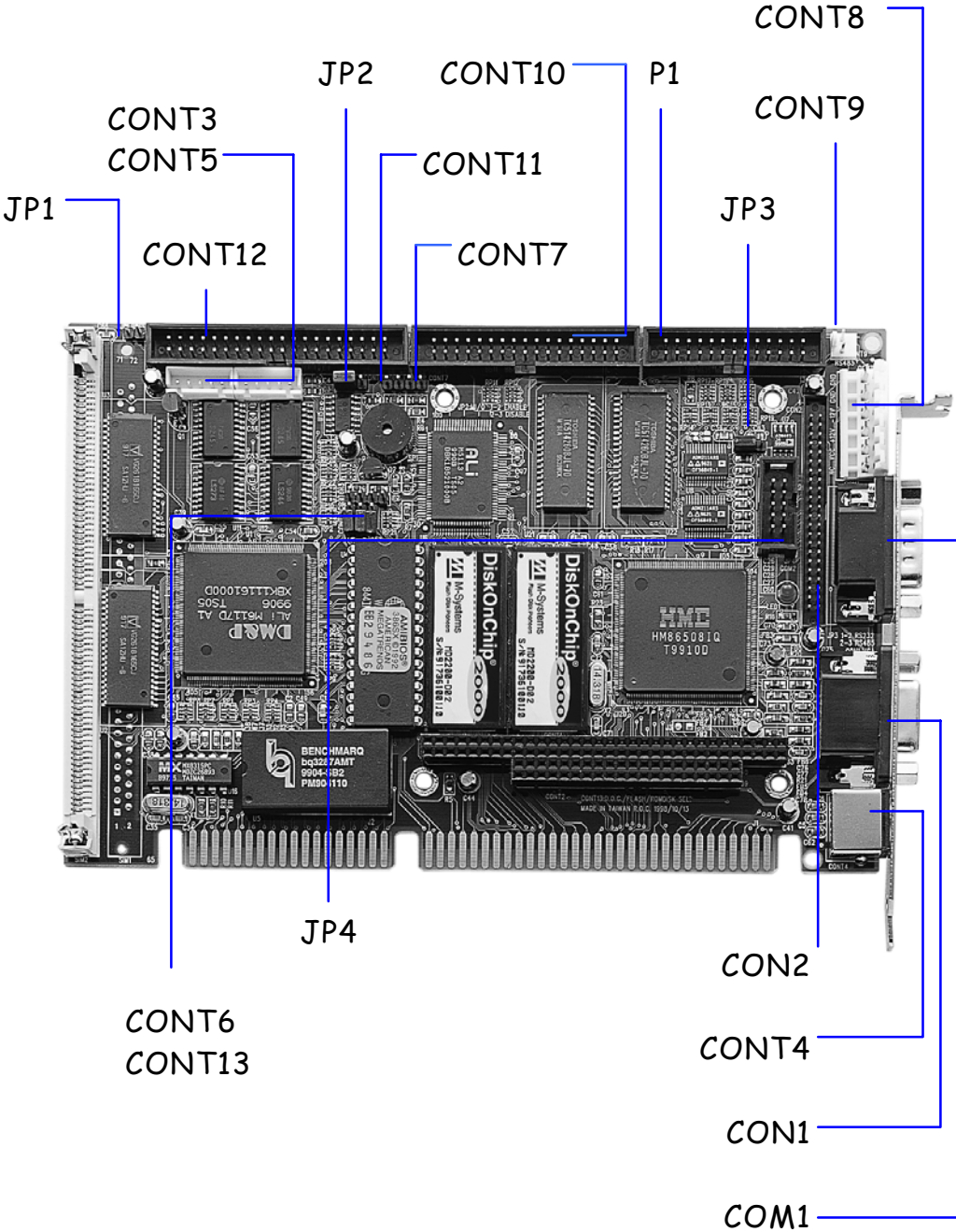
Installation

2.1 Jumper Settings

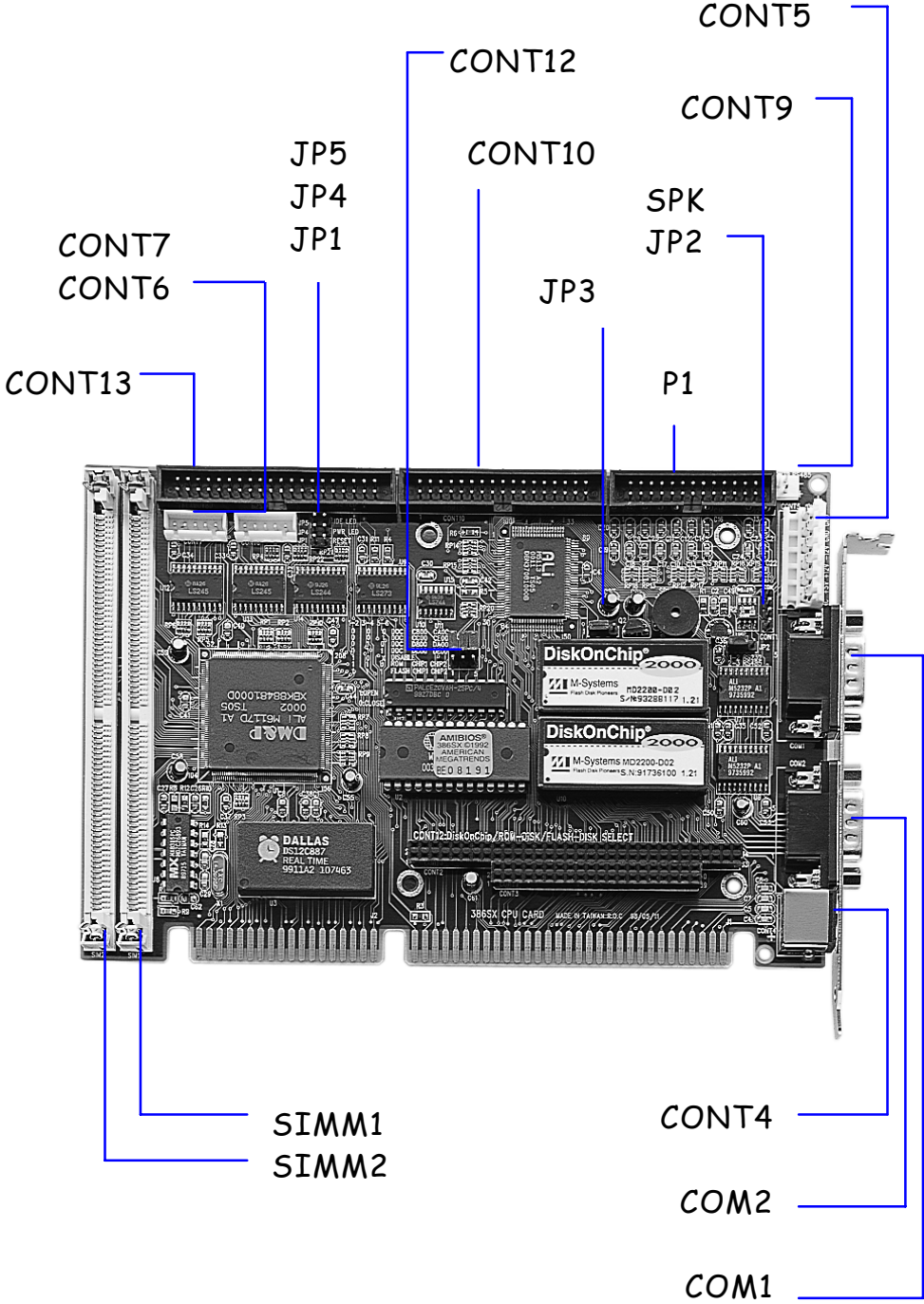
ICOP-6025V



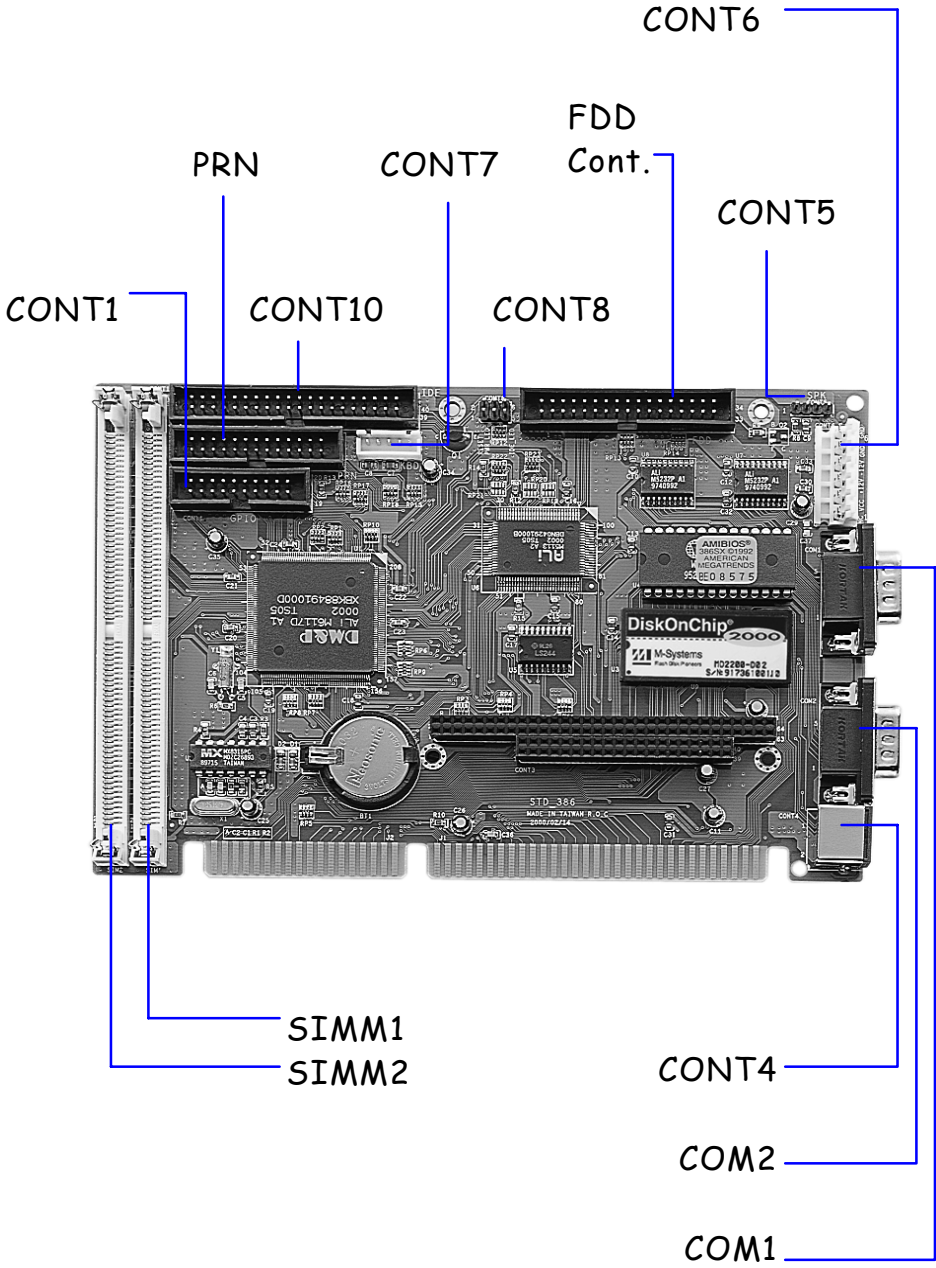
ICOP-6024V



ICOP-6022



ICOP-6020



2.1.1 ICOP-6025/6025V

- JP1** RESET connector
- JP2** Power LED connector
- JP3** RS-232/485 selection for COM2
 1-2: RS-232 mode (CONT11 active)
 2-3: RS-485 mode (CONT8 active)
- JP6** IDE LED connector
- JP7** VGA IRQ9 operation (**ICOP-6025V**)
 open: VGA operation without IRQ9
 close: VGA operation with IRQ9
- JP8** IRQ # selection for COM3
 1-2: IRQ 3
 2-3: IRQ 11
- JP9** IRQ # selection for COM4
 1-2: IRQ 4
 2-3: IRQ 10

2.1.2 ICOP-6024/6024V

- JP1** RESET connector
- JP2** Multi I/O ALi M5113 Enable/disable
 1-2: Enabled
 2-3: Disabled
- JP3** RS-232/485 selection for COM2
 1-2: RS-232 mode (JP4 active)
 2-3: RS-485 mode (CONT9 active)
- CONT13** DiskOnChip/EPROM Disk/Flash Disk address select

DOC address	1-2	3-4	5-6
C800H & CA00H (default)	close	close	close
CA00H & CE00H	close	close	open
D800H & DA00H	close	open	close
DC00H & DE00H	close	open	open
Disabled	open	close	open
Both EPROM	open	open	close
Both Flash	open	open	open

2.1.3 ICOP-6022

JP1 RESET connector

JP2 Multi I/O ALi M5113 Enable/disable

1-2: Enabled

2-3: Disabled

JP3 RS-232/485 selection for COM2

1-2:RS-232 mode (JP4 active)

2-3:RS-485 mode (CONT9 active)

JP4 Power LED connector

JP5 IDE LED connector

CONT12 DiskOnChip/EPROM Disk/Flash Disk address select

DOC address	1-2	3-4	5-6
C800H & CA00H (default)	close	close	close
CA00H & CE00H	close	close	open
D800H & DA00H	close	open	close
DC00H & DE00H	close	open	open
Disabled	open	close	open
Both EPROM	open	open	close
Both Flash	open	open	open

2.1.4 ICOP-6020

CONT8

1-2: RESET connector

3-4: Power LED

5-6: IDE LED

2.2 Connectors

2.2.1 ICOP-6025/6025V

- CON1** External female 15-pin D-type CRT Display connector (**ICOP-6025V**)
- CON2** Internal 44-pin Flat Panel Display connector (**ICOP-6025V**)
- CONT1** Internal 20-pin box header for 16-bit GPIO (digital I/O)
- CONT2** PC/104 bus 64-pin
- CONT3** PC/104 bus 40-pin
- CONT4** External PS/2 and AT keyboard connector
- CONT5** Speaker connector
- CONT6** Power connector
- CONT7** Internal AT-keyboard connector
- CONT8** Internal COM2 RS-485
- CONT9** FDD connector
- COM1** External 9-pin male D-type connector for COM1
- CONT11** Internal 10-pin box header connector for COM2
- CONT12** IDE connector
- CONT13** Internal 10-pin box header connector for COM3
- CONT14** Internal 10-pin box header connector for COM4
- P1** Parralel Port
- SIM1** (not available) Replaced by 4 MB onboard EDO memory
- SIM2** Memory bank 1 (EDO DRAM)

2.2.2 ICOP-6024/6024V

- JP4** Internal COM2 RS-232 connector
- CON1** External female 15-pin Dtype CRT Display connector (**ICOP-6024V**)
- CON2** Internal 44-pin Flat Panel Display connector (**ICOP-6024V**)
- CONT1** PC/104 bus 64-pin
- CONT2** PC/104 bus 40-pin

- CONT3** Internal AT-keyboard connector
- CONT4** External PS/2 and AT keyboard connector
- CONT5** Internal PS/2 mouse connector
- CONT6** External speaker connector
- CONT7** Power LED connector
- CONT8** Power connector
- CONT9** Internal COM2 RS-485
- CONT10** FDD controller
- CONT11** IDE LED connector
- CONT12** IDE connector
- P1** Parralel Port
- COM1** External COM1
- SIM1** (not available) Replaced by 4 MB onboard EDO memory
- SIM2** Memory bank 1 (EDO DRAM)
- LED1** Power-on LED

2.2.3 ICOP-6022

- CONT1** PC/104 bus 64-pin
- CONT2** PC/104 bus 40-pin
- CONT4** External PS/2 and AT keyboard connector
- CONT5** Power connector
- CONT6** Internal PS/2 mouse connector
- CONT7** Internal AT-keyboard connector
- CONT9** Internal COM2 RS-485
- CONT10** FDD connector
- CONT13** IDE connector
- SPK** Speaker

- P1** Parralel Port
- COM1** External COM1
- COM2** External COM2
- SIM1** Memory bank 0 (EDO DRAM)
- SIM2** Memory bank 1 (EDO DRAM)

2.2.4 ICOP-6020

- CONT1** Internal 20-pin box header for 16-bit GPIO (digital I/O)
- CONT2** PC/104 bus 64-pin
- CONT3** PC/104 bus 40-pin
- CONT4** External PS/2 and AT keyboard connector
- CONT5** Speaker connector
- CONT6** Power connector
- CONT7** Internal AT-keyboard connector
- CONT9** FDD connector
- CONT10** IDE connector
- PRN** Parallel Port
- COM1** External COM1
- COM2** External COM2
- SIM1** Memory bank 0 (EDO DRAM)
- SIM2** Memory bank 1 (EDO DRAM)

2.3 DiskOnChip/EPROM/Flash ROM Disk

2.3.1 Setup a DiskOnChip ® 2000 Flash Disk

Installation Instructions

1. Make sure the ICOP-602X(V) is powered OFF
2. Plug the DiskOnChip 2000 device(s) into its socket. Verify the direction is correct (pin 1 of the DiskOnChip 2000 is aligned with pin 1 of the socket)
3. Set address for both DiskOnChip and Flash Disk devices as below instructions: (Software Setting only for ICOP-6020 & ICOP-6025)

Step1: Enter to AMI BIOS Setup Utility while system power on

Step2: Enter to "Advanced Chipset Setup"

Step3: Select "GPCS Function" to "Enable"

(For DiskOnChip)

Step4: Select "GPCS0 Command" to "MEMR/W 8bit"

Step5: Select "GPCS0 Start Address" to "0C8000 HEX"

Step6: Select "GPCS0 Size" to "8 KBYTE" (goto Step 10)

(For Flash Disk – only for ICOP-6020)

Step4: Select "GPCS0 Command" to "MEMR/W 8bit"

Step5: Select "GPCS0 Start Address" to "0E0000 HEX"

Step6: Select "GPCS0 Size" to "64 KBYTE"

Step7: Select "GPCS1 Command" to "IOW 8bit"

Step8: Select "GPCS1 Start Address" to "000100 HEX"

Step9: Select "GPCS1 Size" to "2 BYTE"

Step10: Save changed and exit.

4. Power up the system
5. During power up you may observe the messages displayed by the DiskOnChip 2000 when its drivers are automatically loaded into system's memory
6. At this stage the DiskOnChip 2000 can be accessed as any disk in the system
7. If the DiskOnChip 2000 is the only disk in the system, it will appear as the first disk (drive C: in DOS)
8. If there are more disks besides the DiskOnChip 2000, the DiskOnChip 2000 will appear by default as the last drive, unless it was programmed as first drive. (Please refer to the DiskOnChip 2000 utilities user manual)

9. 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.

2.3.2 Setting up a Flash Disk

Before you can use the ICOP-602X(V)'s Flash disk you will have to initialize it using a software utility called "PC104.EXE". This program can be found on the utility disk in the subdirectory "A:\FLASH"

- Connect a keyboard and floppy disk ICOP-602X(V) to the PC/104 bus and boot-up your system.

- Run PC104.EXE (this is a DOS command line utility)

```
ICOP-602X(V) FLASH disk initialize program V1.0
```

```
FLASH manufacturer : (1)ATMEL (2)SST
```

```
Input manufacturer number (1,2) : 1
```

```
Input quantity of FLASH (1,2) : 2
```

```
Simulation disk:
```

```
(1)DISK-A (2)DISK-B (3)DISK-C (4)DISK-D
```

```
Input manufacturer number (1,2,3,4) : 1
```

```
FLASH-DISK initialize finish.
```

(Text in bold should be entered by user)

- After running the PC104.EXE configuration program reboot the system, while holding down the left "Ctrl" key. This will bring you to the "Flash Disk Utility"

- "CHANGE CURRENT DISK NUMBER" lets you select the drive you want to assign to the disk, either A, B, C or D

- "CHANGE FLASH DISK SIZE" lets you select the amount of Flash EPROM chips that are onboard.

- make selections and reboot the system after closing the program

Your disk can now be formatted and setup with normal DOS commands such as

FORMAT, FDISK, COPY, SYS etc.

Note: when assigning the solid state disk as either C or D, you first have to run FDISK before formatting the drive !

2.3.3 Setting up an EPROM disk

EPROMs should be inserted starting from Socket. All modules have to be of the same type.

To create a ROM disk you will need the following:

- EPROM devices
- EPROM programmer
- ROM files

The ROM files are hacked-up portions of your system and program files that should have the same size as your EPROM devices.

On the utility disk you will find a program called: ROMIMAGE.EXE that will assist you in creating these files. Before using the program there are some files you will have to prepare first:

1. The system files, for example MSDOS.SYS, I/O.SYS, COMMAND.COM
The program can pick these files up automatically from your boot device or from a bootable floppy.
2. Your application files and other necessary DOS files. Make a subdirectory that only contains these additional files. With "other DOS files" are meant files such as AUTOEXEC.BAT, CONFIG.SYS, EMM386.EXE etc
3. Prepare a directory that can temporarily hold the generated ROM files. Once you prepared all the above, start the ROMIMAGE.EXE program
System Driver: location of system files (see 1)

Source path: location of program files (see 2)

Destination path: this is where the ROM files go (see 3)

EPROM-size: depends on your choice

Simulation-disk: set this to the drive letter the ROM disk should emulate

After you have set all the right directories, use the **Analysis file** function to let the program determine how many files of what size it should generate.

After using the Analysis function go to **Create image**, and generate the ROM files. Then exit the program. In the directory that was assigned to hold the ROM files you will find your ROM images:

For example: ROM010.01 ROM010.02

Use an EPROM programmer to write the files to their EPROMs.

Beware to keep track of their sequence when inserting the EPROM's

2.4 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 system timer 0. It can be programmed to periodically generate a configurable IRQ. It may be clear that the selected IRQ, will be no longer available to the system.

Configuring the Watchdog Timer in the BIOS

The M6117D 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. More a 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 read "Timeout Status & Reset - INDEX 3CH" on page 12 and look at the example on page 15 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 M6117D 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 M6117D configuration registers you always have to unlock first and lock the registers afterwards

Unlock configuration register

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

Lock configuration register

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

```

nop                                nop
nop                                nop
mov al, 0c5h                        mov al, 000h
out 23h, al                          out 23h, al
nop                                nop
nop                                nop

```

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)

2.5 General Purpose I/O

M6117D supports 16 independent GPOs and GPIs. This group of GPOs does not need external 74LS373 to latch as generate purpose output. Also this group of GPIs do not share signals with the ISA data bus, so no external 74LS245 is required either.

At boot time the state of the GPIO ports can be set in the BIOS.

Go to BIOS Setup's "**Advanced Chipset Setup**"

GPIO Sample Program

; Please use TASM to compiler the following program.

; Execute under DOS environment.

;

.286

.model small

.code

mov al,13h ; Unlock 6117D configuration register.

out 22h,al ;

mov al,0c5h ;

out 23h,al ;

mov al,4eh ; Enable GPIO[7-0] is output pin.

out 22h,al ;

mov al,0ffh ; If AL fill "FF", then
; GPIO[7-0] set as output pin.

out 23h,al ; User can be set logic "1"
; of OUT direction.

mov al,4fh ; Enable GPIO[15-8] is input pin

out 22h,al ;

mov al,00 ; If AL fill "00", then
; GPIO[15-8] set as input pin.

out 23h,al ; User can be set logic "0"

```

; of IN direction.
mov al,47h ; Output data port.
out 22h,al ;
mov al,55h ; Example data out value is 55h,
; to output pin
out 23h,al ; GPIO[7-0]. So user can
; repeat this loop.
mov al,46h ; If GPIO[7-0] is set input direction, then data
out 22h,al ; input port is 46.
in al,23h ; Example data input value
; from data input GPIO[7-0]
mov al,4ch ; Input data port
out 22h,al ;
in al,23h ; Read data from GPIO[15-8]
; into AL register.
mov al,4dh ; If GPIO[15-8] is set output
; direction, then data
out 22h,al ; output port is 4dh.
mov al,55h ; output data value is 55h.
out 23h,al ; Example data output value
; to data input GPIO[15-8]
..... continue program
end

```

Chapter 3

SVGA Setup

3.1 Introduction

The ICOP-602XV has an on-board VGA interface. The specifications and features are described as follows:

3.1.1 Chipset

The ICOP-602XV uses a TOPRO TP65081Q for its SVGA controller, which 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 (multisync) monitors are handled as if they were analog monitors.

3.1.2 Display memory

With 1 MB memory, the VGA controller can drive CRT displays or color panel displays with resolutions up to 1024 x 768 at 256 colors.

3.2 Flat Panel BIOS and Wiring

Below is a list of optional Flat Panel SVGA BIOS. The VGA BIOS is combined with the system BIOS in a single. To change to another BIOS please contact your local dealer.

MLCD.dat - Data File for MONO DSTN640*480 (**Default**)

example : (1) HOSIDEN HLM6667
 (2) HITACHI LMG5160XUFC
 (3) CASIO MD650TS00-01
 (4) OPTREX DMF_50260NFU-FW-8

DSTN.dat - Data file for Color DSTN640*480

example : (1) Sanyo LCM-5331-22NTK
 (2) SHARP LM64C35P

TFT_S1.dat - Data File for TFT640*480-Sync (16 BIT)

TFT_S2.dat - Data File for TFT640*480-Sync (18/24 BIT)

- example :
- (1) HITACHI TX26D60/TX24D55
 - (2) TOSHIBA LTM09C015A
 - (3) SHARP LQ10D321

TFT_LP1.dat - Data File For TFT640*480-LP (16 BIT)

TFT_LP2.dat - Data File For TFT640*480-LP (18/24 BIT)

- example :
- (1) Toshiba LTM09c015A)

TFT86_S1.dat - Data File for TFT800*600_sync (16 BIT)

TFT86_S2.dat Data File for TFT800*600_sync (18/24 BIT)

- example :
- (1) NEC NL8060AC26-05
 - (2) NEC NL8060AC26-04
 - (3) NEC NL8060BC31-02

EL.dat - Data File for EL640*480

- example :
- (1) PLANAR EL640.480-A

PLASMA.dat - Data File for PLASMA640*480

- example :
- (1) PANASONIC S817

CRT/Flat Panel Mode

All the above BIOS support either CRT only, Flat Panel only or CRT/Flat Panel simultaneously. To set the mode a Panel Switching Utility is used.

USAGE:

At DOS prompt type >**SW508** then Screen will show

- 1. CRT Only
- 2. Panel Only
- 3. CRT/Panel Simutaneous

NEC NL6448AC33-18 wiring

NEC NL6448AC33-18		ICOP-602XV CON1	
Pin	Pin Name	Pin	Pin Name
CN1-1	GND	3	GND

CN1-2	CLK	35	SHFCLK
CN1-3	Hsync	38	LP
CN1-4	Vsync	36	FLM
CN1-5	GND	4	-
CN1-6	R0	27	P18
CN1-7	R1	28	P19
CN1-8	R2	29	P20
CN1-9	R3	30	P21
CN1-10	R4	31	P22
CN1-11	R5	32	P23
CN1-12	GND	33	-
CN1-13	G0	19	P10
CN1-14	G1	20	P11
CN1-15	G2	21	P12
CN1-16	G3	22	P13
CN1-17	G4	23	P14
CN1-18	G5	24	P15
CN1-19	GND	34	-
CN1-20	B0	11	P2
CN1-21	B1	12	P3
CN1-22	B2	13	P4
CN1-23	B3	14	P5
CN1-24	B4	15	P6
CN1-25	B5	16	P7
CN1-26	GND	39	-
CN1-27	ENAB	37	MDE
CN1-28	Vcc	43	Vcc

CN1-29	Vcc	44	Vcc
CN1-30	NC	-	-
CN1-31	NC	-	-

NEC NL6448AC30-10 wiring

NEC NL6448AC30-10		ICOP-602XV CON1	
Pin	Pin Name	Pin	Pin Name
CN1-1	CLK	42	SHFCLK
CN1-2	Hsync	38	LP
CN1-3	Vsync	36	FLM
CN1-4	DE	37	MDE
CN1-5	-	-	P0
CN1-6	B0	10	P1
CN1-7	B1	11	P2
CN1-8	B2	12	P3
CN1-9	B3	13	P4
CN1-10	-	14	P5
CN1-11	-	15	P6
CN1-12	G0	16	P7
CN1-13	G1	17	P8
CN1-14	G2	18	P9
CN1-15	G3	19	P10
CN1-16	-	20	P11
CN1-17	R0	21	P12
CN1-18	R1	22	P13

CN1-19	R2	23	P14
CN1-20	R3	24	P15
CN1-21	-	-	P16
CN1-22	-	-	P17
CN1-23	-	27	P18
CN1-24	-	28	P19
CN1-25	-	29	P20
CN1-26	-	30	P21
CN1-27	-	31	P22
CN1-28	-	32	P23
CN1-29	PVcc	5	LCD Vdd
CN1-30	Vcc	43	Vcc
CN1-31	MODE	44	Vcc
CN1-32	GND	3	GND
CN1-33	GND	4	GND
CN1-34	Vdd +12	1	+12
CN1-35	ENABKL	40	ENABKL
CN1-36	GND	39	GND

LJ32H028 wiring

LJ32H028		ICOP-602XV CON1	
Pin	Pin Name	Pin	Pin Name
CN1-1	D1	11	P2
CN1-2	D0	12	P3
CN1-3	D3	9	P0
CN1-4	D2	10	P1
CN1-5	CP2	35	SHF_CLK

CN1-6	GND	3,4	GND
CN1-7	CP1	38	LP
CN1-8	GND	33,34	GND
CN1-9	S	36	FLM
CN1-10	-	-	-
CN1-11	-	-	-
CN1-12	-	-	-
CN1-13	+5V	43,44	+5V(Vdd)
CN1-14	-	-	-
CN1-15	+12V	1,2	+12V

SHARP LQ10D42 wiring

(640 X 480 TFT Color)

SHARP LQ10D42		ICOP-602XV CON1	
Pin	Pin Name	Pin	Pin Name
CN1-1	GND	3,4	GND
CN1-2	CLK	42	SHFCLK
CN1-3	Hsync	38	LP
CN1-4	Vsync	36	FLM
CN1-5	GND	3,4	GND
CN1-6	R0	21	P12
CN1-7	R1	22	P13
CN1-8	R2	23	P14
CN1-9	R3	24	P15
CN1-10	R4	25	P16
CN1-11	R5	26	P17

CN1-12	GND	3,4	GND
CN1-13	G0	15	P6
CN1-14	G1	16	P7
CN1-15	G2	17	P8
CN1-16	G3	18	P9
CN1-17	G4	19	P10
CN1-18	G5	20	P11
CN1-19	GND	3,4	GND
CN1-20	B0	9	P0
CN1-21	B1	10	P1
CN1-22	B2	11	P2
CN1-23	B3	12	P3
CN1-24	B4	13	P4
CN1-25	B5	14	P5
CN1-26	GND	3,4	GND
CN1-27	ENAB	40	M
CN1-28	Vcc	43,44	Vcc +5V
CN1-29	Vcc	43,44	Vcc +5V
CN1-30	R/L	-	-
CN1-31	U/D	-	-

SHARP LQ12S31 wiring

(800 X 600 TFT Color)

SHARP LQ12S31		ICOP-602XV CON1	
Pin	Pin Name	Pin	Pin Name
CN1-1	GND	3	GND

CN1-2	CLK	35	SHFCLK
CN1-3	GND	4	GND
CN1-4	Hsync	38	LP
CN1-5	Vsync	36	FLM
CN1-6	GND	8	GND
CN1-7	GND	8	GND
CN1-8	GND	8	GND
CN1-9	R0	27	P18
CN1-10	R1	28	P19
CN1-11	R2	29	P20
CN1-12	GND	8	GND
CN1-13	R3	30	P21
CN1-14	R4	31	P22
CN1-15	R5	32	P23
CN1-16	GND	39	GND
CN1-17	GND	39	GND
CN1-18	GND	39	GND
CN1-19	G0	19	P10
CN1-20	G1	20	P11
CN1-21	G2	21	P12
CN1-22	GND	39	
CN1-23	G3	22	P13
CN1-24	G4	23	P14
CN1-25	G5	24	P15
CN1-26	GND	41	GND
CN1-27	GND	41	GND

CN1-28	GND	41	GND
CN1-29	B0	11	P2
CN1-30	B1	12	P3
CN1-31	B2	13	P4
CN1-32	GND	41	GND
CN1-33	B3	14	P5
CN1-34	B4	15	P6
CN1-35	B5	16	P7
CN1-36	GND	41	GND
CN1-37	ENAR	37	M
CN1-38	TST	-	-
CN1-39	Vcc	43	+5Vcc
CN1-40	Vcc	44	+5Vcc
CN1-41	TST	-	-

Appendix

Pin Assignments

IDE Interface Connector

Pin	Description	Pin	Description
1	Reset	2	GND
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 16
19	GND	20	N/C
21	N/C	22	GND
23	IOW #	24	GND
25	IOR #	26	GND
27	N/C	28	BALE-Default
29	N/C	30	GND-Default
31	Interrupt	32	IOCS16-Default
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0	38	HDC CSI #
39	HDD Active	40	GND

VGA/Flat Panel Connectors

Flat Panel Connector Pin Assignment

(44 Pin for all ICOP 386 Series)

Pin	Description	Pin	Description
1	+12V	2	+12V
3	GND	4	GND
5	PVcc	6	PVcc
7	ENAVEE	8	ENAVEE
9	P0	10	P1
11	P2	12	P3
13	P4	14	P5
15	P6	16	P7
17	P8	18	P9
19	P10	20	P11
21	P12	22	P13
23	P14	24	P15
25	P16	26	P17
27	P18	28	P19
29	P20	30	P21
31	P22	32	P23
33	GND	34	GND
35	SHFCLK	36	FLM
37	M	38	LP
39	GND	40	ENABKL
41	GND	42	ASHFCLK
43	Vcc	44	Vcc

Description for Pin of Flat Panel Connector

Name	Description
P0~P23	Flat panel data output
ENABKL	Activity Indicator and Enable Backlight outputs
SHFCLK	Shift clock. Pixel clock for flat panel data
M	M signal for panel AC drive control
LP	Latch pulse. Flat panel equivalent of HSYNC
FLM	First line marker. Flat panel equivalent of VSYNC
+12V	+12V power from PC power supply
ENAVDD	Power sequencing controls for panel LCD bias volt
ENAVEE	Power sequencing controls for panel LCD bias volt
-SHFCLK	The inverter signal of SHFCLK
VDDM	3.3V or 5V selected by JP6

Floppy Disk Connector

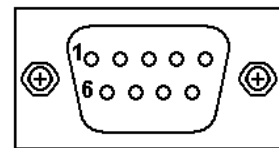
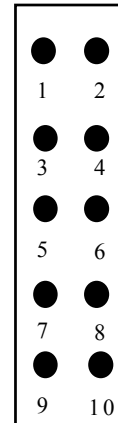
Pin	Description	Pin	Description
1	GND	2	Drive Enable Select
3	GND	4	N/C
5	GND	6	N/C
7	GND	8	Index #
9	GND	10	Drive select 0
11	GND	12	Drive select 1
13	GND	14	Drive select 2
15	GND	16	Motor enable
17	GND	18	Direction #
19	GND	20	STEP #
21	GND	22	Write data #
23	GND	24	Write gate #
25	GND	26	Track 0 #
27	GND	28	Write protect #
29	GND	30	Read data #
31	GND	32	Side 1 select #
33	GND	34	Disk change #

Parallel Port Interface

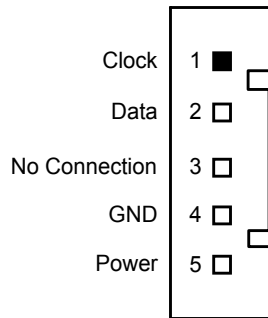
Pin	Description	Pin	Description
1	Strobe	2	Data 0
3	Data 1	4	Data 2
5	Data 3	6	Data 4
7	Data 5	8	Data 6
9	Data 7	10	Acknowledge #
11	Busy	12	Paper Empty #
13	Printer Select	14	Auto Form Feed #
15	Error #	16	Initialize #
17	Printer Select In #	18	GND
19	GND	20	GND
21	GND	22	GND
23	GND	24	GND
25	GND	26	NC

Serial Port Interface

10- Pin	D-Type	Description
1	1	Data Carrier Detect (DCD)/5V/12V
2	2	Receive Data (RXD)
3	3	Transmit Data (TXD)
4	4	Data Terminal Ready (DTR)
5	5	Ground (GND)
6	6	Data Set Ready (DSR)
7	7	Request to Send (RTS)
8	8	Clear to Send (CTS)
9	9	Ring Indicator (RI)/5V/12V
10	X	NC



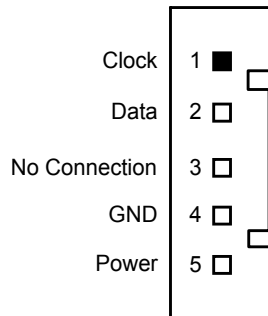
Keyboard and PS/2 Mouse Connector



Note for Keyboard:

Pin1: KBCLK

Pin2: KBDATA



Note for Mouse:

Pin1: MCLK

Pin2: MDATA

PC/104 Connectors

64-Pin Long Connector

PIN No.	PIN Name	PIN No.	PIN Name
1	IOCHCHK *	2	0V
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	0V
63	0V	64	0V

40-Pin Short Connector

PIN No.	PIN Name	PIN No.	PIN Name
1	0V	2	0V
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	0V	38	SD15
39	0V	40	(KEY)

16-bit General Purpose I/O

Pin	Description	Pin	Description
1	GND	2	Vcc
3	GP0	4	GP8
5	GP1	6	GP9
7	GP2	8	GP10
9	GP3	10	GP11
11	GP4	12	GP12
13	GP5	14	GP13
15	GP6	16	GP14
17	GP7	18	GP15
19	Vcc	20	GND

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, or inability 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.