

TOP-2000

Industrial Panel PC

User's Manual



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TOP-2000
TOP-2000

PROFESSIONAL FLAT PANEL COMPUTER
DESIGNED TO MEET THE EXTREMELY HIGH
INDUSTRIAL STANDARDS




TOP-2000 Flat Panel Computer is designed to operate in industrial environment which is characterized by extreme temperature, contaminants, shock, vibration and wide fluctuations of input power.

HIGHLIGHTS

-  Intelligent Temperature Control
-  Shock-proof hard disk mobile module
-  Galvanic isolation on I/O ports
-  Impact-resistance mechanism
-  High protection against corrosion
-  Liquid-proof front panel to meet IP-65, NEMA 4/12

INTELLIGNET TEMPERATURE CONTROL


Intelligent Temperature Control regulates the system temperature in an advanced way. Temperature is always controlled at a normal level. In the situation of excessive heat, the system itself will recover quickly from abnormal temperature without system halt.

-  Alarm and self-recovery from abnormal temperature
-  Automatic turn on of spare fan and slowing down of CPU
-  Temperature upper limit setting and monitoring for both system and CPU



SHOCK-PROOF HARD DISK MOBILE MODULE(patented)

Shock-proof hard disk mobile module includes one anti-vibration container and one mobile carrier. The anti-vibration container with numbers of leaf springs resolves vibration from all directions – top, bottom, front, rear, right and left. The mobile carrier allows easy maintenance, easy upgrade and fast access to the system. Two Springs-loaded Panel Fasteners sitting on the door of Shock-proof hard disk mobile module grant quick access to

LED INDICATOR

-  Keep track of the system status including Power, CPU fan, Aux. fans, Temperature and LAN .

INDIVIDUAL GALVANIC ISOLATION ON I/O PORTS

-  +/-8KV ESD Protection.
-  High protection against electrical shocks and transients.

Specification

		TOP-2000														
Processor	Pentium MMX 133-233 or compatible															
System Memory	8-128MB SIMM or DIMM															
Video Controller	PCI based SVGA controller C&T 65554															
Display Memory	2MB															
Cache	on-board 512KB															
LCD	10.4" color TFT 640x480 250 cd/m2 12.1" color TFT 800x600 250 cd/m2 15" color TFT 1024x768 200 cd/m2															
Touch Screen(Optional)	Infrared (Citron), Resistive(MicroTouch)															
COM port	2xRS-232, 2xRS-232/422/485 configurable galvanic isolation individually															
Parallel port	one multi-mode SPP/ECP/EPP parallel port with galvanic isolation															
LAN	10/100BaseT auto-sensing fast ethernet port															
USB	2 USB ports.															
PS/2 port	One PS/2 mouse and one keyboard ports.															
HDD	2.5" industrial grade HDD.															
Solid State Disk(Optional)	M-system DiskOnChip 2MB-72MB															
FDD	3.5" slim line FDD															
Power Supply	90W power 90-264VAC input, +5V@12A, +12V@1A, -12V@0.5A 100W power 18-36VDC input, +5V@15A, +12V@2A															
Expansion Slots	2xISA or 1xPCI, 1xISA															
Operating Temperature	PC Unit	-25°C to +60°C														
	LCD Panel	0°C to +50°C														
Relative Humidity	5-85% non-condensing															
EMC, Safety	CE															
Industrial Front Panel	IP65, NEMA 4/12															
Construction	Inside/outside heavy stainless steel.															
Vibration (Operating)	1G peak(5-500Hz)															
Shock (Operating)	20G, 11ms, Half sine wave, 6-axis.															
Dimension(WxHxD) (mm)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Model</th> <th style="text-align: center;">Dimension</th> </tr> </thead> <tbody> <tr> <td>T2-10AIC, T2-10ARC</td> <td>378.6x315.6x188.0</td> </tr> <tr> <td>T2-10DIC, T2-10DRC</td> <td>378.6x315.6x171.0</td> </tr> <tr> <td>T2-12AIC, T2-12ARC</td> <td>404.0x329.6x188.0</td> </tr> <tr> <td>T2-12DIC, T2-12DRC</td> <td>404.0x329.6x171.0</td> </tr> <tr> <td>T2-15AIC</td> <td>508.0x398.0x188.0</td> </tr> <tr> <td>T2-15DIC</td> <td>508.0x398.0x171.0</td> </tr> </tbody> </table>		Model	Dimension	T2-10AIC, T2-10ARC	378.6x315.6x188.0	T2-10DIC, T2-10DRC	378.6x315.6x171.0	T2-12AIC, T2-12ARC	404.0x329.6x188.0	T2-12DIC, T2-12DRC	404.0x329.6x171.0	T2-15AIC	508.0x398.0x188.0	T2-15DIC	508.0x398.0x171.0
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T2-15AIC	508.0x398.0x188.0															
T2-15DIC	508.0x398.0x171.0															

TOP-2000 Panel PCs part number list

Part no.	Part no.	Part no.	Part no.
T2-10ARO-1	T2-10ARC-1	T2-10ARO-2	T2-10ARC-2
T2-10AIO-1	T2-10AIC-1	T2-10AIO-2	T2-10AIC-2
T2-10DRO-1	T2-10DRC-1	T2-10DRO-2	T2-10DRC-2
T2-10DIO-1	T2-10DIC-1	T2-10DIO-2	T2-10DIC-2
T2-12ARO-1	T2-12ARC-1	T2-12ARO-2	T2-12ARC-2
T2-12AIO-1	T2-12AIC-1	T2-12AIO-2	T2-12AIC-2
T2-12DRO-1	T2-12DRC-1	T2-12DRO-2	T2-12DRC-2
T2-12DIO-1	T2-12DIC-1	T2-12DIO-2	T2-12DIC-2
T2-15DIO-1	T2-15DIC-1	T2-15DIO-2	T2-15DIC-2

Pre-loaded software

Part no.	Description
E-WIN95	Pre-loaded EWin95/98 and TOP-2000 drivers
E-WIN98	Pre-loaded EWin95/98 and TOP-2000 drivers
E-WINNT40	Pre-loaded EWinNT 4.0 and TOP-2000 drivers

Ordering information

T2	-	10	A	R	C	-	1	(Part number)
TOP-2000	10:	10.4" TFT	A: AC power	R: Res touch	C: close frame	config.1:	Pentium233, RAM64MB, HDD3.2G	
	12:	12.1" TFT	D: DC power	I: IR touch	O: open frame	config.2:	Pentium233, RAM128MB, HDD3.2G	
	15:	15.1" TFT						

***** CPU, RAM, HDD, Expansion module are optional only when single shipment is above 20 units *****

Spare part list for TOP-2000 PANEL PCs

Part number	Description	Remark
T2-LCD-1	10.4" TFT LCD	
T2-LCD-2	12.1" TFT LCD	
T2-LCD-3	15.1" TFT LCD	
T2-INV-1	10.4" inverter	
T2-INV-2	12.1" inverter	
T2-INV-3	15.1" inverter	
T2-CAB-1	10.4" LCD cable	
T2-CAB-2	12.1" LCD cable	
T2-CAB-3	15.1" LCD cable	
T2-IRT-1	10.4" IR touch	
T2-IRT-2	12.1" IR touch	
T2-IRT-3	15.1" IR touch	
T2-MB-1	Main board MB-564	
T2-DCP-1	DC power module	
T2-ACP-1	AC power supply	
T2-FAN-1	Fan module (3 pcs of Fan + Fan metal holder)	
T2-HDD-1	HDD 3.2GB 2.5"	
T2-HDD-2	HDD 3.2GB 2.5" with holder	
T2-FDD-1	FDD slim line	
T2-CPU-1	CPU Pentium-233+ Heat sink + FAN	
T2-RAM-1	RAM 128MB	
T2-120-1	LS-120 drive	
Other		

TOP-2000

Installation Manual

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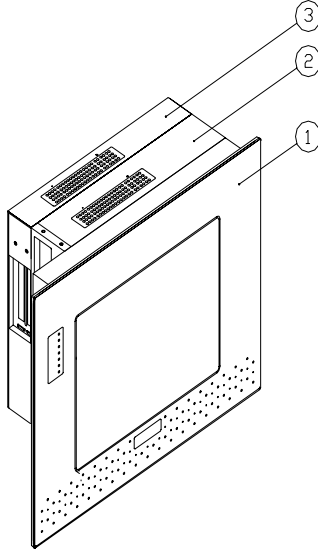
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CHAPTER
1

**General
Information**

Overview



Item	Name
1	Display Unit.
2	PC Unit.
3	Expansion Unit.

Features

- Intelligent System Temperature Control.
- Infrared/Resistive touch screen.
- Shockproof hard disk mobile module.
- Isolation on I/O ports.
- Liquid-proof and dust-proof in front panel. Meet IP65/NEMA 4/12 standard.
- Expansion capabilities: two ISA or one PCI , one ISA.
- Networking: On-board 10/100BaseT auto-sensing Fast Ethernet port.

General specifications

- **Construction:** Inside/outside heavy duty stainless steel.
- **Cooling system:** Three 11.5 CFM(flow-out) fans.
- **CPU :** Pentium MMX 133-233 or compatible.
- **System Memory:** 8-128MB SIMM or DIMM.
- **LCD display panel:**

Size	10.4"	12.1"	15"
Display Type	Color TFT	Color TFT	Color TFT
Resolution	640 x 480	800 x 600	1024 x 768
Luminance (cd/m ²)	250	250	200

• **I/O ports:**

Four COM ports (2xRS-232, 2x232/422/485).

One parallel port.

Two USB ports.

One PS/2 mouse and keyboard interface.

One VGA output connector.

10/100MHz fast LAN.

• **HDD:** EIDE HDD interface (2.5" industrial grade).

• **FDD:** 3.5" slim line FDD.

• **Expansion capabilities:** two ISA or one PCI, one ISA.

• **Dimensions (WxHxD) (mm):**

Model	Dimension
T2-10AIC, T2-10ARC	378.6 x 315.6 x 188.0
T2-10DIC, T2-10DRC	378.6 x 315.6 x 171.0
T2-12AIC, T2-12ARC	404.0 x 329.6 x 188.0
T2-12DIC, T2-12DRC	404.0 x 329.6 x 171.0
T2-15AIC	508.0 x 398.0 x 188.0
T2-15DIC	508.0 x 398.0 x 171.0

Power supply

AC input:

Input Voltage: 90-264Vac@47-63HZ.

OutputVoltage: +5V@12A, +12V@1A, -12v@0.5A

Output Power: 90W(MAX)

Safety: Meets UL, CSA, CE

EMC: Meets CE/FCC Class B

MTBF: 100,000 hrs.

DC input:

Input voltage: 18-36Vdc

Output voltage: +5v@15A, +12V@2A

Output power: 100W(max)

MTBF: 100,000 hrs.

Environmental specifications

- **Operating temperature:** 0 to 50 °C.
- **Relative humidity:** 5-85% non-condensing.
- **EMC:** CE.
- **Shock (Operating):** 20G, 11ms, Half sine wave, 6-axis.
- **Vibration (Operating):** 1G peak(5-500Hz).

Touch screens

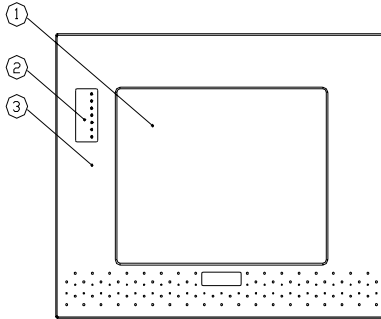
Infrared touch type

- **Touch-point density:** 16tps/cm² physical, 64tps/cm² interpolated.
- **Response time:** 2.5-6.5ms(software programmable).
- **Light Transmission:** 100%.
- **Touch sensor life:** unlimited.
- **MTBF-controller:** >500000 hrs.
- **Controller:** RS-232 interface.
- **Power consumption:** 5V@219mA(max).

Analog resistive type

- **Resolution:** 1024 touch points per axis within the calibrated area.
- **Response time:** 8-15ms.
- **Light Transmission:** 80%.
- **Touch sensor life:** >35 million touches.
- **MTBF-controller:** >500000 hrs.
- **Controller:** RS-232 interface.
- **Power consumption:** 5V@70mA(typical).

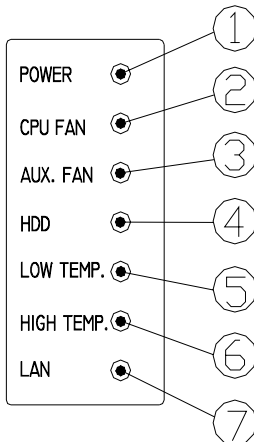
Front panel



<i>Item</i>	<i>Name</i>
1	LCD panel and Touch screen
*2	System status indicator
3	Aluminum panel

* For further information, please read section " System status indicator".

System status indicator



Item	Name	Active Color	Status
1	Power	Green	System Power On
2	CPU Fan	Green	Operating
3	AUX Fan	Green	Operating
4	HDD	Green	Operating
* 5	Low Temp.	Green	System temperature is in normal temperature level
* 6	High Temp.	Red	System temperature is in abnormal temperature level
7	Lan	Flash	Operating

* The warning temperature is determined in CMOS setup, Please refer to "Chipset feature setup" in ***TOP-2000 Main Board User's Manual***.

Touch screen driver and user's manual

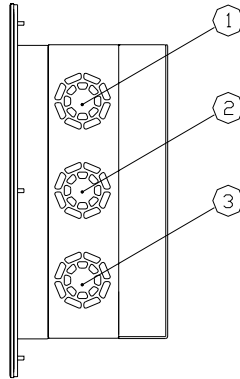
(1) Infrared type touch screen:

For further information, please see the user's manual in \CITRON directory of the ***TOP-2000 driver and utility disk*** CD-ROM for detail.

(2) Resistive type touch screen:

For further information, please see the user's manual in \MICROT-OUCH directory of the ***TOP-2000 driver and utility disk*** CD-ROM for detail.

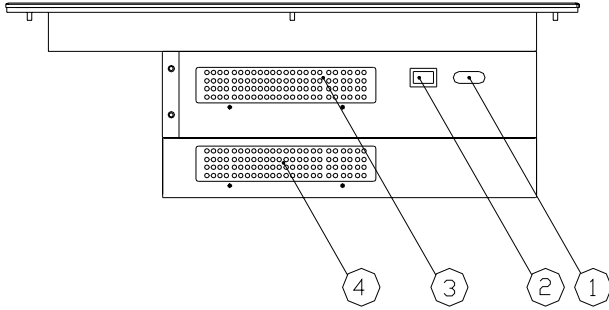
Cooling system



Item	Name	Normal Status
1 , 3	System Fan	Operating
* 2	Auxiliary Fan	Controlled by BIOS setting

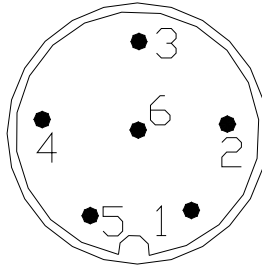
* For further information, please see the *TOP-2000 Main Board User's Manual* for detail.

Power input and power switch



Item	Name
* 1	Power input connector
2	Power switch
3, 4	Filter

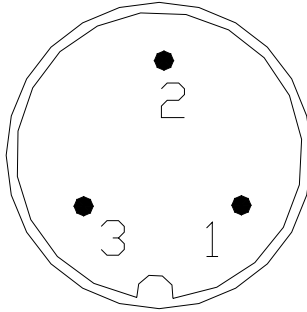
* (1) For DC input model:



Pin 1, 2 : Ground

Pin 4, 5 : DC 18-36 Volts

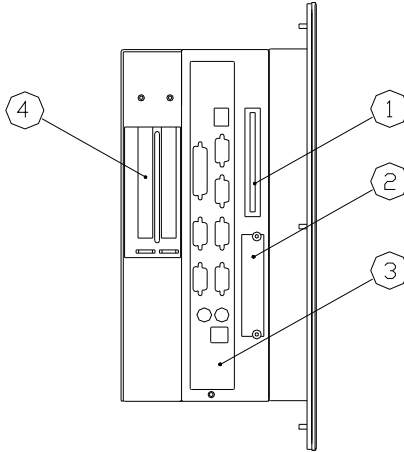
*** (2) For AC input model:**



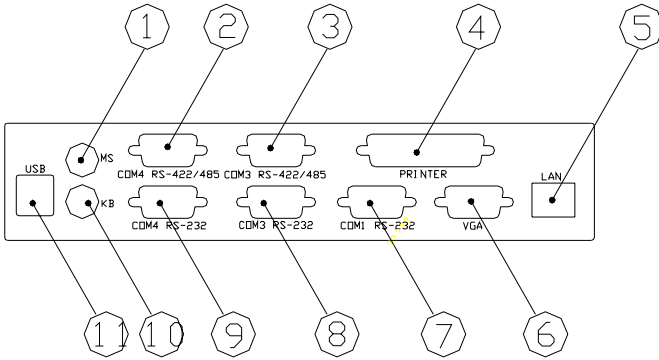
Pin 1, 3 : AC line in

Pin 2 : Earth ground

I/O ports and peripherals



Item	Name
1	Floppy disk drive
2	Hard disk drive
3	I/O ports
4	Add-on card slot in expansion unit



Item	Name
1	PS/2 mouse port
* 2	COM4 RS-422/RS-485
* 3	COM3 RS-422/RS-485
4	Printer port
5	Lan port
6	VGA port
7	COM1 RS-232
* 8	COM3 RS-232
* 9	COM4 RS-232
10	PS/2 keyboard port
11	USB port

* For further information, please see the **TOP-2000 Main Board User's Manual** for detail.

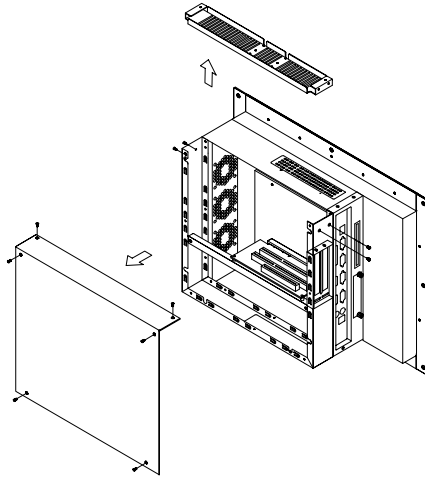
CHAPTER

2

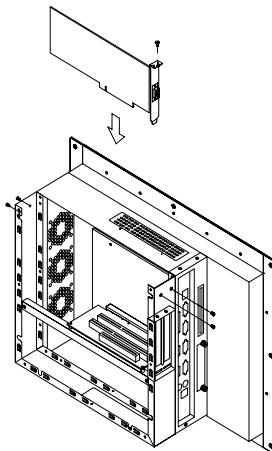
System Installation

Install Add-on Card in TOP-2000

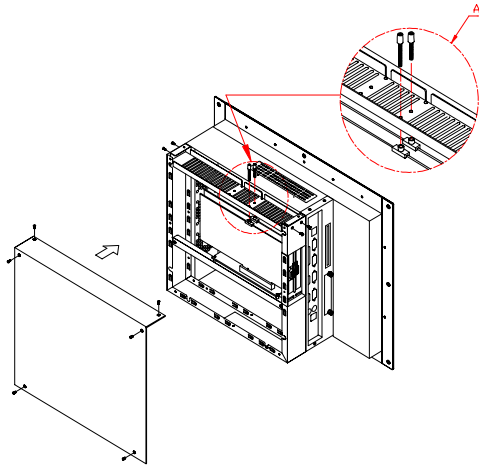
Step A : Remove the following items.



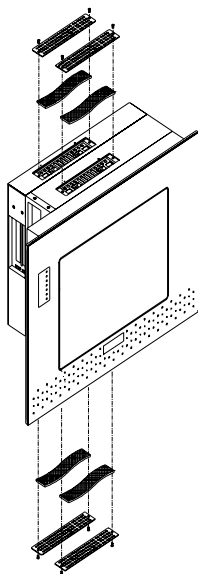
Step B : Insert your add-on card in system



Step C : Secure your add-on card



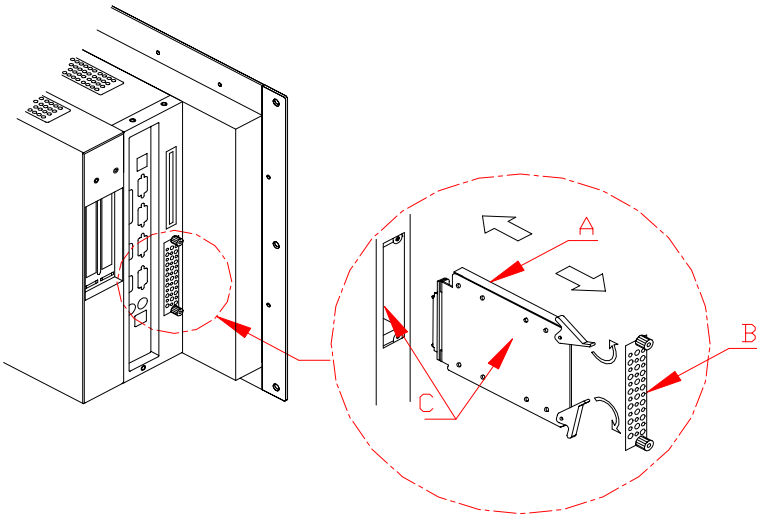
Replace filters



* You can find four filters in the TOP-2000 accessory box.

Install / Maintain hard disk drive in TOP-2000

Warning *Disclaimer : HDD is a highly sensitive device, thus installation can only be handled by authorized personnel. Any damage results from improper installation by unauthorized personnel is not claimable”.*



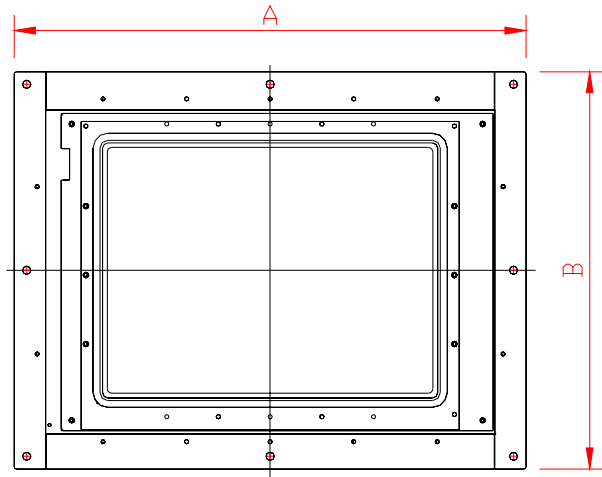
Comments

A	HDD module should be installed carefully with correct orientation.
B	HDD door can be removed / closed manually or by screw driver.
C	Slide HDD module along the rail in HDD bay until the end is reached. Push two black plastic ejectors toward the unit by both hands gently and carefully to set HDD in final position.

Outside view of TOP-2000

TOP-2000 without aluminum frame (open frame)

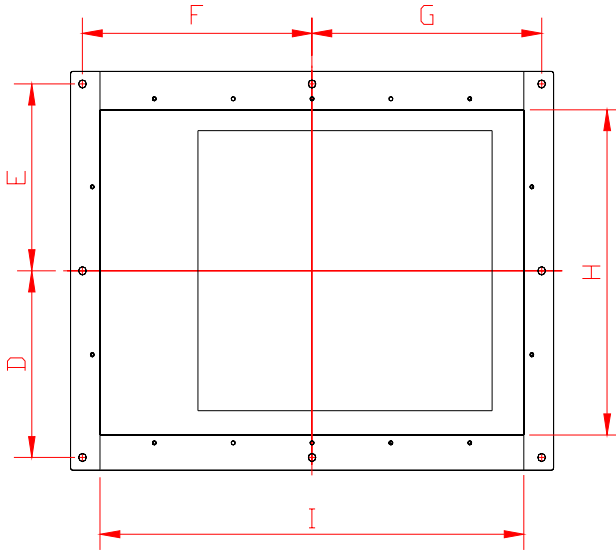
(1) Front view



Size	A	B
15.1"	490.0	380.0
12.1"	386.6	311.6
10.4"	360.6	297.6

(Unit: mm)

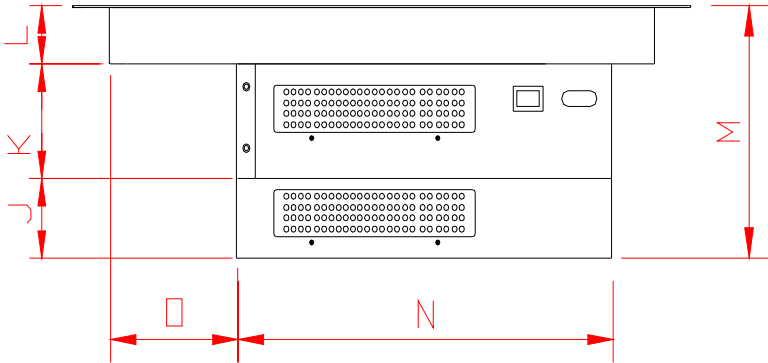
(2) Back view



	D	E	F	G	H	I
15.1"	178.0	178.0	233.0	233.0	312.0	432.0
12.1"	146.5	146.5	184.0	184.0	264.0	341.0
10.4"	139.5	139.5	171.0	171.0	240.0	315.0

(Unit: mm)

(3) Bottom view

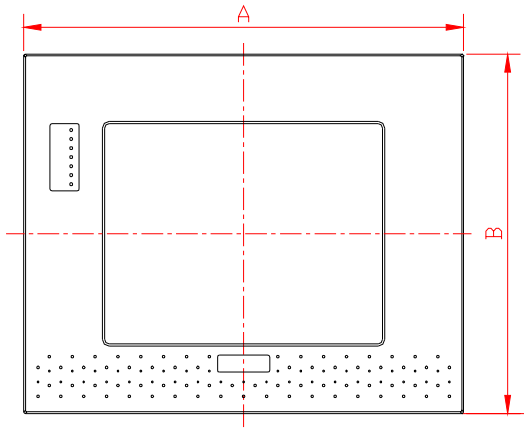


	J	K	L	M	N	O
15.1"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	83.6
12.1"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	63.0
10.4"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	50.0

(Unit: mm)

TOP-2000 with aluminum frame

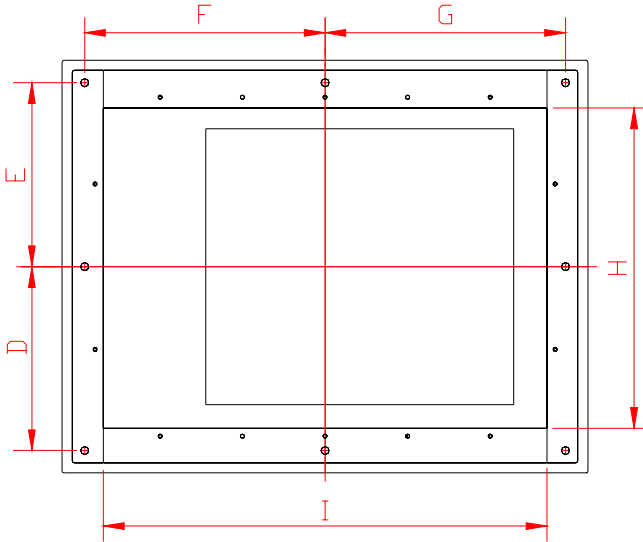
(1) Front view



	A	B
15.1"	508.0	398.0
12.1"	404.0	329.6
10.4"	378.6	315.6

(Unit: mm)

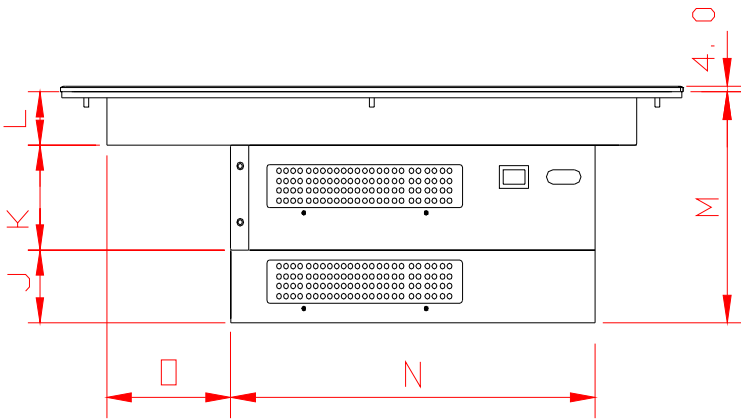
(2) Back view



	D	E	F	G	H	I
15.1"	178.0	178.0	233.0	233.0	312.0	432.0
12.1"	146.5	146.5	184.0	184.0	264.0	341.0
10.4"	139.5	139.5	171.0	171.0	240.0	315.0

(Unit: mm)

(3) Bottom view

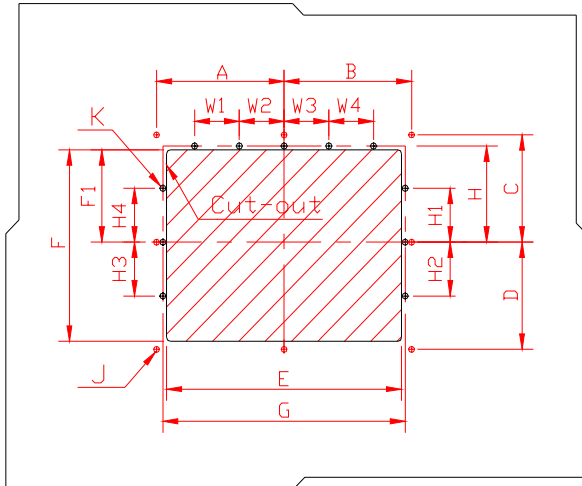


	J	K	L	M	N	O
15.1"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	83.6
12.1"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	63.0
10.4"	52.0	AC=94.0 DC=77.0	38.0	AC=184.0 DC=167.0	265.0	50.0

(Unit: mm)

Install TOP-2000 with aluminum frame in your system

Cut-out for a TOP-2000 with aluminum frame in your panel.

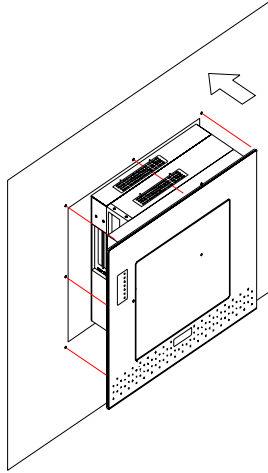


	A	B	C	D	E	F	F1	G	H	H1 - H4	J (x8)	K (x11)	W1 - W4
15.1"	233.0	233.0	178.0	178.0	435.0	327.0	157.5	446.0	164.0	80.0	Φ 6.0	Φ 8.0	80.0
12.1"	184.0	184.0	146.5	146.5	344.0	275.0	133.5	351.0	137.0	70.0	Φ 6.0	Φ 8.0	60.0
10.4"	171.0	171.0	139.5	139.5	318.0	252.0	121.5	325.0	125.0	70.0	Φ 6.0	Φ 8.0	60.0

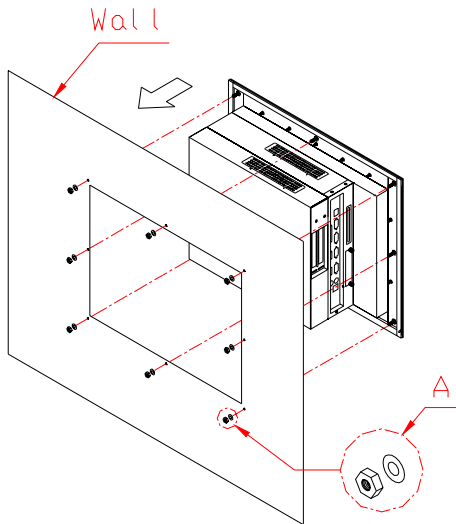
(Unit: mm)

Installation

(1)

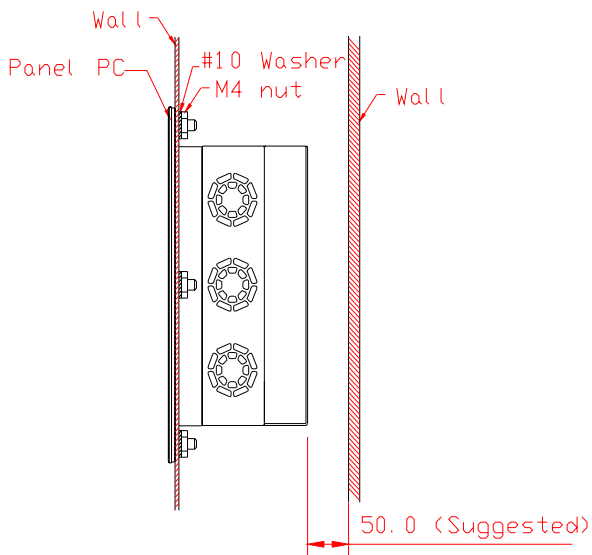


(2)



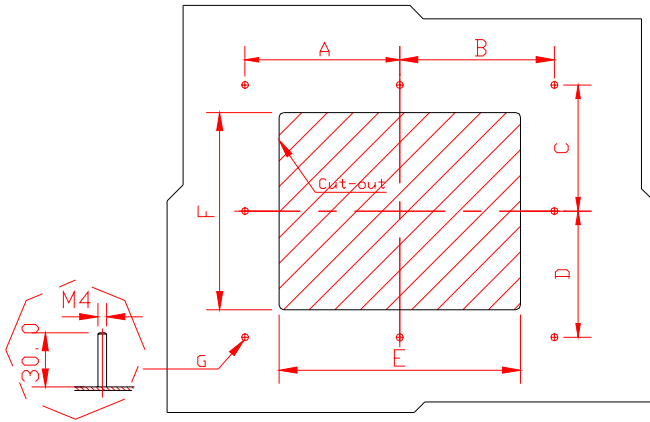
Comments

- A (1) #10 washer, M4 nut.
(2) You can find them in the TOP-2000 accessory box.



Install TOP-2000 without aluminum frame (open frame) in your system

Cut-out for a TOP-2000 without aluminum frame (open frame) in your panel.



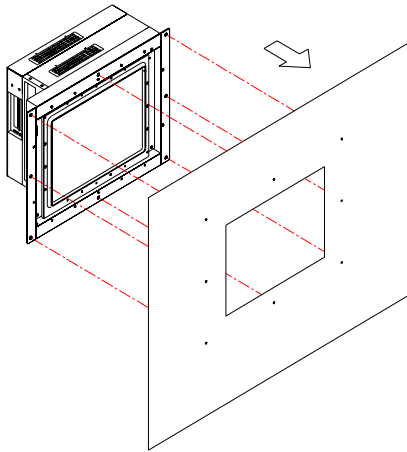
	A	B	C	D	E	F	G *
15.1"	233.0	233.0	178.0	178.0	345.0	268.0	M4x30
12.1"	184.0	184.0	146.5	146.5	284.0	223.0	M4x30
10.4"	171.0	171.0	139.5	139.5	249.0	196.0	M4x30

(Unit: mm)

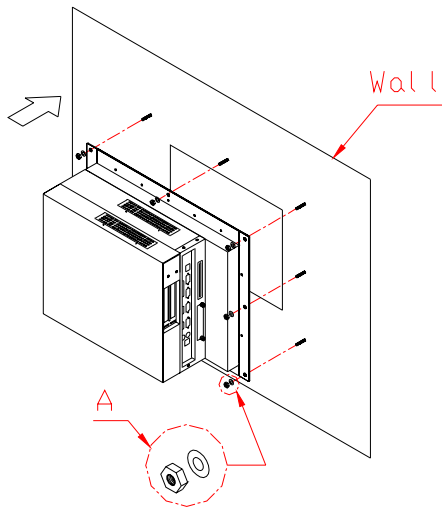
* To mount open frame TOP-2000, you need to plant M4x30 bolts with thread in the wall as shown in the cut-out drawing.

Installation

(1)

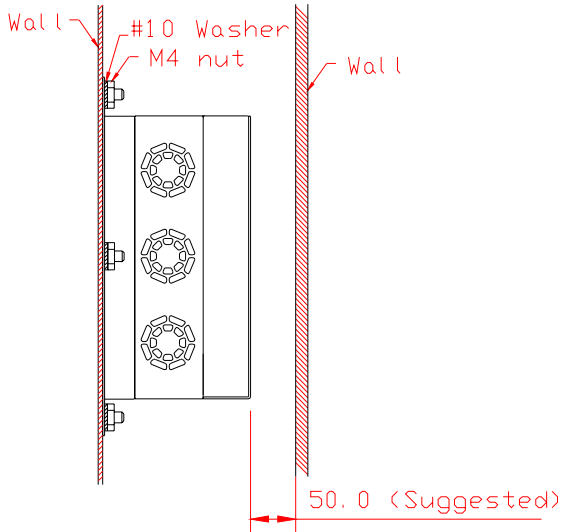


(2)

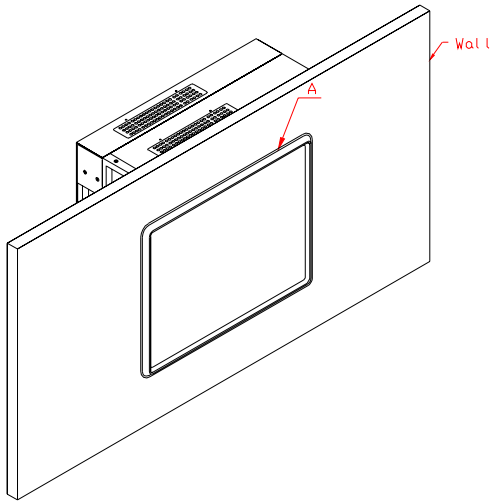


Comments	
A	(1) #10 washer, M4 nut. (2) You can find them in the TOP-2000 accessory box.

(3)



(4)



Comments	
A	The gap between TOP-2000 and wall must be sealed carefully to repel water and dust.

TOP-2000 Main Board

User's Manual

FCC STATEMENT

THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE. (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

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General Information

This chapter gives background information on the TOP-2000 Main Board.

Sections include:

- Specifications
- Layout and dimensions

Introduction

The TOP-2000 Main Board is an all-in-one LPX Pentium MMX computer with an on-board PCI SVGA controller, a PCI Ethernet interface and a PISA expansion slot (one dedicated EISA slot for PCI/ISA riser card option). Equipped with 64 bits and local bus architecture, the TOP-2000 Main Board releases Pentium's full potential and provides unprecedented performance compared to current 32-bit processor boards. Supports Intel Pentium P54C/P55C(MMX), AMD K5/K6, and Cyrix M1/M2 CPUs. The TOP-2000 Main Board offers all the functions of an industrial computer on a single board, but fits in the space of LPX form factor (only 225mm x 220mm). For maximum performance, the TOP-2000 Main Board also supports 2nd level cache sized 512 KB.

On-board features include four serial ports (Two RS-232 and two RS-232/422/485), one multi-mode parallel (ECP/EPP/SPP) port, a floppy drive controller, a keyboard and a PS/2 mouse interface. The built-in high-speed PCI IDE controller supports both PIO bus master and Ultra DMA/33 modes. Up to four IDE devices can be connected, including hard disks, CD-ROM drives, tape backup drives, and other IDE devices.

The TOP-2000 Main Board also features power management to minimize power consumption. It complies with the Green Function™ standard and supports three types of power-saving features: Doze mode, Standby mode, and Suspend mode. In addition, the board's watchdog timer can automatically reset the system or generate an interrupt in case the system stops due to a program bug or EMI.

On-board peripherals with true PCI performance

The TOP-2000 Main Board is a highly integrated, all-in-one LPX computer. All on-board peripherals (including PCI flat panel/VGA interface, PCI Ethernet, and PCI IDE) adopt PCI technology and operate through an internal PCI bus. Integrating a Pentium board with PCI architecture has unleashed a revolutionary level of performance.

Features

- Accepts Intel Pentium P54C/P55C 75-233 MHz, AMD K5 PR75~166, K6 PR2 166~300, Cyrix/IBM/SGS 6x86 PR100+~166+ and M2 CPUs
- Award Flash BIOS, Flat-Panel configured by programming Flash chip
- 2nd level cache: supports Pipeline burst RAM module, 512 KB cache memory
- 32-bit PCI-bus SVGA controller, supports flat panel (TFT, STN, mono and EL) and CRT displays
- 10/100 Mbps auto-sense Ethernet LAN controller RTL8139A
- One PISA slot for PCI/ISA riser card
- Built-in, bus-master PCI IDE controller supports both PIO bus master and Ultra DMA/33 mode up to four IDE devices (hard disk, CD-ROM, tape backup, etc.)
- Supports both common and EDO type DRAM, from 8 MB to 128 MB of DRAM
- One 168-pin SDRAM socket
- Two USB ports on board
- One 32-pin DIP socket supports M-system Disk-On-Chip 2000 series, memory capacity from 2 MB to 72 MB
- One enhanced multi-mode SPP/EPP/ECP parallel port, four serial ports: two RS-232 and two RS-232/422/485 selectable
- Green function: supports doze/standby/suspend modes
- Intel ligent temperature control
- LCD backlight control
- Dimensions: 225mm x 220mm

Specifications

Standard MB functions

CPU: Intel Pentium P54C/P55C(MMX) 75-233 MHz,
Cyrix / IBM / SGS 6X86 100+~166+, M2,
AMD K5 PR75~166, K6 PR2 166 ~300 MHz

BIOS: Award 256KB FLASH BIOS

Chipset: SiS 5582

Super I/O: UM8663, UM8661

Cache memory: On board 512 KB pipeline burst RAM 2nd level cache

RAM memory: 8MB to 128MB. Two 72-pin SIMM socket on board,
one 168-pin SDRAM socket

IDE hard disk drive interface: Supports both PIO bus master and Ultra
DMA/33 mode up to four IDE (AT bus) drives. BIOS auto-detect.
(44 pin, patch 2.0mm connector x 1; 40 pin, pitch 2.54mm connector x 1)

Floppy disk drive interface: Supports up to two floppy disk drives,
5.25" (360KB and 1.2MB) and/or 3.5" (720KB, 1.44MB, and 2.88MB)

Multi-mode parallel port: Configured to LPT1, LPT2, LPT3 or disabled.
Supports SPP, ECP, and EPP.

Serial ports: Two RS-232 and two RS-232/422/485 serial ports. Ports
can be configured as COM1, COM2, COM3, COM4, or disabled
individually. Four 16C550 serial UARTs.

DMA channels: 7

Interrupt levels: 15

Keyboard/mouse connector: 6 pin mini DIN connector x 2, support
standard keyboard and P/S2 mouse.

USB ports: Two USB ports on board.

Real Time Clock/Calendar: quartz oscillator, powered by lithium
battery for data retention of up to 10 years.

Power management: I/O peripheral devices support power saving and
Doze/Standby/Suspend modes. AMP 1.2 compliant.

Flat panel VGA interface (PCI Bus)

Chipset: C&T 65554

Display memory: 2MB

Display type: Supports CRT and flat panel (TFT, DSTN, mono and EL) display. Can display both CRT and flat panel simultaneously.

Resolution: 1024x768@64K colors

Ethernet interface (PCI Bus)

Chipset: Realtek 8139A PCI bus Ethernet controller.

SSD interface

One 32-pin DIP socket supports M-system Disk-On-Chip 2000 series, memory capacity from 2MB to 72MB.

Expansion slots

PISA slot: One dedicated PISA slot for PCI/ISA riser card

Mechanical and environmental

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

Max. power requirements:

Bare Board: +5V @ 1.5A

Pentium MMX: +5V @ 6A

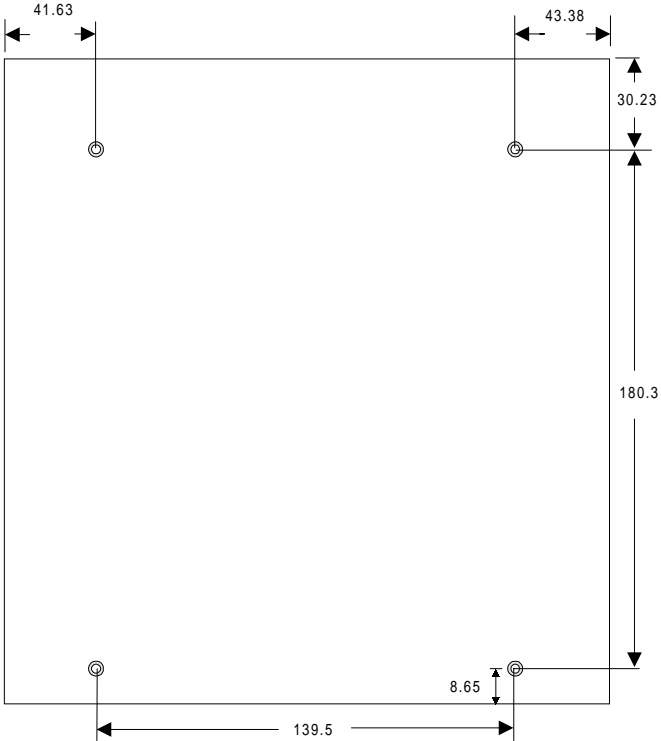
AMD K6-233: +5V @ 10A

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

Board Size: 225mm (L) x 220mm (W)

Weight: 1.1 lb. (0.5 Kg)

Board dimensions



Dimensions in mm

TOP-2000 Main Board dimensions

CHAPTER
2

Installation

This chapter describes how to set up the mainboard hardware, including instructions on setting jumpers and connecting peripherals, switches, and indicators. Be sure to read all the safety precautions before you begin the installation procedure.

Jumpers and connectors

Connectors on the board link them to external devices such as hard disk drives, a keyboard, or floppy drives. In addition, the board has a number of jumpers that allow you to configure your system to suit your application.

The table below lists the function of each of the board's jumpers and connectors.

DIP Switches

Label	Function
SW1 (1,2,3)	System clock setting
SW1 (4,5,6)	CPU frequency ratio
SW2 (1,2)	RS-232,422,485 selection for COM3
SW2 (3,4)	RS-232,422,485 selection for COM4
SW2 (5,6,7)	DiskOnChip memory address setting
SW4	CPU voltage setting

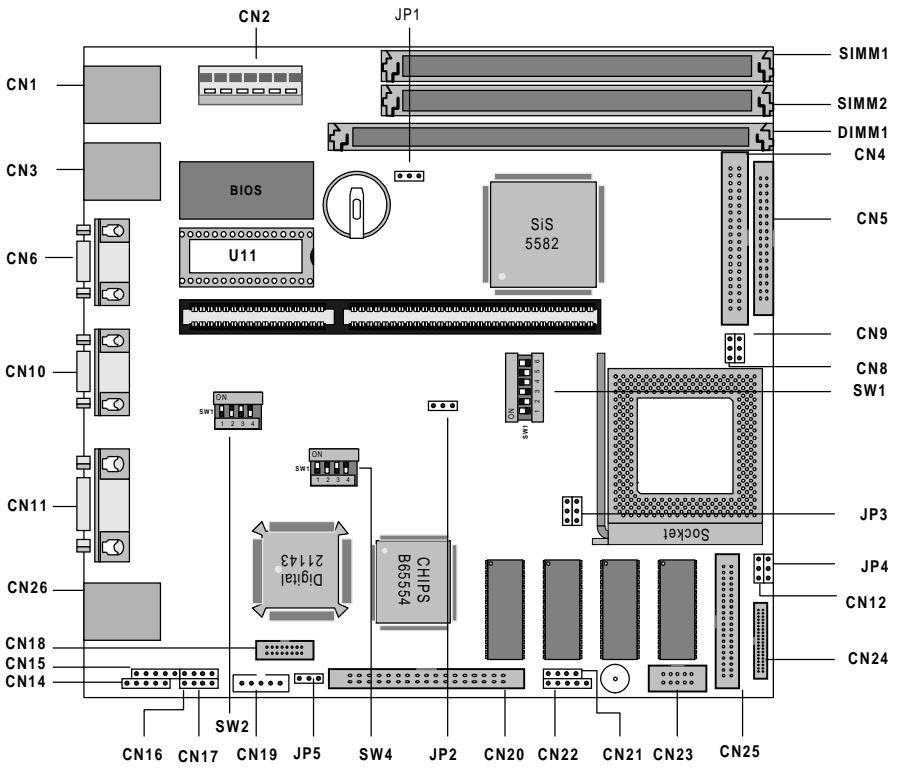
Jumpers

label	Function
JP1	Clear CMOS
JP2	PCI clock setting
JP3,JP4	CPU type selection
JP5	LCD 5V/3.3V selection

Connectors

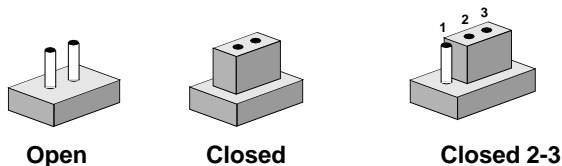
label	Function
CN1	USB
CN2	POWER
CN3	Keyboard / Mouse
CN4	Secondary IDE
CN5	Primary IDE
CN6	COM4
CN7	EISA bus (ISA/PCI)
CN8,9	System fans
CN10	COM3
CN11	COM1/ Printer port/ VGA
CN12	CPU fan
CN26	10/100BaseT Ethernet RJ-45
CN14	Reset
CN16	IrDA
CN17	Digital I/O (bit 0~3)
CN18	System status LED
CN19	Back light control
CN20	LCD interface
CN21	Buzzer / speaker
CN22	Keyboard lock
CN23	COM2
CN24	slim FDD
CN25	FDD

Locating jumpers and connectors



Setting jumpers

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



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



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

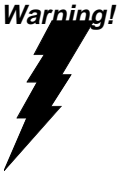
If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

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

CPU installing and upgrading

You can upgrade to a higher power Pentium CPU at any time. Simply remove the old CPU, install the new one, and set the jumpers for the new CPU type and speed.

Warning!



Always disconnect the power cord from your chassis when you are working on it. Do not make connections while the power is on, as 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 PC board. 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.

When you install a new CPU, be sure to adjust the board settings, such as CPU type and CPU clock. **Improper settings may damage the CPU.**

System clock setting (SW1-1, 2, 3)

SW1-1, 2, 3 are used to synchronize the system clock with the CPU type. You may need to adjust the CPU clock according to the base CPU speed.

System clock select

	50MHz	55MHz	60MHz	66MHz*	75MHz	83MHz
SW1-1	ON	ON	OFF	ON	OFF	ON
SW1-2	ON	ON	ON	OFF	ON	OFF
SW1-3	ON	OFF	ON	ON	OFF	OFF

* Default

CPU frequency ratio (SW1-4, 5, 6)

System frequency

	2x	2.5x	3x*	3.5x	4x	4.5x	5.0x	5.5x
SW1-4	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW1-5	OFF	ON	ON	OFF	OFF	ON	ON	OFF
SW1-6	OFF	OFF	OFF	OFF	ON	ON	ON	ON

CPU voltage setting (SW4)

SW4 must be set to match the CPU type. The chart below shows the proper jumper settings for their respective V_{cc} .

CPU voltage setting (SW4-1, SW4-2, SW4-3, SW4-4)				
CPUV _{cc}	SW4-1	SW4-2	SW4-3	SW4-4
2.0V	OFF	OFF	OFF	OFF
2.1V	OFF	OFF	OFF	ON
2.2V	OFF	OFF	ON	OFF
2.3V	OFF	OFF	ON	ON
2.4V	OFF	ON	OFF	OFF
2.5V	OFF	ON	OFF	ON
2.6V	OFF	ON	ON	OFF
2.7V	OFF	ON	ON	ON
2.8V*	ON	OFF	OFF	OFF
2.9V	ON	OFF	OFF	ON
3.0V	ON	OFF	ON	OFF
3.1V	ON	OFF	ON	ON
3.2V	ON	ON	OFF	OFF
3.3V	ON	ON	OFF	ON
3.4V	ON	ON	ON	OFF
3.5V	ON	ON	ON	ON

* Default

Installing DRAM (SIMM1, SIMM2, DIMM1)

The TOP-2000 Main Board provides two 72-pin SIMM (Single In-line Memory Module) sockets and one 168-pin DIMM (Dual-in-line Memory Module). The SIMM supports either Fast Page Mode (FPM) or Extended Data Output (EDO) DRAM with a speed of at least 70 ns. The DIMM supported by this mainboard are always 64-bit wide SDRAM (Synchronous DRAM). Unlike most other CPU cards, the MB-564 supports both single and dual insertion into the memory bank. Depending on the combination of modules you use, you can install from 8 MB to 128 MB of RAM. Please always insert two SIMM or one DIMM for correct operation. Don't use SIMM and DIMM modules in one system.

Installing SIMMs & DIMM

NOTE: The modules can only fit into a socket one way. Their chips must face the CPU, and their gold pins must point down into the SIMM socket.

1. Ensure that all power sources are disconnected.
2. Slip the memory module into the socket at a 45 degree angle.
3. Push the module toward the vertical posts at both ends of the socket until the module is upright and the retaining clips at both ends of the module click into place. When positioned correctly, the pins on top of the vertical posts should correspond to the circular holes on the ends of the module.
4. Repeat steps 2 and 3 for each module you install.

DiskOnChip memory address select (SW2)

The DiskOnChip 2000 occupies a 8 Kbyte window in the upper memory address range of CC00 to E000. You should ensure this dose not conflict with any other device's memory address.

DiskOnChip 2000 memory address (SW2)			
Memory address (HEX)	5	6	7
CC00	ON	OFF	ON
D000*	ON	OFF	OFF
D400	OFF	ON	ON
D800	OFF	ON	OFF
DC00	OFF	OFF	ON
E000	OFF	OFF	OFF

* Default

These addresses might conflict with the ROM BIOS on some of other peripheral boards. Please select appropriate memory address to avoid memory conflict.

Clear CMOS (JP1)

You can connect an external switch to clear CMOS. This switch closes JP1 and turns on the power, at which time the CMOS setup can be cleared.

Clear CMOS (JP1)

Protect*



Clear CMOS



* default

PCI clock setting (JP2)

JP2 is used to synchronize the system clock with the CPU clock and PCI clock. You may need to adjust the CPU clock according to the base CPU speed.

PCI clock setting (JP2)

PCI clock

32 MHz

1/2 CPU clock*



* Default

CPU type select (JP3, JP4)

JP3, JP4 must be set both to match the CPU type between Dual-Voltage (e.g.P55C) and Single-Voltage (e.g.P54C) type CPU. the chart below shows the proper jumper setting for their respective CPU type.

CPU type select (JP3)

Dual-Voltage*



Single-Voltage



* Default

CPU type select (JP4)

P55C*



P54C



* Default

LCD driving voltage select (JP5)

You can select the LCD connector LCD CON driving voltage by setting JP5. The configuration as follows:

LCD driving voltage select (JP5)

5V*



3.3V



* Default

USB connector (USB1, USB2)(CN1)

You can connect your USB (Universal Serial Bus) devices to USB connector. With USB, there is no need to have separate connectors for keyboards, modems, and mice. USB provides a common interface for all your peripherals.

USB connector (USB1, USB2)(CN1)			
Pin	Function	Pin	Function
1	Vcc	5	Vcc
2	UV1 ⁻	6	UV0 ⁻
3	UN1 ⁺	7	UV0 ⁺
4	GND	8	GND

Power connectors (CN2)

AT power connector (CN2)

The following table lists the pin assignments for the Power Connector:

Power Connector (CN2)			
pin	Signal	pin	Signal
1	PG	7	GND
2	+5V	8	GND
3	+12V	9	-5V
4	-12V	10	+5V
5	GND	11	+5V
6	GND	12	+5V

Power LED (D1)

The power LED to indicate when the mainboard is on.

Keyboard and PS/2 mouse connector (CN3)

The TOP-2000 Main Board provide a keyboard connector and a PS/2 style mouse connector. 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 TOP-2000 Main Board's BIOS standard setup menu allows you to select "All, But Keyboard" under the "Halt On" selection. This allows no-keyboard operation in embedded system applications without the system halting under POST (power-on-self-test).

The upper connector of CN3 is for mouse, the lower one is for keyboard.

IDE hard drive connector (CN5, CN4)

You can attach one to four Enhanced Integrated Device Electronics hard disk drives to the TOP-2000 Main Board internal controller. The TOP-2000 Main Board's IDE controller uses a PCI local-bus interface. This advanced interface supports faster data transfer and allows the IDE hard drive to exceed 528 MB.

Connecting the hard drive

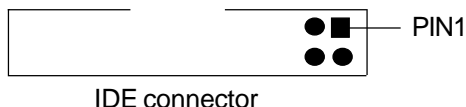
Connecting drives is done in a daisy-chain fashion and requires one of two cables, depending on the drive size. 1.8" and 2.5" drives need a 44-pin to flat-cable connector for CN5(Primary IDE). 3.5" drives use a 40-pin flat-cable for CN4(Secondary IDE).

Wire number 1 on the cable is red or blue, and the other wires are gray.

1. Connect one end of the cable to CN5 or CN4. Make sure that the red (or blue) wire corresponds to pin 1 on the connector, which is labeled on the board (on the right side).
2. Plug the other end of the cable to the Enhanced IDE hard drive, with pin 1 on the cable corresponding to pin 1 on the hard drive. (See your hard drive's documentation for the location of the connector.)

Connect a second drive as described above.

Unlike floppy drives, IDE hard drives can connect to either end of the cable. If you install two drives through one cable, you will need to set one as the master and one as the slave by using jumpers on the drives. If you install just one drive, set it as the master.



Serial ports (CN11, CN23, CN10, CN6)

The TOP-2000 Main Board offers four serial ports: two RS-232 (COM1 ,COM2,) and two RS-232/422/485(COM3, COM4). These ports let you connect to serial devices (a mouse, printers, etc.) or a communication network.

Configure RS-232/422/485 for COM3, COM4

SW2

1	2	3	4	Function
COM3		COM4		
OFF	x	OFF	x	RS-232*
ON	OFF	ON	OFF	RS-422
ON	ON	ON	ON	RS-485

x : Don't care

* : Default

RS-232

COM 1,2,3,4 RS-232 ports

pin	Signal	pin	Signal
1	DCD	6	DSR
2	RX	7	RTS
3	TX	8	CTS
4	DTR	9	RI
5	GND		

RS-422/485

COM 3,4 RS-422/485 ports

pin	Signal	pin	Signal
1	TXD+	6	NC
2	TXD-	7	NC
3	RXD+	8	NC
4	RXD-	9	GND
5	GND		

System fan connectors (CN8,CN9)

Two system fan connectors (CN8, CN9) are controlled by BIOS. System fan interfaces can be turned on when overheat or can be always on” which is pre-set in the CMOS SETUP – CHIPSET FEATURES SETUP.

System fan connectors (CN8,CN9)

Pin	Function
1	GND (FAN ON/OFF CONTROL)
2	+12
3	RPM (ROTATION DETECT SIGNAL)



Display connectors (CN11, CN20)

The TOP-2000 Main Board's PCI SVGA interface can drive conventional CRT displays through CN11 and is capable of driving a wide range of flat panel displays including electroluminescent (EL), gas plasma, passive LCD and active LCD displays. The card has two connectors to support these displays, one for standard CRT VGA monitors and one for flat panel displays.

The TOP-2000 Main Board's SVGA connector (VGA) with PCI bus supports monochrome display as well as high resolution color displays. The card also features a LCD connector (CN20), which allows you to connect various flat panel displays. The following table lists pin assignments of CN20:

LCD connector (CN20)			
Pin	Function	Pin	Function
1	+12V _{DC}	2	+12V _{DC}
3	GND	4	GND
5	+5V _{DC} (or 3.3V)	6	+5V _{DC} (or 3.3V)
7	EN LCD (ENAVEE)	8	GND
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	P24	34	P25
35	LCD clock (SHFCLK)	36	FLM (V SYN)
37	M	38	LP (H SYN)
39	GND	40	-blank (ENABKL)
41	P26	42	P27
43	P28	44	P29

Pin	Function	Pin	Function
45	P30	46	P31
47	P32	48	P33
49	P34	50	P35

SVGA connector (CN11)

Pin	Function
1	Red video
2	Green video
3	Blue video
4	Not used
5	GND
6	Red return (GND)
7	Green return (GND)
8	Blue return (GND)
9	Key (no pin)
10	Sync return (GND)
11	Monitor ID (not used)
12	Monitor ID
13	Horizontal sync
14	Vertical sync
15	Not used

CPU fan connector (CN12)

CPU fan connectors (CN12)

Pin	Function
1	GND (FAN ON/OFF CONTROL)
2	+12V
3	RPM (ROTATION DETECT SIGNAL)

Ethernet configuration (CN26)

The mainboard is equipped with a high performance 32-bit PCI-bus Ethernet interface which is fully compliant with IEEE 802.3 10/100Mbps CSMA/CD standards. It is supported by all major network operating systems.

Configuration is very simple and is done via the BIOS setup. The medium type can be configured via the program included on the utility disk.

Ethernet 100/10BASE-T connector (CN26)

100/10BASE-T connects to the mainboard via a RJ-45 connector (CN26).

Ethernet 100/10BASE-T connector (CN26)

Pin	Signal
1	TX+
2	TX-
3	RX+
4	GND
5	GND
6	RX-
7	GND
8	GND

Reset switch (CN14)

You can connect an external switch to easily reset your computer.

This switch restarts your computer as if you had turned off the power then turned it back on. The following table shows the pin assignments for RESET SW.

Reset switch (CN14)

Pin	Function
1	GND
2	Reset

IrDA connector (CN16)

The IrDA connector can be configured to support wireless infrared modul, with this module and application software such as Laplink, user can transfer file to or from laptops, note book, PDA and printers. The pin assignment as follows:

IrDA connector (CN16)

Pin	Function
1	Vcc
2	FIR RX
3	IR Rx
4	GND
5	IR Tx

Digital I/O connector (CN17)

The digital I/O connector provides 4 TTL level input and output pins for general purpose.

Digital I/O connector (CN17)

Pin	294H (I/O port address)
1	bit 0
2	bit 1
3	bit 2
4	bit 3

LCD backlight control (CN19)

The CN19 is a 5-pin inverter connector which could provide the power for LCD inverter. The following table is the pin assignment of CN19. The pin-5 "BKL_ON" is normally active "high". Please refer to "Power Management Setup" in the BIOS SETUP Menu and select "LCD off Option" to enable power management.

CN19 offers LCD backlight control signals for your applications. The pin assignment is as follows:

LCD backlight control (CN19)

PIN	Function
1	+12V ENB
2	GND
3	VCC
4	NC
5	BKL_ON

System speaker (CN21)

The CPU card has its own buzzer. You can disable the internal buzzer and connect an external speaker to SPK.

System speaker (CN21)

Pin	Function
1	Vcc
2	Speaker output
3	Buzzer in *
4	Speaker output *

*default: connect a jumper between pin 3 and pin 4 for internal buzzer output.

Floppy drive connector (CN24, CN25)

You can attach up to two floppy disks to the TOP-2000 Main Board's on-board controller. You can use any combination of 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB, 1.44 MB, and 2.88 MB) drives.

A 34-pin daisy-chain drive connector cable is required for a dual-drive system. On one end of the cable is a 34-pin flat-cable connector. On the other end are two sets of floppy disk drive connectors. Each set consists of a 34-pin flat-cable connector (usually used for 3.5" drives) and a printed-circuit board connector (usually used for 5.25" drives).

CN24 is for a slim floppy drive. PIN1 of CN24 is shown on the M/B.

Connecting the floppy drive

1. Plug the 34-pin flat-cable connector into CN25 make sure that the red wire corresponds to pin one on the connector.
2. Attach the appropriate connector on the other end of the cable to the floppy drive(s). You can use only one connector in the set. The set on the end (after the twist in the cable) connects to the B: drive. The set in the middle connects to the A: drive.
3. If you are connecting a 5.25" floppy drive, line up the slot in the printed circuit board with the blocked-off part of the cable connector. If you are connecting a 3.5" floppy drive, you may have trouble determining which pin is pin number one. Look for a number printed on the circuit board indicating pin number one. Also, the connector on the floppy drive connector may have a slot. When the slot is up, pin number one should be on the right. Check the documentation that came with the drive for more information.

DiskOnChip socket (U11)

The DiskOnChip 2000 family of products provides a single chip solid-state flash disk in a standard 32-pin DIP package. The DiskOnChip 2000 is a solid-state disk with no moving parts, resulting in a significant reduction in power consumption and an increase in reliability. The DiskOnChip is small, plug and play Flash disk. It is easy to use and saves integration overhead.

The DiskOnChip 2000 family of products is available in capacities ranging from 2MB up to 72 MB, unformatted. This way, the same socket on the target platform will not have to be changed. In order to manage the disk, the DiskOnChip 2000 includes the TrueFFS, M-Systems' Flash File System proprietary software. The DiskOnChip 2000 package is pin-to-pin compatible with standard 32-pin EPROM device.

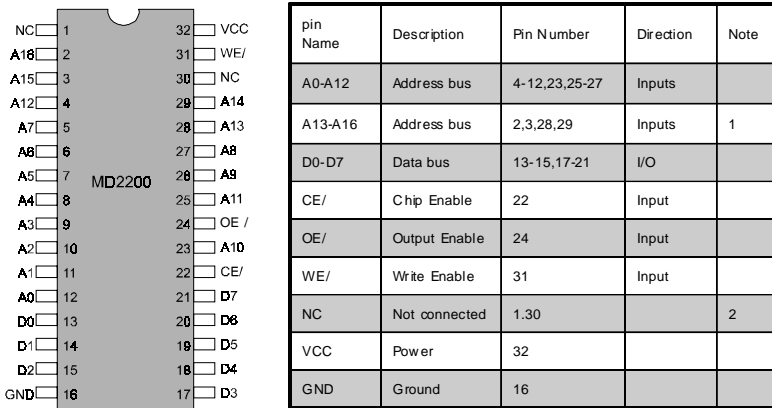


Figure1-MD2200 Pin-out

Note 1:Pins A13 through A16 are not used by the MD2200. They are kept for socket backward compatibility with ED 1100 (DiskOnChip 1000)

Note 2:Pins 1 and 30 are not used by MD2200

Ethernet

This chapter shows what is inside the Ethernet disk and which web site to connect for more information or driver download.

Ethernet Driver in TOP-2000 Driver CD

The TOP-2000 Driver CD includes Microsoft network drivers for

--- Windows for Workgroups 3.1

--- Windows 95 & OSR2

--- Windows NT 3.5, 3.51, 4.0

The Ethernet drivers are in the directory

\TOP2000_driver&utilities\Main board\Ethernet chip

For other information or to download other drivers, please connect
<http://www.realtek.com.tw/cn/driver/8139-driver.htm>

Flat Panel/CRT Controller Display Drivers and Utilities

This chapter provides information about:

- Driver types and installation
- Software utility installation and use

Software drivers and utilities

TOP-2000 Driver CD includes VGA drivers and utilities for Windows3.1, Windows95, NT and OS2.

The drivers are in the directory \TOP2000_driver&utility\Main board\VGA chip\Driver.

The utilities are in the directory \TOP2000_driver&utilities\Main board\VGA chip\Tools

For other information or to update drivers, please connect <http://www.chips.com>.

Award BIOS Setup

This chapter describes how to set BIOS configuration data.

System test and initialization

These routines test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

press <F1> to RESUME

Write down the message, and press the F1 key to continue the bootup sequence.

System configuration verification

These routines check the current system configuration against the values stored in the card's CMOS memory. If they don't match, the program outputs an error message. You will then need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

1. You are starting your system for the first time.
2. You have changed the hardware attached to your system.
3. The CMOS memory has lost power and the configuration information has been erased.

The mainboard CMOS memory has an integral lithium battery backup. The battery backup should last ten years in normal service, but when it finally runs down, you will need to replace the complete unit.

AWARD BIOS setup



Setup program initial screen

Award's 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 CMOS RAM so that it retains the Setup information when the power is turned off.

Entering setup

Power up the computer and press immediately. This will allow you to enter Setup.

Standard CMOS setup

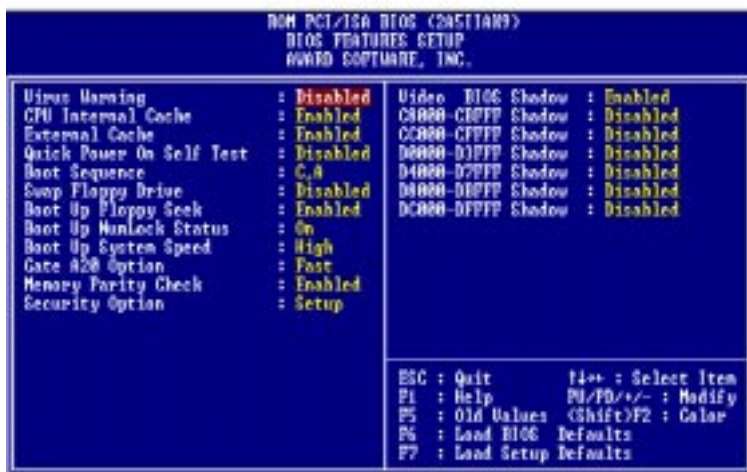
When you choose the STANDARD CMOS SETUP option from the INITIAL SETUP SCREEN menu, the screen shown below is displayed. This standard Setup Menu allows users to configure system components such as date, time, hard disk drive, floppy drive, display, and memory. Once a field is highlighted, on-line help information is displayed in the left bottom of the Menu screen.



CMOS setup screen

BIOS features setup

By choosing the BIOS FEATURES SETUP option from the INITIAL SETUP SCREEN menu, the screen below is displayed. The following configurations are based on the SETUP DEFAULTS settings.



BIOS features setup

Virus Warning

When this item is enabled, the Award BIOS will monitor the boot sector and partition table of the hard disk drive for any attempt at modification. If an attempt is made, the BIOS will halt the system and the following error message will appear. Afterward, if necessary, you will be able to run an anti-virus program to locate and remove the problem before any damage is done.

! WARNING !

Disk boot sector is to be modified

Type "Y" to accept write or "N" to abort write

Award Software, INC.

CPU Internal Cache/External Cache

These two categories speed up memory access. However, it depends on CPU/chipset design.

Quick Power-On Self-Test

This category speeds up Power-On Self-Test(POST) after you power up the computer. If it is set to Enable, BIOS will shorten or skip some check items during POST.

Boot Sequence

This category determines which drive to search first for the disk operating system (i.e., DOS).

Swap Floppy Drive

This item allows you to determine whether you want to swap floppy drive or not.

Boot Up Floppy Seek

During POST, BIOS will determine if the floppy disk drive installed is 40 or 80 tracks. 360K type is 40 tracks while 760K, 1.2M and 1.44M are all 80 tracks.

Boot Up NumLock Status

This allows you to determine the default state of the numeric keypad. By default, the system boots up with NumLock on.

Boot Up System Speed

This allows you to determine the Boot Up Speed. The choice : High / Low.

Gate A20 Option

This entry allows you to select how the gate A20 is handled. The gate A20 is a device used to address memory above 1 Mbytes. Initially, the gate A20 was handled via a pin on the keyboard. Today, while keyboards still provide this support, it is more common, and much faster, for the system chipset to provide support for gate A20.

Memory Parity Check

Set this option to Enabled to Check the Parity of all system memory.

Security Option

This category allows you to limit access to the system.

CHIPSET features setup

By choosing the CHIPSET FEATURES SETUP option from the INITIAL SETUP SCREEN menu, the screen below is displayed. The following configurations are based on the SETUP DEFAULTS settings.



Chipset Features Setup

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.

The only time you might consider making any changes would be if you discovered that data was being lost while using your system.

Auto Configuration

Set this item to *Enabled* to pre-defined values for DRAM, cache timing according to CPU type & system clock. Thus, each item value may display differently depending on your system configurations.

When this item is enabled, the pre-defined items will become SHOW-ONLY.

NA# Enable

This item allows you to select between two methods of chipset NA# asserted during CPU write cycle/CPU line fills, Enabled and Disabled.

RAS Precharge Time

DRAM must continually be refreshed or it will lose its data. Normally, DRAM is refreshed entirely as the result of a single request. This option allows you to determine the number of CPU clocks allocated for the Row Address Strobe to accumulate its charge before the DRAM is refreshed. If insufficient time is allowed, refresh may be incomplete and data lost.

RAS to CAS Delay

When DRAM is refreshed, both rows and columns are addressed separately. This setup item allows you to determine the timing of the transition from Row Address Strobe (RAS) to Column Address Strobe (CAS).

CPU to PCI Post Write

Set this option to Enabled to give priority to posted messages from the CPU to PCI bus.

CPU to PCI Burst Men_WR

Set this option to Enabled to allow write instructions to be combined in PCI burst mode. The settings are Enabled or Disabled.

ISA Bus Clock Frequency

This item allows you to select the ISA bus clock PCICLK/3 OR PCICLK/4.

System BIOS Cacheable

When enabled, accesses to the system BIOS ROM addressed at F0000H-FFFFFH are cached, provided that the cache controller is enabled.

Video BIOS Cacheable

As with caching the System BIOS above, enabling the Video BIOS cache will cause access to video BIOS addressed at C0000H to C7FFFH to be cached, if the cache controller is also enabled.

Memory Hole at 15M-16M

In order to improve performance, certain space in memory can be reserved for ISA cards. The memory must be mapped into the memory space below 16 MB.

Boot ROM Function

This item allows you to set the Enabled or Disabled Ethernet Boot ROM function.

CPU Warning Temperature

CPU Warning Temperature setting determines at which temperature level and above on CPU will **Intelligent Temperature Control System** start to give alarm, speed down CPU and/or turn on auxiliary fans until its recovery.

Current CPU Temperature

Current CPU Temperature is measured in real time and shown here.

SYS Warning Temperature

System Warning Temperature setting determines at which temperature level and above in system will **Intelligent Temperature Control System** start to give alarm, speed down CPU and/or turn on auxiliary fans until its recovery.

Current Sys Temperature

Current System Temperature is measured in real time and shown here.

CPU SPEED OVERHEAT

When the temperature is overheated (higher than the **CPU Warning Temperature** or **SYS Warning Temperature**), CPU speed will follow this setting to speed down to its 1/2, 1/3, 1/4 or remain full speed.

SPEAKER ALARM OVERHEAT

You must enable the setting to give alarm when CPU or system is overheated.

SYSTEM FAN WORK CONTROL

System fans can be controlled by on board Intelligent Temperature Control System through **CN8**, **CN9**. To turn on the fans when overheated, you must select “**Overheat**” other than “**Always on**” in the setting.

Power management setup

By choosing the POWER MANAGEMENT SETUP option from the INITIAL SETUP SCREEN menu, the screen below is displayed. The following configurations are based on SETUP DEFAULTS settings.



Power management setup

Power Management

There are four selections for Power Management: Disabled, Min Saving, Max Saving, User Define. Except Disabled, three of the above selections have fixed mode settings. When PM is set Disabled, the pre-defined items will become show only.

PM Control by APM

When enabled, an Advanced Power Management device will be activated to enhance the Max Power Saving mode and stop the CPU internal clock.

Video Off Option

User can select All Modes→Off, Always On, Suspend→Off, or Susp, Stby→Off to execute the PM mode.

Video Off Method

This determines the manner in which the monitor is blanked.

Blank screen	This option only writes blanks to the vide buffer.
DPMS	Initial display power management signaling.

LCD Off Option

You can set up LCD Off Options by selecting All Modes→Off, Always On, Suspend→Off, or Susp, Stby→Off. For detailed setup, you can select saving mode for switch function, time interval for Doze, Stdbby, and MODEN, and Hot Key Power Off. When LCD off is executed, the LCD's backlight will be turned off and save system power consumption. The on-board 5-pin inverter power connector CN19 allows user to use this PM function and truly increase the life of backlight. The item of Hot Key SMI allows user to use "Ctl-Alt-Back Space" to enter Suspend Mode, and press any key to wake-up.

PM Timers

The following four modes are Green PC power-saving functions which are only user configurable when User Defined Power Management has been selected. See above for available selections.

HDD Off After

When enabled and after the set time of system inactivity, the hard disk drive will be powered down while all other devices remain active.

Doze Mode

When enabled and after the set time of system inactivity, the CPU clock will run at slower speed while all other devices still operate at full speed.

Standby Mode

When enabled and after the set time of system inactivity, the fixed disk drive and the video will be shut off while all other devices still operate at full speed.

Suspend Mode

When enabled and after the set time of system inactivity, all devices except the CPU will be shut off.

PM Events

PM events are I/O events whose occurrence can prevent the system from entering a power-saving mode or can awaken the system from such a mode. In effect, the system remains alert for anything which occurs to a device which is configured as *Enabled*, even when the system is in a power down mode.

The following is a list of IRQ, Interrupt ReQuests, which can be exempted much as the COM ports and LPT ports above can. When an I/O device wants to gain the attention of the operating system, it signals this by causing an IRQ to occur. When the operating system is ready to respond to the request, it interrupts itself and performs the service.

- IRQ3 (COM 2)
- IRQ4 (COM 1)
- IRQ5 (LPT 2)
- IRQ6 (Floppy Disk)
- IRQ7 (LPT 1)
- IRQ8 (RTC Alarm)
- IRQ9 (IRQ2 Redir)
- IRQ10 (Reserved)
- IRQ11 (Reserved)
- IRQ12 (PS/2 mouse)
- IRQ13 (Coprocessor)
- IRQ14 (Hard Disk)
- IRQ15 (Reserved)

PnP/PCI Configuration

By choosing the PCI CONFIGURATION SETUP option from the INITIAL SETUP SCREEN menu, the screen below is displayed. This section describes configuring the PCI bus system. PCI, or Personal Computer Interconnect, is a system which allows I/O devices to operate at speeds nearing the speed the CPU itself uses when communicating with its own special components. This section covers some very technical items, and it is strongly recommended that only experienced users should make any changes to the default settings. The following configurations are based on SETUP DEFAULTS Settings.

```

                                ROM PCI/ISA BIOS (DATE:10/97)
                                PNP/PCI CONFIGURATION
                                AWARD SOFTWARE, INC.

Resources Controlled By : Manual
Reset Configuration Data : Disabled

IRQ-3 assigned to : Legacy ISA
IRQ-4 assigned to : Legacy ISA
IRQ-5 assigned to : PCI/ISA PnP
IRQ-7 assigned to : Legacy ISA
IRQ-9 assigned to : PCI/ISA PnP
IRQ-10 assigned to : PCI/ISA PnP
IRQ-11 assigned to : PCI/ISA PnP
IRQ-12 assigned to : PCI/ISA PnP
IRQ-14 assigned to : Legacy ISA
IRQ-15 assigned to : Legacy ISA
DMA-0 assigned to : PCI/ISA PnP
DMA-1 assigned to : PCI/ISA PnP
DMA-3 assigned to : PCI/ISA PnP
DMA-5 assigned to : PCI/ISA PnP
DMA-6 assigned to : PCI/ISA PnP
DMA-7 assigned to : PCI/ISA PnP

PCI IRQ Actived By      : Level
PCI IBE 2nd Channel     : Enabled
PCI IBE IRQ Map To     : PCI-AUTO
Primary IDE INT#       : 0
Secondary IDE INT#     : 0

ESC : Quit      F10+ : Select Item
F1  : Help      F6/PB/+/- : Modify
F5  : Old Values (Ehife)F2 : Color
F6  : Load BIOS Defaults
F7  : Load Setup Defaults

```

PnP/PCI Configuration setup

Resource Controlled by

The Award Plug and Play BIOS has the capacity to automatically configure all of the boot and Plug and Play compatible devices. However, this capability means absolutely nothing unless you are using a Plug and Play operating system such as Windows® 95.

Reset Configuration data

This item allows you to reset the configuration data or not.

IRQ3/4/5/7/9/10/11/12/14/15, DMA0/1/3/5/6/7 assigned to

This item allows you to determine the IRQ/DMA assigned to the ISA bus and is not available to any PCI slot.

PCI IRQ Activated by

This sets the method by which the PCI bus recognizes that an IRQ service is being requested by a device. Under all circumstances, you should retain the default configuration unless advised otherwise by your system manufacturer.

Choices are *Level* and *Edge*.

PCI IDE IRQ Map to

This allows you to configure your system to the type of IDE disk controller in use. The more apparent difference is the type of slot being used.

If you have equipped your system with a PCI controller, changing this allows you to specify which slot has the controller and which PCI interrupt (A, B, C, or D) is associated with the connected hard drives.

Remember that this setting refers to the hard disk drive itself, rather than individual partitions. Since each IDE controller supports two separate hard drives, you can select the INT# for each. Again, you will note that the primary has a lower interrupt than the secondary.

Selecting *PCI Auto* allows the system to automatically determine how your IDE disk system is configured.

Primary/Secondary IDE INT#

Refer to the above description of PCI IDE IRQ.

Integrated Peripherals



IDE Primary/Secondary Master/Slave PIO

These four lines set the hard disk PIO transfer mode, which affects the hard disk data transfer rate. The system will auto-detect the PIO mode of a device in any of these positions when they are set to 'Auto', the recommended setting. Alternatively, you can set the mode manually. Modes 0 to 4 are supported.

Primary/Secondary Master/Slave UltraDMA

These four lines enable hard disk UltraDMA transfer mode, which requires a drive that supports this data transfer method. The system will auto-detect an UltraDMA device in any of these four positions when they are set to 'Auto', the recommended setting. The other setting is 'Disabled'. You can leave these set to Auto without effect if there are no UltraDMA devices installed.

IDE Burst Mode

When this item is *Enabled*, the system will support burst data transfer mode to increase HDD transfer speed.

IDE Data Port Post Write

This item allows users to select *Enabled* to use data port post write for IDE drive.

IDE HDD Block Mode

Set this item to *Enabled* to use HDD block transfer mode.

Onboard FDD Controller

Enables or *Disables* the onboard Floppy Drive controllers.

Onboard Parallel Port

Sets the I/O address for the onboard parallel port. The setting options are:

378H/IRQ7 (default)

Disabled

278H/IRQ5

38CH/IRQ7

Onboard Serial Port 3/4

Sets the I/O address for serial ports 3/4. The system will auto-detect the COM port address when this item is set Auto, the default setting.

COM1/3F8

COM2/2F8

COM3/3E8

COM4/2E8

USB Controller/ USB Keyboard Support

Enables or Disables the onboard USB port controller and USB Keyboard support.

Load BIOS defaults / Load setup defaults

Load BIOS defaults loads the default system values directly from ROM. The BIOS Defaults provide the most stable settings, though they do not provide optimal performance. Load setup defaults, on the other hand, provide for maximum system performance. If the stored record created by the Setup program becomes corrupted (and therefore unusable), BIOS defaults will load automatically when you turn on the mainboard.



Load BIOS defaults screen

Change password

To change the password, choose the PASSWORD SETTING option from the Setup main menu and press <Enter>.

1. If the CMOS is bad or this option has never been used, there is default password which is stored in the ROM. The screen will display the following messages:

Enter Password:

Press <Enter>.

2. If the CMOS is good or 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:

Confirm Password:

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 can be at most 8 characters long.

Remember - to enable this feature, you must first select either Setup or System in the BIOS FEATURES SETUP.

Auto detect hard disk

The IDE HDD AUTO DETECTION utility can automatically detect the IDE hard disk installed in your system. You can use it to self-detect and/or correct the hard disk type configuration.

ROM PCI/ISA BIOS (2A511AK9) CMOS SETUP UTILITY AWARD SOFTWARE, INC.							
CYLS. HEADS PRECOMP LANDZONE SECTORS MODE							
Drive C : (Mb)							
Select Drive C Option (N=Skip) : N							
Options	SIZE	CYLS.	HEADS	PRECOMP	LANDZONE	SECTORS	MODE
1(Y)		0	0	0	0	0	0
NORMAL							
ESC = SKIP							

IDE HDD auto detection screen

HDD low level format

Selecting this utility allows you to execute HDD low level formatting. This Award Low-Level-Format Utility is designed as a tool to save your time formatting your hard disk. The Utility automatically looks for the necessary information of the drive you selected. The Utility also searches for bad tracks and lists them for your reference.

Shown below is the menu which appears after you enter into the Award Low-Level-Format Utility.

ROM PCI/ISA BIOS (2A511AK9) CMOS SETUP UTILITY AWARD SOFTWARE, INC.							
HARD DISK LOW LEVEL FORMAT UTILITY				BAD TRACKS TABLE NO. CYLS HEAD			
SELECT DRIVE BAD TRACK LIST PREFORMAT							
CURRENT SELECT DRIVE IS: C							
Drive: C	Cylinder:	Head:					
	SIZE	CYLS	HEAD	PRECOMP	LANDZ	SECTOR	MODE
Primary Master:	54	996	16	65535	995	63	NORMAL
Primary Slave:	0	0	0	0	0	0	AUTO
Secondary Master:	0	0	0	0	0	0	AUTO
Secondary Slave:	0	0	0	0	0	0	AUTO
←→↑↓: SELECT ITEM				ENTER: ACCEPT		ESC: Exit/Abort	
Copyright (c) Award Software, Inc. 1992-1994 All Rights reserved							

HDD low level format screen

Save & exit setup

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

Exit without saving

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

Programming the Watchdog Timer

The mainboard is equipped with a watchdog timer that resets the CPU or generates an interrupt if processing comes to a standstill for whatever reason. This feature ensures system reliability in industrial stand-alone and unmanned environments.

Programming the watchdog timer

How to program the WATCHDOG TIMER

1. To set the time-out interval of watchdog timer:
 - output the desired value to port **0x443**. Since the data is of 1 byte, the maximum value will be 255. In our design 1 ~ 127 will denote 1sec ~ 127sec, though 129 ~ 255 will denote 1min ~ 127min. e.g.
outportb(0x443, 30); // set interval to 30 seconds
outportb(0x443, 0x85); // set interval to 5 minutes
2. To set the time-out event:
 - output data to **port 0x444**,
 - 0: reset system
 - 1, 2, 3: IRQ 10, 15, 11 respectively
 - 4: NMI
 - e.g.
outportb(0x444, 0); // set time-out event to reset-system
3. To disable watchdog timer:
 - output any value to port 0x80, e.g.
outportb(0x80, data); // disable watchdog timer
4. To enable or refresh watchdog timer(the watchdog timer will return to its initial value, then count down):
 - access the I/O port **0x443**, e.g.
outportb(0x80, 0); // disable watchdog timer
inportb(0x443); // refresh watchdog timer
 - * note: if you want to refresh the watchdog timer, you have to disable it first.

Demo program

```
outportb(0x444, 0);           // set time-out event to reset-system
outportb(0x443x 10);        // set time-out interval to 10 seconds
iutportb(0x443);           // enable watchdog timer
customer_job();            // execute your job here, be sure your
                             // job will finished within 10 seconds
outportb(0x80, 0);         // refresh watchdog timer, otherwise
                             // the system will reset after time-out
outputb(0x443, 20);       // set time-out interval to 20 seconds
inportb(0x443);           // enable watchdog timer
another_job();            // another job finished in 20 seconds
outportb(0x80, 0)         // disable watchdog timer
...
...
```


TOSHIBA

LTM10C209A

FEATURES

- (1) High Luminance and long life, Twin CCFL Backlight.
- (2) Low reflection and clear 256K-colors (K=1024).
- (3) Thin and light weight design.
- (4) Full compatible with LTM10C273(SVGA).
- (5) 640x480 pixels color display.
- (6) Lamp replaceable structure.
- (7) Fast response.

APPLICATIONS

- (1) LCD monitor.
- (2) FA,OA Equipment.
- (3) Display terminal.
- (4) Measuring Instrument.
- (5) New Media Equipment.

MECHANICAL SPECIFICATIONS

Item	Specifications		
Dimensional Outline	265.0	(W) x 188.8	(H) x 12.0max (D) mm
Number of Pixels	640	(W) x 480	(H) Pixels
Active Area	211.2	(W) x 158.4	(H) mm
Pixel Pitch	0.33	(W) x 0.33	(H) mm
Weight(Approx.)	590 g		
Backlight	Twin-CCFLs, Side-light type		

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit.	
Supply Voltage	(V _{DD})	-0.3	7.0	V
	(V _{FL})	0	2000	Vrms
FL Driving Frequency (f _{FL})	0	100	KHz	
Input Signal Voltage (V _{IN})	-0.3	V _{DD} +0.3	V	
Operating Temperature	0	50	°C	
Storage Temperature	-20	60	°C	
Storage Humidity (Max. Wet bulb temp = 39C)	10	90	%RH	

ELECTRICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.	Remarks
Supply Voltage	(V _{DD})	4.75	5.0	5.25	V	
	(V _{FL})	500	550	600	Vrms	If _l =6.0mA
FL Start Voltage(Ta=0C)	(V _{FLS})	1500	-	1800	Vrms	
High Level Input Voltage	(V _{IH})	3.5	-	V _{DD}	V	
Low Level Input Voltage	(V _{IL})	0	-	1.5	V	
Current Consumption	*1 (I _{DD})	-	125	250	mA	
	(I _{FL})	3.0	6.0	7.0	mA	Each CCFL
Power Consumption *1, *2	(P)	-	7.2	-	W	I _{FL} =6.0mA

*1: 8 Color Bars Pattern.

*2: Except the efficiency of FL Inverter.

OPTICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.
Contrast Ratio	(CR)	100	-	-	-
View Angle (CR ≥ 10)	(Upper+Lower)	-	-	50	deg.
	(Left+Right)	-	-	50	deg.
Luminance	(L)	200	250	-	cd/m ²
Response Time	(ton)	-	-	50	ms
	(toff)	-	-	50	ms

TOSHIBA

LTM12C275A

FEATURES

- (1) 12.1" SVGA for FA and LCD monitor use.
- (2) High Brightness 250cd/m² with twin ccFLs sidelight.
- (3) Wide Viewing angle (Vertical direction: 90 degree, horizontal one: 110 degree)
- (4) Long life CCFLs (Average life time: 25000 hours).

APPLICATIONS

- (1) LCD monitor.
- (2) FA Equipment.
- (3) Display terminal.
- (4) Measuring Instrument.

MECHANICAL SPECIFICATIONS

Item	Specifications		
Dimensional Outline	290.0	(W) x 220.0	(H) x 15.0max (D) mm
Number of Pixels	800	(W) x 600	(V) Pixels
Active Area	246.0	(W) x 184.5	(H) mm
Pixel Pitch	0.3075	(W) x 0.3075	(H) mm
Weight(Approx.)	840 g		
Backlight	Twin-CCFLs, Side-light type		

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit.	
Supply Voltage	(V _{DD})	-0.3	7.0	V
	(V _{FL})	0	2000	Vrms
FL Driving Frequency (f _{FL})	0	100	KHz	
Input Signal Voltage (V _{IN})	-0.3	V _{DD} +0.3	V	
Operating Temperature	0	50	°C	
Storage Temperature	-20	60	°C	
Storage Humidity (Max. Wet bulb temp = 39C)	10	90	%RH	

ELECTRICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.	Remarks
Supply Voltage	(V _{DD})	4.75	5.0	5.25	V	
	(V _{FL})	580	630	680	V _{rms}	I _{fl} =6.0mA _{rms}
FL Start Voltage(Ta=0C)	(V _{FLS})	1400	-	1900	V _{rms}	
High Level Input Voltage	(V _{IH})	0.8 V _{DD}		V _{DD}	V	
Low Level Input Voltage	(V _{IL})	0	-	0.2 V _{DD}	V	
Current Consumption	*1 (I _{DD})	-	170	270	mA	
	(I _{FL})	3.0	6.0	6.5	mA _{rms}	Each CCFL
Power Consumption *1, *2	(P)	-	8.4	-	W	I _{FL} =6.0mA _{rms}

*1: Toshiba standard pattern (Color Bars Pattern)

*2: Except the efficiency of FL Inverter.

OPTICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.
Contrast Ratio	(CR)	100	250	-	-
View Angle (CR ≥ 10)	(Upper+Lower)	70	90	-	deg.
	(Left+Right)	90	110	-	deg.
Response Time	L:10-90%	-	40	70	ms
Response Time	L:90-10%	-	10	20	ms
Luminance	(L)	200	250	-	cd/m ²

TOSHIBA

LTM15C151A

FEATURES

- (1)15.0" XGA for Monitor use.
- (2)High Brightness 200cd/m² with twin-ccFLs sidelight.
- (3)Wide Viewing angle(Vertical direction:90 degree, horizontal one:110 degree)
- (4)Long life CCFLs (Average life time:25000hours).

APPLICATIONS

- (1) LCD monitor.
- (2) FA Equipment.
- (3) Display terminal.
- (4) New media equipment.

MECHANICAL SPECIFICATIONS

Item	Specifications		
Dimensional Outline	350.0	(W) x 266.5	(H) x 15.0max (D) mm
Number of Pixels	1024	(W) x 768	(H) Pixels
Active Area	304.128	(W) x 228.096	(H) mm
Pixel Pitch	0.297	(W) x 0.297	(H) mm
Weight(Approx.)	1320 g		
Backlight	twin-CCFLs, Side-light type		

ABSOLUTE MAXIMUM RATINGS

Item	Min.	Max.	Unit.	
Supply Voltage	(V _{DD})	-0.3	6.0	V
	(V _{FL})	0	2100	Vrms
FL Driving Frequency (f _{FL})	0	100	KHz	
Input Signal Voltage (V _{IN})	-0.3	3.6	V	
Operating Temperature	0	50	°C	
Storage Temperature	-20	60	°C	
Storage Humidity (Max. Wet bulb temp = 39C)	10	90	%RH	

ELECTRICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.	Remarks
Supply Voltage	(V _{DD})	4.75	5.0	5.25	V	
	(V _{FL})	-	710	-	Vrms	Ifl=6.0mArms
FL Start Voltage(Ta=0C)	(V _{FLS})	1700	-	-	Vrms	
High Level Input Voltage	(V _{IH})	2.64		3.3	V	
Low Level Input Voltage	(V _{IL})	0	-	0.66	V	
Current Consumption *1	(I _{DD})	-	300	-	mA	
	(I _{FL})	-	6.0	-	mArms	Each CCFL
Power Consumption *1, *2	(P)		10.0		W	I _{FL} =6.0mArms

*1: Toshiba standard pattern (Color Bars Pattern)

*2: Except the efficiency of FL Inverter.

OPTICAL SPECIFICATIONS(Ta=25C)

Item		Min.	Typ.	Max.	Unit.
Contrast Ratio	(CR)	100	250	-	-
View Angle (CR ≥ 10)	(Upper+Lower)	70	90	-	deg.
	(Left+Right)	90	110	-	deg.
Response Time	L:10-90%	-	40	70	ms
Response Time	L:90-10%	-	10	20	ms
Luminance	(L)	150	200	-	cd/m ²



ELECTRONICS

TO :

DATE : 98.04.30

SAMSUNG TFT-LCD

MODEL NO. : LT150X1-151

NOTE :

The information described in this SPEC is preliminary and can be changed without prior notice.

PREPARED BY : AMLCD Application Engineering Group

SAMSUNG ELECTRONICS CO., LTD.

GENERAL DESCRIPTION

DESCRIPTION

LT150X1-151 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a back-light system. The resolution of a 15.0" contains 1024 x 768 pixels and can display up to 262,144 colors. 6 o'clock direction is the optimum viewing angle.

FEATURES

- High contrast ratio, High aperture structure
- Wide viewing angle
- High speed response
- XGA(1024x768 pixels) resolution
- Low power consumption
- 2 dual CCFTs(Cold Cathode Fluorescent Tube)
- SYNC & DE(Data Enable) Mode and DE only Mode
- TTL Interface with 2pixels / clock

APPLICATIONS

- Desktop monitors
- Display terminals for AV application products
- Monitors for Industrial machine

General Information

ITEM	SPECIFICATION	UNIT	NOTE
Display area	304.128(H) x228.096(V) (15 inch diagonal)	mm	
Driver element	a-si TFT active matrix		
Display colors	262,144		
Number of pixel	1024 x 768	pixel	
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.297(H) x 0.297(W)	mm	
Display Mode	Normally white		
Surface treatment	Haze 13 , Hard - Coating (3H)		

Mechanical Information

ITEM		MIN.	TYP.	MAX.	NOTE
Module size	Horizontal (H)	367.5	368.0	368.5	mm
	Vertical (V)	274.5	275.0	275.5	mm
	Depth (D)	-	-	20	mm
Weight (Without inverter)		-	-	1550	g

1. ABSOLUTE MAXIMUM RATINGS

1.1 ABSOLUTE RATINGS OF ENVIRONMENT

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage temperature	T_{STG}	-20	60	°C	(1),(5)
Operating temperature (Ambient Temperature)	T_{OPR}	0	50	°C	(1),(5),(6))
Shock (non-operating)	Snop	-	50	G	(2),(4)
Vibration (non-operating)	Vnop	-	1.0	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.

95 % RH Max. ($40\text{ }^{\circ}\text{C} \geq T_a$)

Maximum wet - bulb temperature at $39\text{ }^{\circ}\text{C}$ or less. ($T_a > 40\text{ }^{\circ}\text{C}$) No condensation.

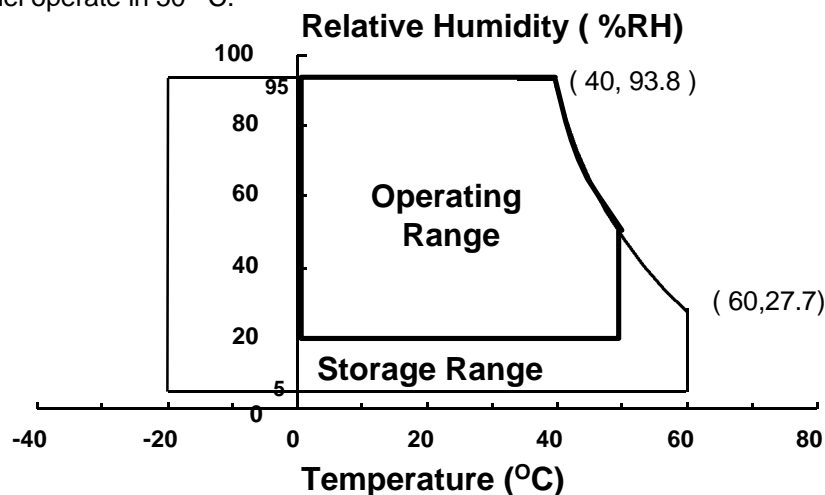
(2) 6ms, sine wave, one time for i , θ_i , ϕ_i , ψ

(3) 10 - 55 - 10 Hz, Sweep rate 2.5 min, 120 min for X,Y,Z.

(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

(5) If product is used for extended time excessively or exposed to high temperatures for extended time, there is a possibility of wide viewing angle film damage which could affect visual characteristics.

(6) Compensation film may be discolored when surrounding temperature over $40\text{ }^{\circ}\text{C}$ but panel operate in $50\text{ }^{\circ}\text{C}$.



1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

(V_{SS} = GND = 0 V)

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V _{DD}	GND-0.3	6.0	V	(1)

NOTE (1) Within Ta (25 ; 32 °C)

(2) BACK-LIGHT UNIT

Ta = 25 ; 0 °C

ITEM	SYMBOL	MIN.	MAX.	UNIT.	NOTE
Lamp current	I _L	4.0	12.0	mArms	(1),(2)
Lamp frequency	f _L	30	80	KHz	(1)

NOTE (1) Permanent damage to the device may occur if maximum values are exceeded.
Functional operation should be restricted to the conditions described under Normal Operating Conditions.

(2) Specified values are for a dual lamp(Refer to the Note (1) in the page 13 for further information).

2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (4).

Measuring equipment : TOPCON BM-5A

* Ta = 25j 0C , VDD=5V, fv= 60Hz, fdCLK=32.5 MHz, IL = 11.2 mA_{rms}

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio (Center of screen)	CR		150	200	-		(1), (2), (4)
Response Time at Ta	Rising	T _R	-	20	-	msec	(1), (3)
	Falling	T _F	-	30	-		
Luminance of White (Center of screen)	Y _L		170	200	-	cd/m ²	(1), (4)
Color Chromaticity (CIE)	Red	R _X	φ = 0, θ = 0 Normal Viewing Angle	0.589	0.619	0.649	
		R _Y		0.313	0.343	0.373	
	Green	G _X		0.268	0.298	0.328	
		G _Y		0.565	0.595	0.625	
	Blue	B _X		0.116	0.146	0.176	
		B _Y		0.074	0.104	0.134	
	White	W _X		0.264	0.294	0.324	
		W _Y		0.295	0.325	0.355	
Viewing Angle	Hor.	θ _L	CR > 5	60	-	-	
		θ _R		60	-	-	
	Ver.	φ _H		55	-	-	
		φ _L		55	-	-	
Brightness Uniformity	B _{UNI}		-	-	20	%	(5)

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 0°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE	
Voltage of Power Supply	V _{DD}	4.75	5.0	5.25	V		
Input Voltage	High	V _{IH}	2.64	-	V _{DD}	(1)	
	Low	V _{IL}	GND	-	0.6		V
Input Current	High	V _{IH}	-	-	i _{DD}	(1), V _{IH} =V _{DD}	
	Low	V _{IL}	-	-	i _{DD}		(1), V _{IL} =GND
Current of Power Supply	White	I _{DD}	-	360	-	mA	(2)(4)*a
	Mosaic		-	380	-	mA	(2)(4)*b
	V.stripe		-	590	640	mA	(2)(4)*c
Vsync Frequency	f _v	-	60	75	Hz		
Hsync Frequency	f _H	-	48.3	60.0	kHz		
Main Frequency	f _{DCLK}	-	32.5	39.4	MHz	(3)	
Rush Current	I _{rush}	-	-	2.5	A	(5)	

Note (1) MCLK , Vsync , Hsync , DE , RA0 ~ RA5 , GA0 ~ GA5 , BA0 ~ BA5 , RB0 ~ RB5 , GB0 ~ GB5 , BB0 ~ BB5

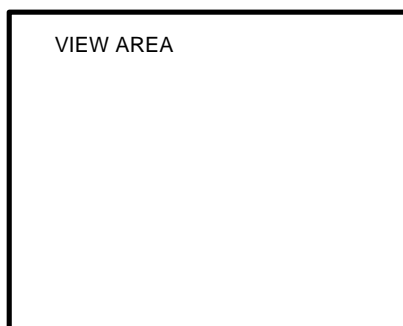
(2) f_v=60Hz, f_{DCLK} =32.5MHZ, V_{DD} = 5.0V, DC Current.

(3) 2 Pixels/clock

(4) Power dissipation check pattern

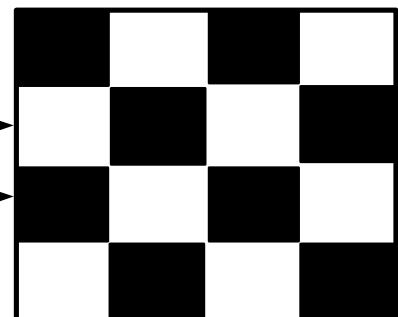
*a) White Pattern

*b) Mosaic Pattern

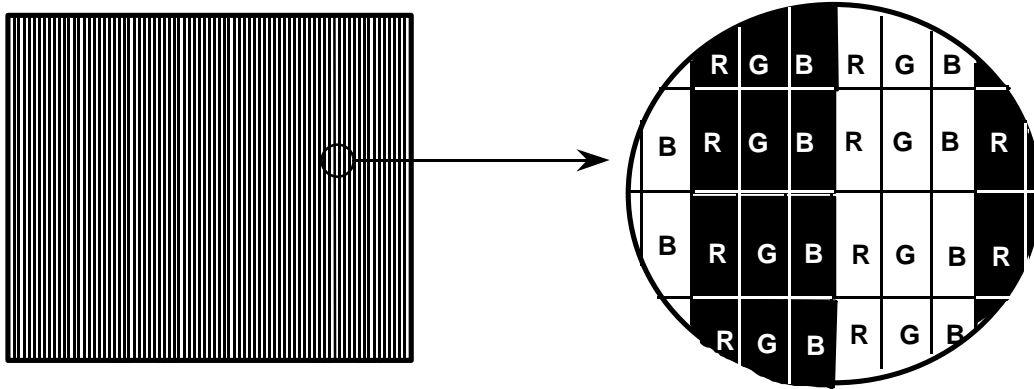


Display Brightest Gray Level →

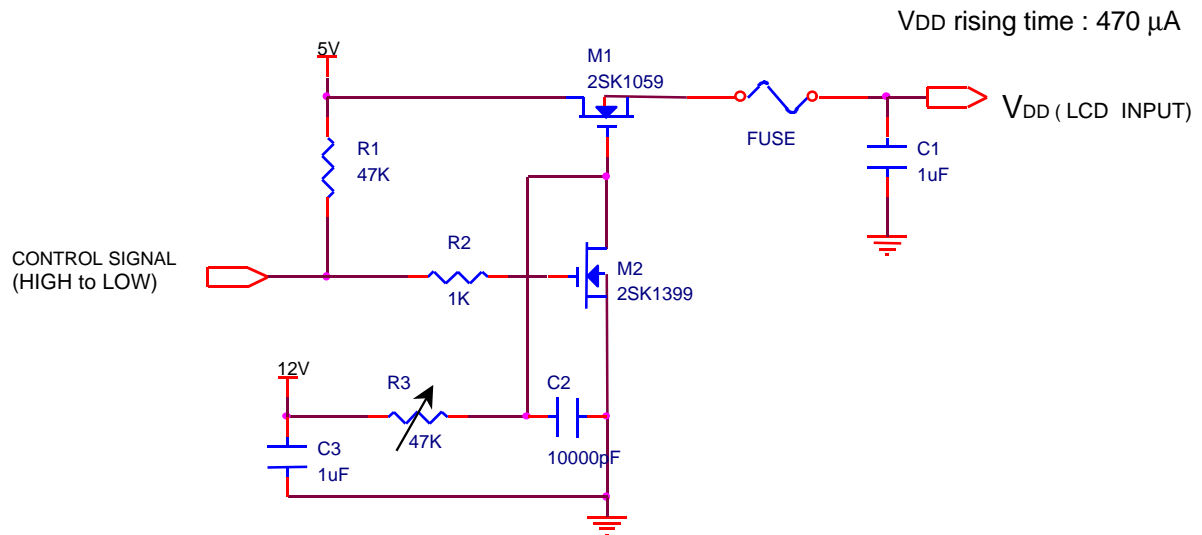
Display Darkest Gray Level →



*c) Vertical stripe pattern



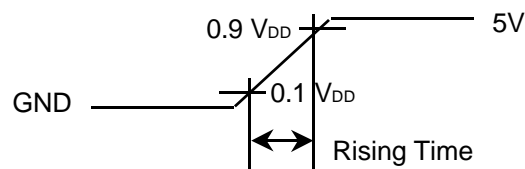
(5) Measurement Conditions



Note : Control Signal : High(+5V) -->Low(Ground)

All Signal lines to panel except for power 5V : Ground

The rising time of supplied voltage is controlled to 470us by R3 and C2 value.



3.2 BACK-LIGHT UNIT

The back-light system is an edge - lighting type with 2 dual CCFTs (Cold Cathode Fluorescent Tube). The characteristics of two dual lamps are shown in the following tables.

INVERTER : SIC-141

Ta=25 ± 0°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	I _L	4.0	11.2	11.6	mArms	(1)
Lamp Voltage	V _L	-	690	-	V _{rms}	
Frequency	f _L	40	-	60	KHz	(2)
Operating Life Time	H _r	25,000	-	-	Hour	(3)
Startup Voltage	V _s	-	-	1100 (25 °C)	V _{rms}	(4)
				1420 (0 °C)		

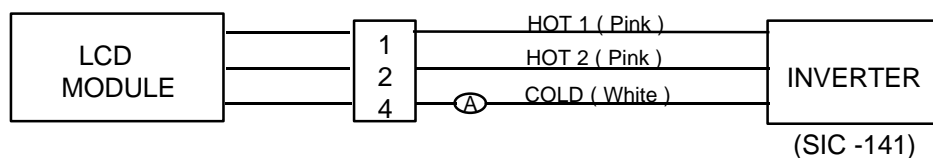
Note) The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for the modularized lamp.

The performance of the back-light, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the back-light and the inverter(miss lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note (1) ⊕ Dual lamp current is measured with current meter for high frequency as shown below.

⊕ Refer to the block diagram of the back-light unit in the next page for more information.

⊕ Specified values are for a dual lamp.



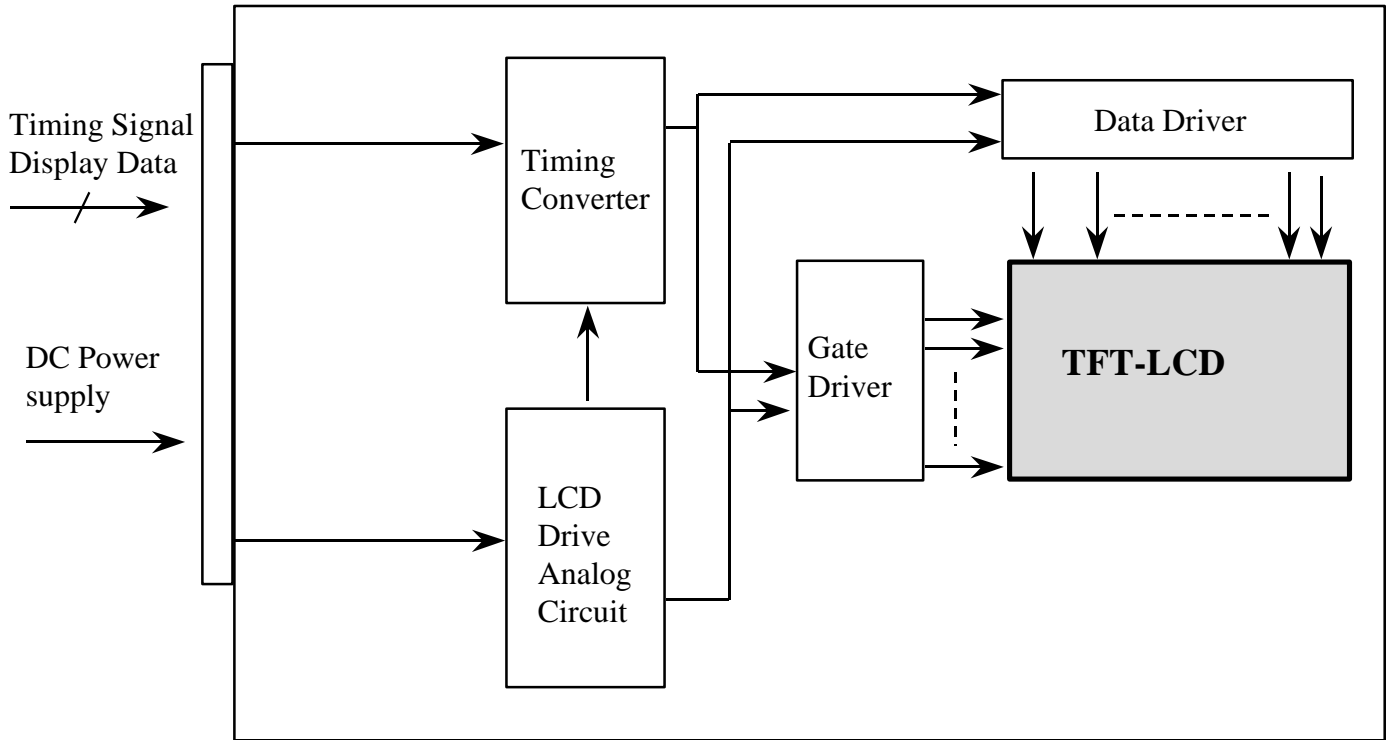
(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of Ta = 25 ± 0°C and I_L = 10 mArms until the brightness becomes 50% or lower than it's original value.

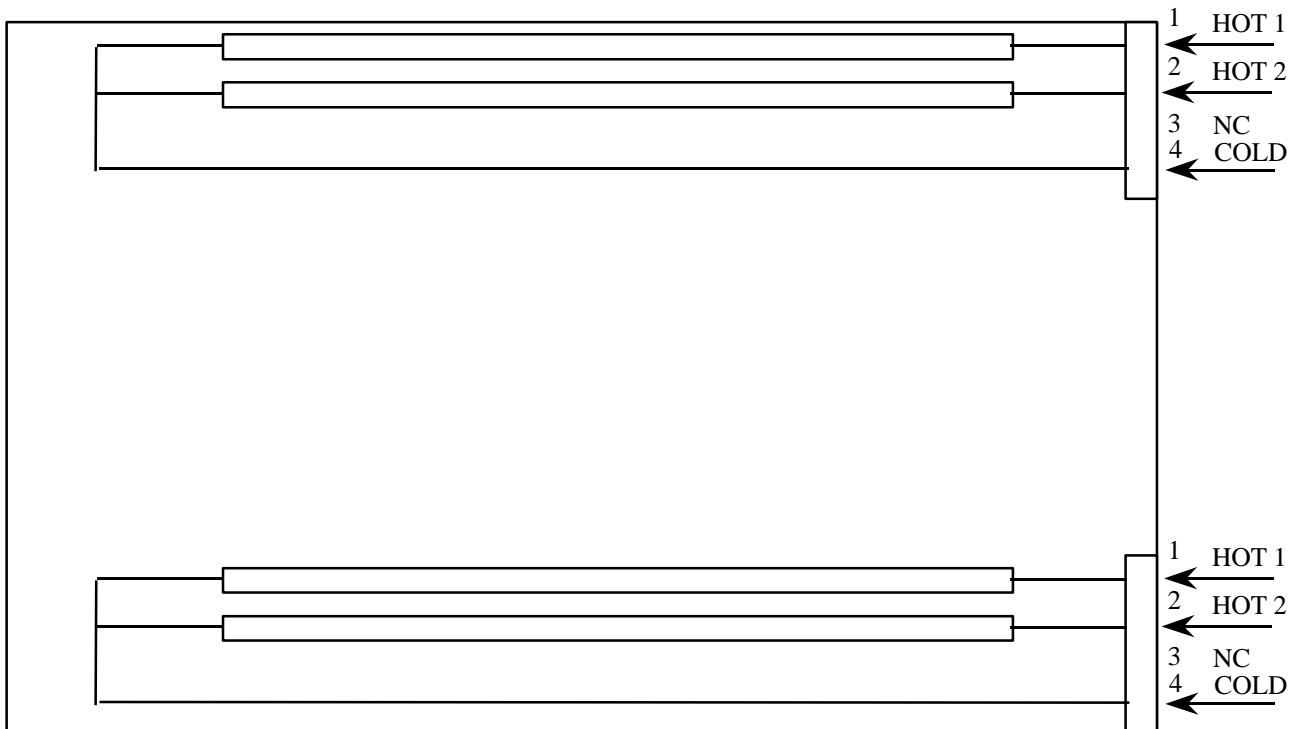
(4) The voltage above this value should be applied to the lamps for more than 1 second to startup. Otherwise the lamps may not to be turned on.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACK-LIGHT UNIT



LQ10D421

Color TFT-LCD Module for Industrial/Measuring instruments/Banking terminals

Features

- 26 cm [10.4"] VGA format
- High brightness (300 cd/m²)
- Built-in long life(25 000 h) backlight
- Wide viewing angle: L/R 120° U/D 90°

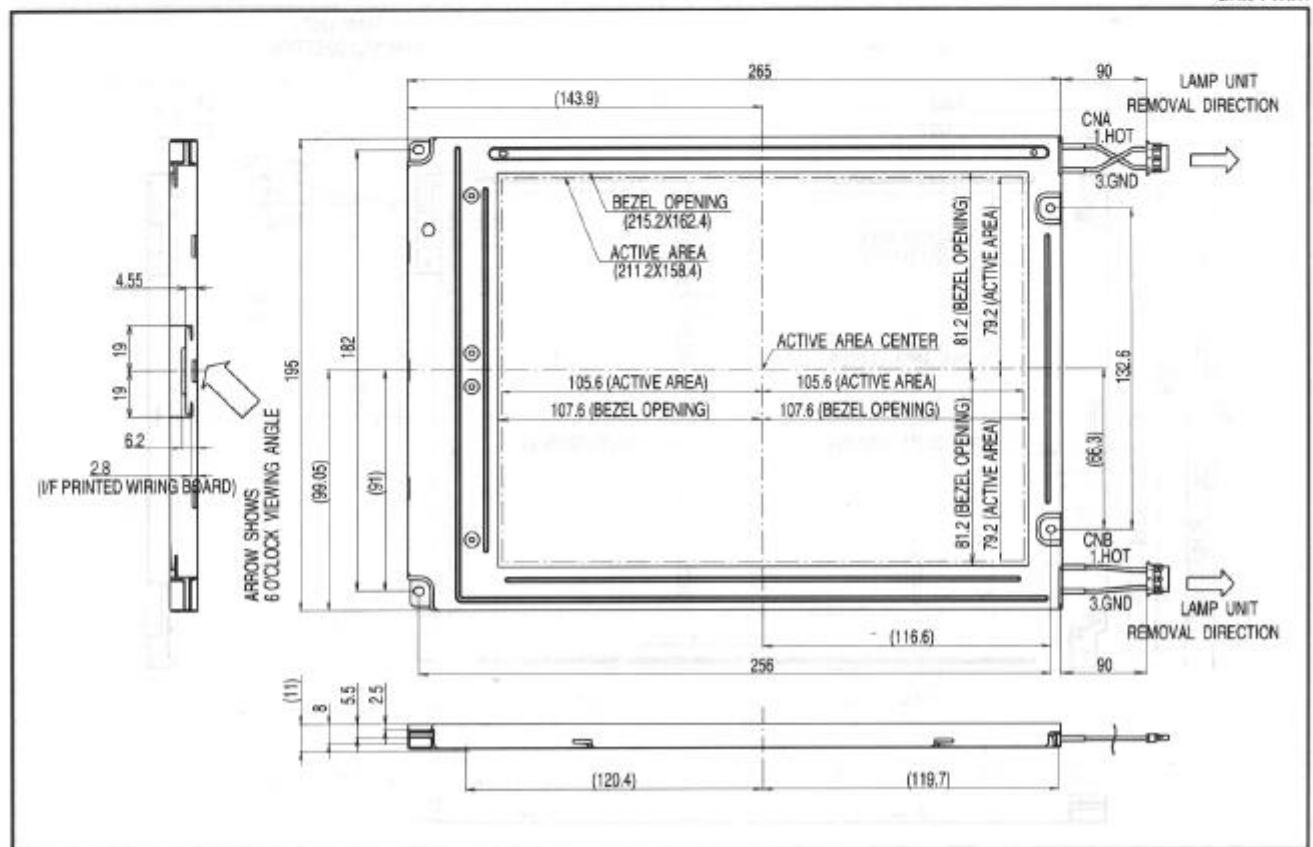
Specifications

Parameter		Unit
Display size	26 [10.4]	cm ["]
Dot format (H x V)	640 x RGB x 480	dot
Dot pitch (H x V)	0.11 x 0.33	mm
Active area (H x V)	211.2 x 158.4	mm
Color	260 000	-
Input signal	6-bit Digital RGB	-
Viewing direction	6:00	-
Backlight type	2CCFT(E)	-

Parameter		Unit
Brightness	300	cd/m ²
Contrast ratio	100 : 1	-
Power consumption panel & Backlight	7 400	mW
Outline dimensions (W x H x D)	265.0 x 195.0 x 11.0	mm
Weight	710	g
Operating temperature	0 to + 55	°C
Storage temperature	-25 to + 70	°C

Outline Dimensions

unit : mm



LQ12S41

Color TFT-LCD Module for Industrial/POS/Banking terminals

Features

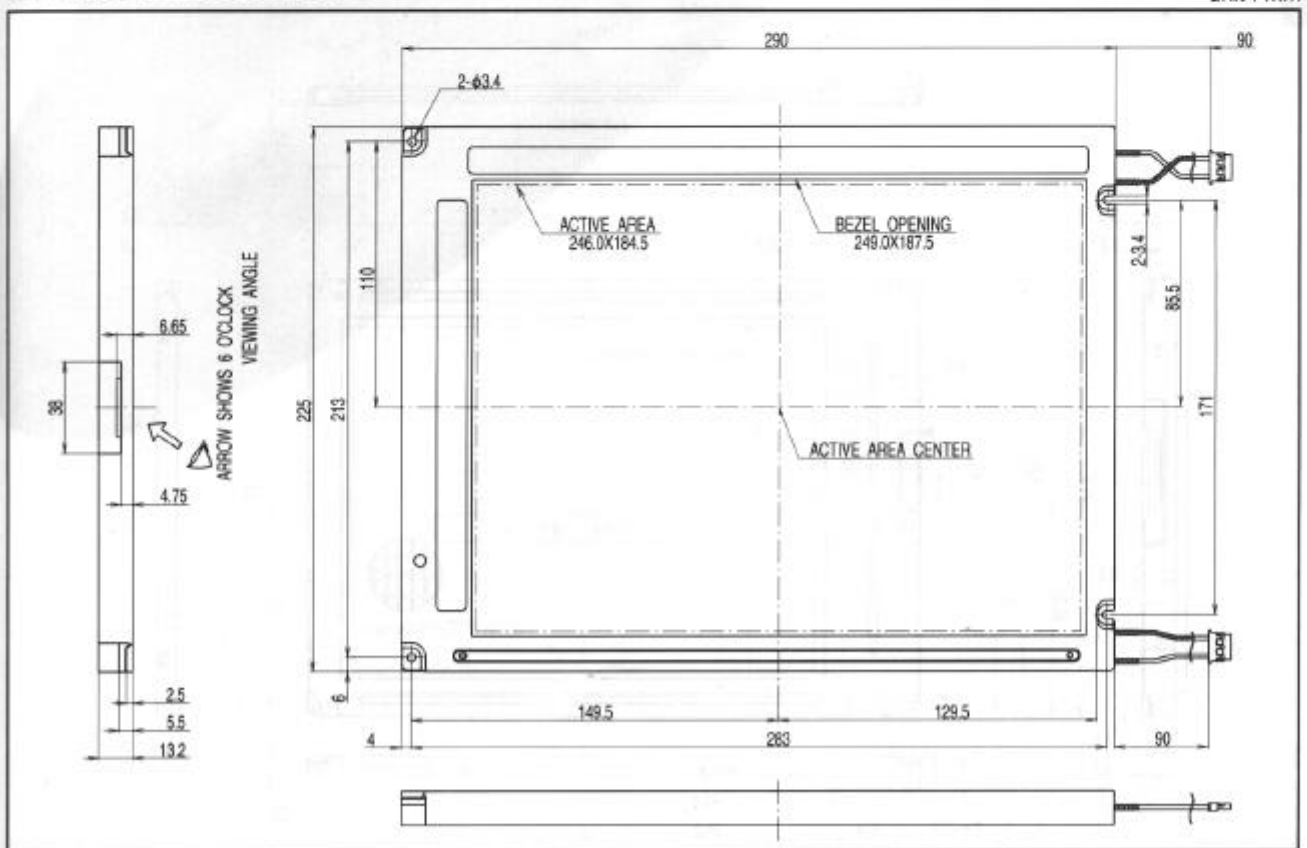
- 31cm [12.1"] SVGA format
- Built-in long life(30 000 h) backlight
- High brightness : 250 cd/m²
- Wide viewing angle: L/R 120° U/D 90°

Specifications

Parameter		Unit
Display size	31 [12.1]	cm ["]
Dot format (H x V)	800 x RGB x 600	dot
Dot pitch (H x V)	0.1025 x 0.3075	mm
Active area (H x V)	246.0 x 184.5	mm
Color	260 000	-
Input signal	6-bit Digital RGB	-
Viewing direction	6:00	-
Backlight type	2CCFT(E)	-

Parameter		Unit
Brightness	250	cd/m ²
Contrast ratio	300 : 1	-
Power consumption panel & Backlight	7 500	mW
Outline dimensions (W x H x D)	290.0 x 225.0 x 13.2	mm
Weight	990	g
Operating temperature	0 to + 50	°C
Storage temperature	-25 to + 60	°C

Outline Dimensions



Electrical Specs	
Voltage	+5,0V (±5%)
Current (typical operating)	204mA
Current (worst case)	250mA
Communication Specs	
Communication	Bi-directional, asynchronous, EIA-232-D and TTL
Baud Rate, Parity	2400 to 38400 bps. Automatic baud rate and parity detection
Protocol	XON/XOFF
Operational Specs	
Active Touch Area	208,3 x 157,5mm
Touchpoint Density	16 tps/cm ² 64 tps/cm ² interpolated
Response time	19 - 24ms
Touch Points	Simultaneous tracking of two touchpoints
Stylus Diameter	≥ 6mm, >8mm for interpolation
Touch Modes	Up to 1009 rectangular areas with individual touch modes: enter, exit, tracking, continuous, Z-Press. Up to 256 area pages
Software Drivers	MS-DOS, Windows 3.11, Windows 95/98, Windows NT 4.0, OS/2 (on request)
Diagnostics	Complete system test at power-on, cyclic beam test during operation
Environmental Specs	
Operating Temperature	0°C to +50°C
Storage Temperature	-20°C to +85°C
Humidity	90% RH @ 70°C, non-condensing
Altitude	tbd
Shock (MIL-STD-810E)	tbd
Vibration (MIL-STD-810E)	tbd
Sealing (EN 60529)	>IP65
Peak Output Wavelength	950nm, infrared
Ambient light	Unaffected
Transmissivity	Up to 100%, depending on filter screen
MTBF (@25°C)	>500.000h
MIL-HDBK-217F	
EMI	EN 50081-1,2 EN 55022, Class B
ESD	EN 50082-1,2

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Mechanical Specs	
Total size Controller & Bezel	W 262,8 x H 220,0 x D 10,3 mm
Maximum component height	2.5mm
Maximum IR-Element height	5.5mm
Weight Controller	88g
Weight Bezel (no filter screen)	82g
Bezel material	PMMA (acrylic glass)
Connectors	X1: 15-pin, Hirose DF13-15P-1.25DS X2: 10-pin, Hirose DF13-10P-1.25DS
Peripherals	1 opto-isolated PWM output for backlight dimming. 1 opto-isolated output for touch saver indication or GP use. 1 opto-isolated input for touchpoint validation or GP use.
Options	
Z-axis:	256 levels
Audio amplifier (key click):	0.5W @ 8Ohm

Connector Pinout:

X1/					
1	+5V	6	RxD_TTL	11	OC_PWM
2	+5V	7	TxD_TTL	12	+Uh
3	GND	8	RxD_RS232	13	/OC_SSAVE
4	GND	9	TxD_RS232	14	GP_IN+
5	GND	10	COM_EMIT	15	GP_IN-

X2/			
1	n.c.	6	LOUDSP1
2	n.c.	7	n.c.
3	n.c.	8	/BURN-IN
4	n.c.	9	/RESEXT
5	LOUDSP2	10	GND

Electrical Specs	
Voltage	+5,0V (±5%)
Current (dozing)	234mArms
Current (typical operating)	356mArms
Current (worst case)	396mArms
Communication Specs	
Communication	Bi-directional, asynchronous, EIA-232-D and TTL
Baud Rate, Parity	75 to 125000 bps. Automatic baud rate and parity detection
Protocol	XON/XOFF
Operational Specs	
Active Touch Area	243,8 x 182,9mm
Touchpoint Density	16 tps/cm ² 64 tps/cm ² interpolated
Response time	2,5 - 6,5ms
Touch Points	Simultaneous tracking of two touchpoints
Stylus Diameter	≥ 6mm, >8mm for interpolation
Touch Modes	Up to 1141 polygonal areas with individual touch modes: enter, exit, tracking, continuous, Z-Press. Up to 256 area pages
Software Drivers	MS-DOS, Windows 3.11, Windows 95/98, Windows NT 4.0, OS/2, Linux
Diagnostics	Complete system test at power-on, cyclic beam test during operation
Environmental Specs	
Operating Temperature	0°C to +70°C -20°C to +85°C (optional)
Storage Temperature	-20°C to +85°C
Humidity	90% RH @ 70°C, non-condensing
Altitude	Tbd
Shock (MIL-STD-810E)	Tbd
Vibration (MIL-STD-810E)	Tbd
Sealing (EN 60529)	>IP65
Peak Output Wavelength	950nm, infrared
Ambient light	Unaffected
Transmissivity	Up to 100%, depending on filter screen
MTBF (@25°C) MIL-HDBK-217F	>500.000h
EMI	EN 50081-1,2 EN 55022, Class B
ESD	EN 50082-1,2

Erstellt: GKOE	Gepruft: TTHA	Freigabe:	Datei: irtg2_specs_12i1.doc	
Datum: 98-09-09	Datum: 98-09-10	Datum:		

Mechanical Specs	
Total size Controller & Bezel	W 300,6 x H 249,0 x D 10,3 mm
Maximum component height	2.5mm
Maximum IR-Element height	5.5mm
Weight Controller	105g
Weight Bezel (no filter screen)	93g
Bezel material	PMMA (acrylic glass)
Connectors	X1: 20-pin, JAE, LZ-20P-SL-SMT X2: 5-pin, JAE, LZ-5P-SL-SMT
Peripherals	1 opto-isolated PWM output for backlight dimming. 1 opto-isolated output for touch saver indication or GP use. 1 opto-isolated input for touchpoint validation or GP use.
Options	
USB-Interface:	
Voltage internal	+3.3VDC
Current (worst case)	90mA rms
Device type	Full speed, 12Mbit/s
USB-Drivers	Windows 95 OSR2.1, Windows 98 / NT 5.0
Z-axis:	64 levels
Audio amplifier (key click):	0.5W @ 80hm

Connector Pinout:

X1/							
1	+5V	6	RxD_TTL	11	OC_PWM	16	GND
2	+5V	7	TxD_TTL	12	+Uh	17	/RESEXT
3	GND	8	RxD_RS232	13	/GP_OUT	18	/BOOT
4	GND	9	TxD_RS232	14	GP_IN+	19	LOUDSP1
5	GND	10	COM_EMIT	15	GP_IN-	20	LOUDSP2

X2/	
1	USB_GND
2	USB_DATA+
3	USB_DATA-
4	USB_VCC
5	n.c.

Electrical Specs	
Voltage	+5,0V (±5%)
Current (dozing)	275mArms
Current (typical operating)	366mArms
Current (worst case)	410mArms
Communication Specs	
Communication	Bi-directional, asynchronous, EIA-232-D and TTL
Baud Rate, Parity	75 to 125000 bps. Automatic baud rate and parity detection
Protocol	XON/XOFF
Operational Specs	
Active Touch Area	309,9 x 233,7mm
Touchpoint Density	16 tps/cm ² 64 tps/cm ² interpolated
Response time	4 - 11ms
Touch Points	Simultaneous tracking of two touchpoints
Stylus Diameter	≥ 6mm, >8mm for interpolation
Touch Modes	Up to 1141 polygonal areas with individual touch modes: enter, exit, tracking, continuous, Z-Press. Up to 256 area pages
Software Drivers	MS-DOS, Windows 3.11, Windows 95/98, Windows NT 4.0, OS/2, Linux
Diagnostics	Complete system test at power-on, cyclic beam test during operation
Environmental Specs	
Operating Temperature	0°C to +70°C -20°C to +85°C (optional)
Storage Temperature	-20°C to +85°C
Humidity	90% RH @ 70°C, non-condensing
Altitude	Tbd
Shock (MIL-STD-810E)	Tbd
Vibration (MIL-STD-810E)	Tbd
Sealing (EN 60529)	>IP65
Peak Output Wavelength	950nm, infrared
Ambient light	Unaffected
Transmissivity	Up to 100%, depending on filter screen
MTBF (@25°C) MIL-HDBK-217F	>500.000h
EMI	EN 50081-1,2 EN 55022, Class B
ESD	EN 50082-1,2

Erstellt: GKOE	Geprüft: TTHA	Freigabe:	Datei: irtg2_specs_15i1.doc	
Datum: 98-09-09	Datum: 98-09-10	Datum:		

Mechanical Specs	
Total size Controller & Bezel	W 361,8 x H 295,0 x D 10,3 mm
Maximum component height	2.5mm
Maximum IR-Element height	5.5mm
Weight Controller	132g
Weight Bezel (no filter screen)	117g
Bezel material	PMMA (acrylic glass)
Connectors	X1: 20-pin, JAE, LZ-20P-SL-SMT X2: 5-pin, JAE, LZ-5P-SL-SMT
Peripherals	1 opto-isolated PWM output for backlight dimming. 1 opto-isolated output for touch saver indication or GP use. 1 opto-isolated input for touchpoint validation or GP use.
Options	
USB-Interface:	
Voltage internal	+3.3VDC
Current (worst case)	90mA rms
Device type	Full speed, 12Mbit/s
USB-Drivers	Windows 95 OSR2.1, Windows 98 / NT 5.0
Z-axis:	64 levels
Audio amplifier (key click):	0.5W @ 80hm

Connector Pinout:

X1/							
1	+5V	6	RxD_TTL	11	OC_PWM	16	GND
2	+5V	7	TxD_TTL	12	+Uh	17	/RESEXT
3	GND	8	RxD_RS232	13	/GP_OUT	18	/BOOT
4	GND	9	TxD_RS232	14	GP_IN+	19	LOUDSP1
5	GND	10	COM_EMIT	15	GP_IN-	20	LOUDSP2

X2/	
1	USB_GND
2	USB_DATA+
3	USB_DATA-
4	USB_VCC
5	n.c.

TouchTek 5

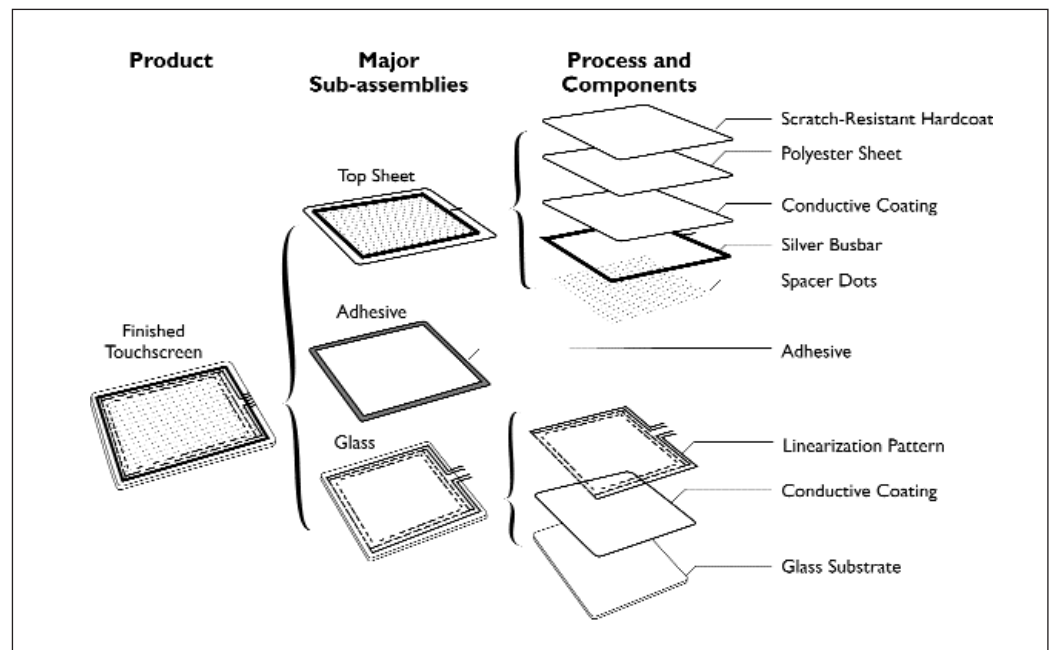
5-WIRE ANALOG RESISTIVE TOUCHSCREENS

TouchTek[®]5, MicroTouch Systems' 5-wire touchscreen, offers the highest level of durability of any resistive touchscreen. TouchTek5 is constructed of a hard-coated polyester topsheet that is overlaid on a conductively-coated glass layer. Voltage is applied to the topsheet. As the user touches the screen, the topsheet compresses into contact with the glass layer, and current flows to the four corners in proportion to the distance from the edge. The TouchTek5 controller then calculates the position of the finger or stylus, based on the current flows.

Because 5-wire technology derives both the "X" and "Y" touch coordinates from the stable glass layer, the accuracy and operation of TouchTek5 is unaffected by damage to the topsheet caused by extended use or neglect.



TouchTek5 Touchscreen



TouchTek5 Resistive Technology Components

TouchTek5 Technical Specifications

OPTICAL¹

Topsheet Finish	Transmissivity ²		Gloss ³	Haze	Clarity
	Flat	Curved			
Ideal ⁴	78%	70%	108.0	10.3	78.1
Industrial ⁵	78%	70%	83.9	11.5	59.2
Polished ⁶	78%	70%	189.0	1.76	99.7

¹ These are typical values, but can change based on customer design.

² Representative values at 550 nm

³ Gloss measured at 60° angle

⁴ Very good optical resolution; superior anti-glare properties

⁵ Lowest optical resolution; greatest anti-glare properties

⁶ Highest optical resolution; no anti-glare properties

TouchTek5 Technical Specifications

ELECTRICAL

ITO Topsheet Resistance

Within One Screen

All values in any 12"x12" square must be within 10% of the average value in that square

Variation Sensor-to-Sensor

325 to 500 ohms/sq.

ITO Glass Resistance

Within One Screen

All values in any 12"x12" square must be within 10% of the average value in that square

Variation Sensor-to-Sensor

400 to 600 ohms/sq.

Glass Conductive Uniformity

≤ 1% defined by $\left[\frac{\text{max} - \text{min}}{2 \times \text{average}} \right] \times \frac{100}{\text{diagonal}}$

Linearity

Greater than 99% (less than 1% accuracy error) when used in conjunction with a MicroTouch controller and NovRAM cable.

MECHANICAL

Input Method

Finger

Switch Travel

Nominally 0.0035" (0.0889 mm)

Touch Activation Force

Less than 127 grams / 5 ounces

Surface Hardness

Scratch hardness 3H, per ASTM 3363-92A

Abrasion Resistance

Taber Abrasion Test showed less than 5% change in haze values. Abrasion was created in a circular motion with a 500 gram weight on Taber abrasion wheel, per ASTM 1044-90.

Tail Bending Resistance

Do not bend to less than 1/8" radius

Tail Thickness

Nominally 4 mils

Cable Harness Strength

Flat Sensors

The heat sealed flexible printed cable can withstand a pull of 8 pounds when pulled at a 90° angle.

Curved Sensors

The soldered flat cable harness can withstand a pull of 10 pounds when pulled at a 90° angle.

Nominal Sensor Thickness

<i>Base Glass Thickness</i>	<i>Nominal Sensor Thickness</i>
0.043" (1.1mm)	0.054" ±0.01" (1.37mm ±0.25mm)
0.063" (1.6mm)	0.074" ±0.01" (1.88mm ±0.25mm)
0.079" (2.0mm)	0.09" ±0.01" (2.28mm ±0.25mm)
0.125" (3.175mm)	0.136" ±0.01" (3.45mm ±0.25mm)

RELIABILITY

Operating Environment

0°C to 50°C (in accordance with Method 501.1 and 502.1 of MIL-STD-810C)

Storage Temperature

-40°C to 71°C (MIL-STD-810C Method 501.1)

Temperature Cycle Test

Ramped to -40°C at a rate of 1-2°C per minute hold for 23 hours. Ramped to 71°C at 1-2°C per minute hold for 23 hours. Repeat cycle 4 times for a total of ten days. (MTS-5808339, rev 1.1)

Humidity Resistance

+35°C, 90%RH (in accordance with paragraph 3.3 and 4.5 of MTS-5808339, rev.1.1)

Finger Touch Durability

Greater than 35 million touches in a single location

Tapping Test

Finger like stylus - durometer 60, "A" shore hardness, 0.5" diameter load 4.9 ± 0.1 ounces

(Repeated tapping at a single point on the touch panel 35,000,000 times at a rate of 4 times per second).

Sealing Test

No evidence of water penetration in accordance with NEMA 250-1991, paragraph 6.

Steel Ball Test

No evidence of possible penetration into the enclosure in accordance with paragraph 4.4.4 or UL 1950 specification

TouchTek5 Test Measurements

Liquids Test

Touchscreens are exposed to various environments where chemicals, household cleaners, or industrial cleaners come in contact with the screen. A typical MicroTouch resistive product is constructed using a glass substrate and a polyester topsheet. The .007" thick polyester has a hardcoat material on the touch surface which resists scratches and can be configured with a polished or anti-glare finish. The liquids test measures the resistance of TouchTek5 to a variety of chemicals.

Test Objective. The silicone-based hardcoat has been tested to resist the following chemicals.

Test Goal. To document which chemicals are compatible with and which chemicals are abusive to the polyester topsheet.

Test Method. The polyester was initially tested by immersing a portion of the film in a specific chemical for a designated amount of time. This method is not entirely satisfactory for long test durations with volatile solvents due to the difficulty of preventing solvent evaporation. The supplier's method therefore involves an initial screening by total immersion, followed by re-testing any reagents giving failure. The secondary test is a spot test, where a drop of the reagent is applied to the center of the polyester which is then covered by a paper tissue and a watch glass. Results are entirely compatible with those achieved by strict adherence to the DIN 42 115 Part 2 method.

Test 1

The polyester film will withstand 24-hour exposure to the following reagents at 50° C without visible staining:

Top Job	Jet Dry	Gumption	Fantastic	Formula 409	Mustard
Grape Juice	Milk	Ariel	Persil	Wish Lenor	Downey
Ajax	Vim	Domestos	Vortex	Windex	

Test 2

The polyester film has been found to withstand exposure for a period longer than 24 hours to the following chemicals, without visible changes:

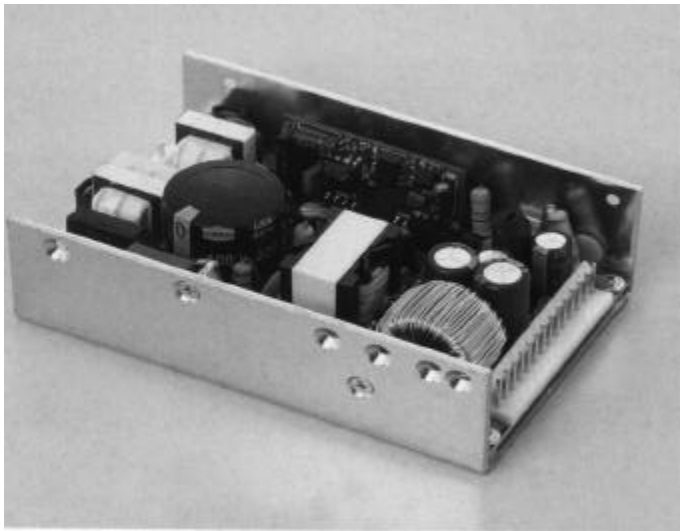
1.1.1. Trichloroethane

Acetaldehyde	Dioxan	Paraffin oil
Acetic acid <50%	Ethanol (Ethyl Alcohol)	Perchloroethylene
Acetone	Ethylacetate	Petrol (Gasoline)
Aliphatic hydrocarbons (Kerosene, Hexane, VMP Naptha)	Fabric conditioner	Phosphoric acid <30%
Alkalicarbonate	Fluorochlorohydrocarbons	Plurchloroethylene
Ammonia <2%	Formic acid <50%	Potassium ferrocyanide/ femcyanide
Benzene	Glycerine	Potassium carbonate
Bichromate	Glycol (Ethyl Glycol)	Silicone oil
Blown castor oil	Hydrochloric acid <10%	Sodium hypochlotrite <20%
Caustic soda <2%	Hydrogen peroxide <25%	Toluene (Toluol)
Cutting oil	Isopropanol	Trichloroethylene
Cyclohexanol	Linseed oil	Turpentine spirits
Diesel oil	Methanol	Washing powders
Dietryl ether	Methyl ethyl ketone (MEK)	Xylene
	Mineral spirits	
	Nitric acid <10%	

Test 3

The polyester film is not resistant to the following chemicals:

Concentrated miner acids	Methylene chloride
Concentrated caustic solution	Benzyl alcohol



KEY FEATURES

- *Universal input
- *Built-in EMI filter
- *Optional Power Factor Corrector (PFC)
- *Optional remote sense on main output
- *Optional constant current charger
- *Optional +12VDC/+24VDC/+48VDC input
- *Optional cover

APPLICATIONS

- *Telecommunications/Business machines
- *Computer peripherals/Medical instruments
- *Test & industrial equipments

ELECTRICAL SPECIFICATIONS

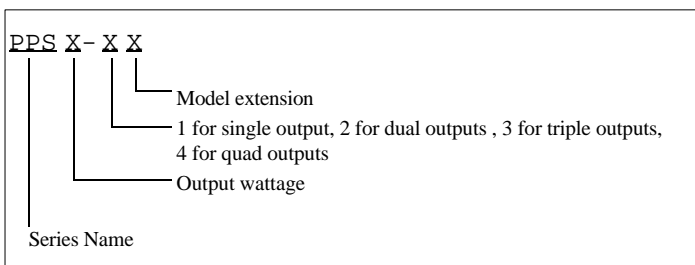
INPUT

- *Input range-----90~264 VAC
- *Frequency-----47~63Hz
- *Inrush current-----38A Max. Cold start @25⁰C
- *Efficiency-----75% typical at full load
- *EMI filter-----FCC Class B conducted, CISPR 22
Class B conducted, EN55022 class B
Conducted
- *Line regulation----- +/- 0.5%

OUTPUT

- *Maximum power----90W convection
- *Hold-up time -----10ms at full load and 115 VAC
nominal line
- *Overload protection-Short circuit protection
- *Overvoltage
protection -----Main output 20% to 40% above
nominal output
- *Ripple/Noise ----- +/- 1% Max. @full load
(Optional +/-0.5 % per inquiry)

ORDERING INFORMATION



EMI & EMC

- *FCC part 15, Class B
- *CISPR 22 / EN55022, Class B
- *VCCI ,Class 2
- *CE

SAFETY APPROVAL

- *UL1950 / c UL
- *Optional CSA 22.2, LEVEL 3
- *TUV EN60950
- *Optional UL 2601

ENVIRONMENTAL

- *Operating temperature :
0 to 50⁰C ambient; derate each output at 2.5% per
degree from 50⁰C to 70⁰C
- *Electromagnetic susceptibility:
Designed to meet IEC 801-2,-3,-4,-5,Level 3
- *Humidity:
Operating; non-condensing, 5% to 95%
- *Vibration :
10~55 Hz at 1G 3 minutes period, 30 minutes along
X, Y and Z axis
- *Storage temperature:
-40 to 85⁰C
- *Temperature coefficient:
+/- 0.05% per degree C
- *MTBF demonstrated:
>100,000 hours at full load and 25⁰C ambient
conditions

OUTPUT SPECIFICATION

PPS100-1X

MODEL	OUTPUT CURRENT (A)								
	5V	12V	15V	24V	48V	13.5V	56V	3.3V	18V
PPS100-10	18								
PPS100-11		7.5							
PPS100-12			6						
PPS100-13				3.8					
PPS100-14					1.9				
PPS100-15						6.6			
PPS100-16							1.6		
PPS100-17									5
PPS100-18								25	

PPS100-3X

MODEL	OUTPUT CURRENT (A)								
	5V	12V	-5V	-12V	15V	-15V	24V	48V	3.3V
PPS100-30	10	4	0.6						
PPS100-31	10	4		0.6					
PPS100-32	10				2.8	0.6			
PPS100-33	14		0.5		2				
PPS100-34	13			0.6	2				
PPS100-35	9			0.6			2		
PPS100-36	9	3.5		0.6					
PPS100-37	9	3.5					0.6		

PPS100-2X

MODEL	OUTPUT CURRENT (A)								
	5V	12V	-5V	-12V	15V	-15V	24V	48V	3.3V
PPS100-20	10	4.2							
PPS100-21	10						2.2		
PPS100-22	10		10						
PPS100-23		4.2		4.2					
PPS100-24					3.4	3.4			
PPS100-25		1							17
PPS100-26	1							2	

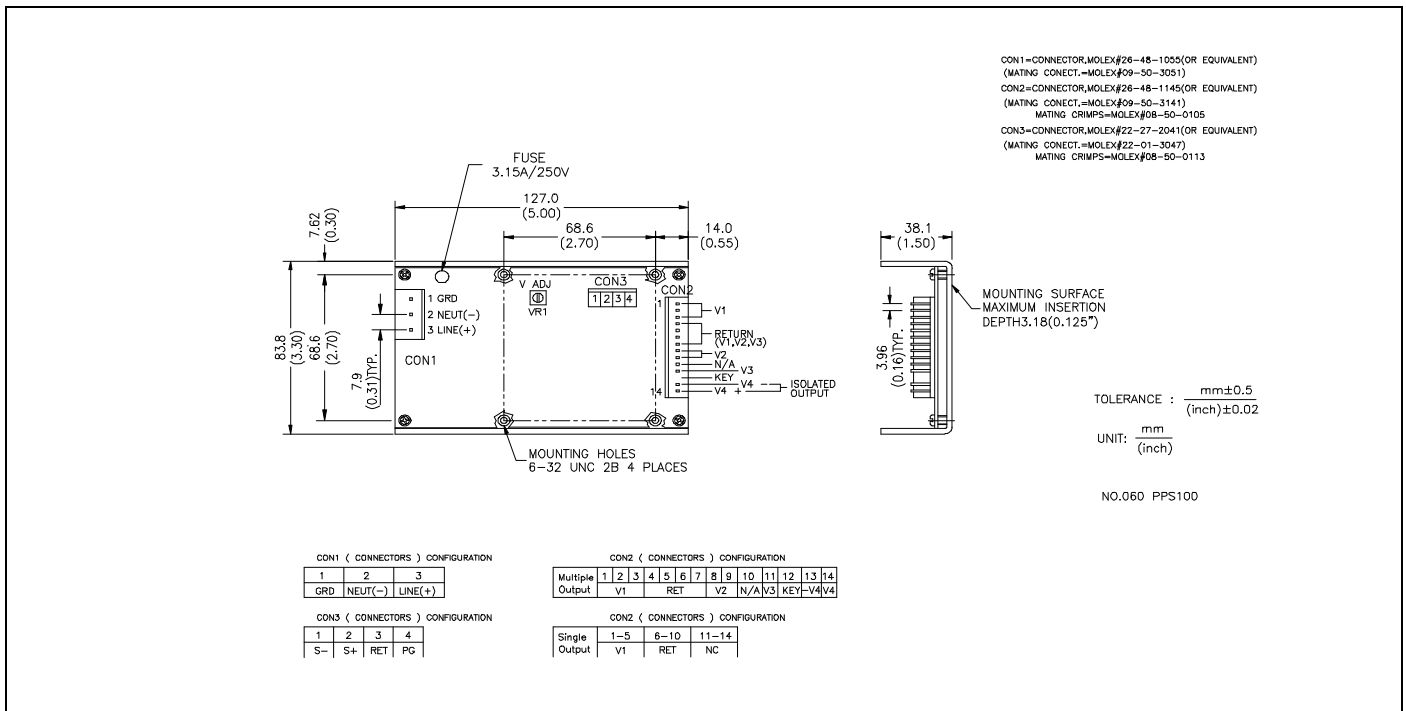
PPS100-4X

MODEL	OUTPUT CURRENT (A)								
	5V	12V	-5V	-12V	15V	-15V	24V	48V	3.3V
PPS100-40	10	3.5	0.5	0.5					
PPS100-41	10	3	1	1					
PPS100-42	10	2			1	1			
PPS100-43	6	2.5		1		1			
PPS100-44	6	1		1				1	
PPS100-45	6	2		1			1.5		

NOTES

- *120% Peak current lasting <30 seconds with a maximum 10% duty cycle.
- *Detailed engineering specification of each model is available for inquiry.
- *Special output voltage /current inquiry is welcomed.
- *Specifications subject to change without notice.
- *25% derated if it is with a cover.
- *25% derated if 24VDC input version; 50% derated if 12 VDC input version.

MECHANICAL DRAWING





VI-J00

MiniMod

DC-DC Converters

25 to 100 Watts

Features

- Up to 50W/Cubic Inch
- UL, CSA, TÜV, BSI, VDE, BABT
- CE Marked
- 80-90% Efficiency
- Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7)
- Remote Sense and Current Limit
- Logic Disable
- Wide Range Output Adjust
- ZCS Power Architecture
- Low Noise FM Control

Product Highlights

The VI-J00 MiniMod family establishes a new standard in component-level DC-DC converters. This "junior" size complement to the higher power VI-200 family offers up to 100 Watts of isolated and regulated power in a board mounted package. At one-half the size and twice the power density of previous 100W modules, and with a maximum operating temperature rating of 100°C, the MiniMod opens new horizons for board-mounted (distributed) power architectures.

Utilizing Vicor's "zero-current-switching" forward converter technology, proven by an installed base of over 8 million units, the MiniMod family combines state of the art power density with the efficiency, low noise and reliability required by next generation power systems.

Packaging Options

SlimMods™, high power density, flangeless packages and FinMods™, featuring integral finned heatsinks.

SlimMod: Option suffix: - S

Example: VI - JXX - XX - S

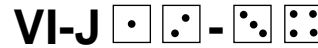
FinMod: Option suffix: - F1 and - F2

Examples:

VI - JXX - XX - F1, 0.75" height

VI - JXX - XX - F2, 1.00" height

Converter Selection Chart



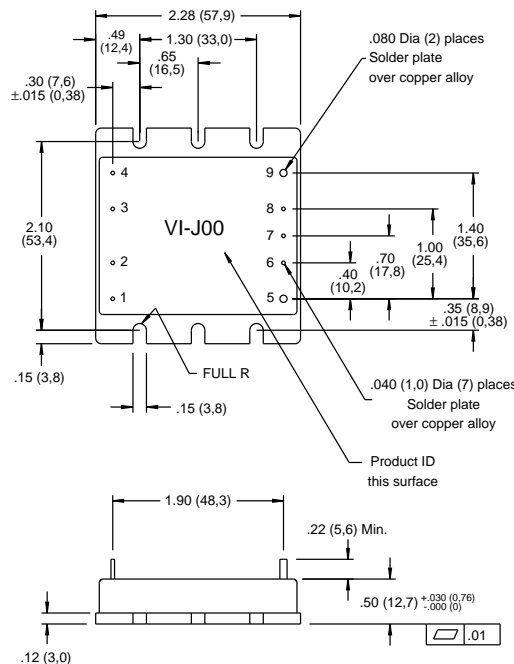
Input Voltage				Output Voltage			
Nominal	Range	Brownout/Transient*		Z	Y	0	M
0 = 12V	10 - 20V(1)	n/a	22V	= 2V	= 3.3V	= 5V	= 10V
1 = 24V	21 - 32V(2)	18V	36V	1 = 12V	2 = 15V	3 = 24V	L = 28V
W = 24V	18 - 36V(2)	n/a	n/a	4 = 48V	1 to 95V, consult factory.		
2 = 36V	21 - 56V(1)	18V	60V				
3 = 48V	42 - 60V(2)	36V	72V				
N = 48V	36 - 76V(2)	n/a	n/a				
4 = 72V	55 - 100V(4)	45V	110V				
T = 110V	66 - 160V(2)	n/a	n/a				
5 = 150V	100 - 200V(2)	85V	215V				
6 = 300V	200 - 400V(3)	170V	425V				
7 = 150/300V	100 - 375V(1)	90V	n/a				

Product Grade/Operating Temp.		Product Grade/Storage Temp.		Output Power/Current			
E	-10°C to +100°C	E	-20°C to +105°C	V _{OUT} ≥ 5V		V _{OUT} < 5V	
C	-25°C to +100°C	C	-40°C to +105°C	Z = 25W	Y = 50W	Z = 5A	Y = 10A
I	-40°C to +100°C	I	-55°C to +105°C	X = 75W	W = 100W	X = 15A	W = 20A
M	-55°C to +100°C	M	-65°C to +105°C				

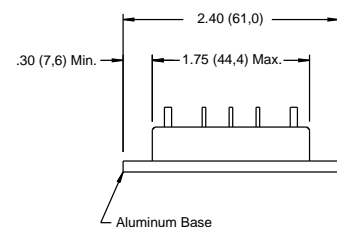
Max. Output For	5V Outputs	> 5V Outputs	< 5V Outputs	Max. Output For	5V Outputs	> 5V Outputs	< 5V Outputs
(1)	50W	50W	10A	(3)	100W	100W	20A
(2)	75W	100W	20A	(4)	75W	75W	15A

*Brownout 75% of rated load; transient voltage for 1 second.

Mechanical Drawing



Pin #	Function
1	+In
2	Gate In
3	Gate Out
4	-In
5	+Out
6	+Sense
7	Trim
8	-Sense
9	-Out



Converter Specifications

(typical at $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	VI-J00 E-Grade			VI-J00 C-, I-, M-Grade			UNITS	TEST CONDITIONS
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
■ Input Characteristics								
Inrush charge		60×10^{-6}		60×10^{-6}	100×10^{-6}		Coulombs	Nominal line
Input reflected ripple current – pp		10%		10%			I_{IN}	Nominal line, full load
Input ripple rejection		$25 + 20 \log\left(\frac{V_{in}}{V_{out}}\right)$		$30 + 20 \log\left(\frac{V_{in}}{V_{out}}\right)$			dB	120 Hz, nominal line
					$20 + 20 \log\left(\frac{V_{in}}{V_{out}}\right)$			2400 Hz, nominal line
No load power dissipation		1.35	2	1.35	2		Watts	
■ Output Characteristics								
Setpoint accuracy		1.0%	2.0%	0.5%	1.0%		V_{NOM}	
Load/line regulation			0.5%	0.05%	0.2%		V_{NOM}	LL to HL, 10% to Full Load
Load/line regulation			1.0%	0.2%	0.5%		V_{NOM}	LL to HL, No Load to 10%
Output temperature drift		0.02		0.01	0.02		$\%/^{\circ}\text{C}$	Over rated temperature
Long term drift		0.02		0.02			$\%/1\text{K hours}$	
Output ripple - pp:								
2V, 3.3V		200		100	150		mV	20 MHz bandwidth
5V		5%		2%	3%			20 MHz bandwidth
10-48V		3%		0.75%	1.5%			20 MHz bandwidth
Trim range ¹	50%		110%	50%		110%	V_{NOM}	
Total remote sense compensation		0.5		0.5			Volts	0.25V max. neg. leg
Current limit	105%		135%	105%		125%	I_{NOM}	Automatic restart
Short circuit current	105%		140%	105%		130%	I_{NOM}	
■ Control Pin Characteristics								
Gate out impedance		50		50			Ohms	
Gate in impedance		10^3		10^3			Ohms	
Gate in high threshold		6				6	Volts	Use open collector
Gate in low threshold	0.65			0.65			Volts	
Gate in low current			6			6	mA	
■ Isolation Characteristics								
Isolation (input to output)	3,000						V_{RMS}	Baseplate earthed
Isolation (output to baseplate)	500						V_{RMS}	
Isolation (input to baseplate)	1,500						V_{RMS}	
■ Thermal Characteristics								
Efficiency		78-88%		80-90%				
Baseplate to sink		0.4		0.4			$^{\circ}\text{C/Watt}$	With Vicor P/N 04308
■ Mechanical Specifications								
Weight		3.0 (85)		3.0 (85)			Ounces (Grams)	

¹110V, 12V and 15V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

For product compliance with agency standards please refer to pages 44 - 46.



Travelstar 4GN

DKLA-22160, DKLA-23240, and DKLA-24320

The latest 2.5" disk drives from IBM provide up to 4320MB in a slim 9.5mm high package. Using the latest GMR head technology, IBM's patented No-ID sector formatting, the SMART function, advanced power saving modes, and IBM's new Load/Unload heads' technology, IBM provides high performance, high capacity drives, particularly suited to the mobile computing market and its increasing application of multimedia.



Applications

- M High performance portable computers
- M Non-IT - process control/fax
- M Removable/secure storage units.

Features

Benefits

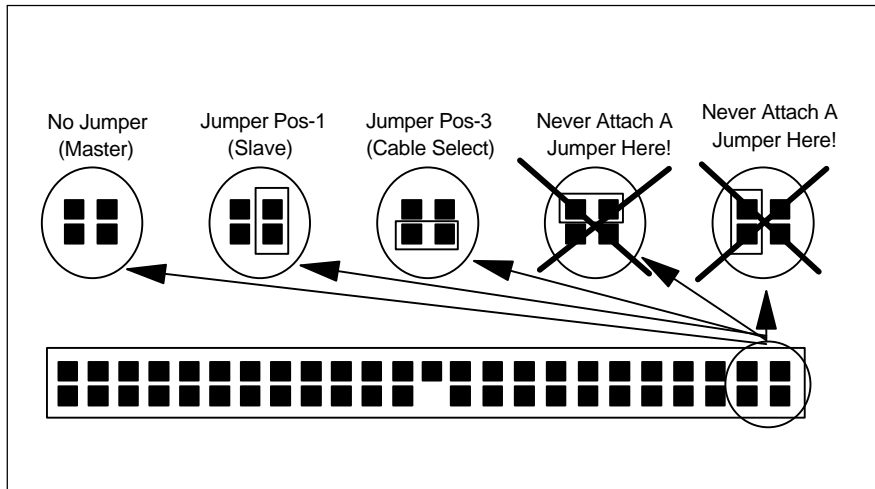
M 2160/3240/4320MB at (512 bytes/sector)	M High capacity in slim 2.5 inch form factor
M Enhanced IDE interface with Ultra-DMA data transfer	M Popular interface with excellent performance
M Single word:mode 2 (8.3MB/sec)	
M Multi word:mode 2(33.3MB/sec)	
M PIO data transfer - mode 4(16.6MB/sec)	
M Shock 700G(1ms) non-operational	M Robust design for portable computing applications
M Shock 150G(2ms) operational	
M Media data rate 61.5 - 102.6 Mbits/s	M Excellent data rate across disk surface
M Rotational speed 4200 rpm	
M Average seek 13 milliseconds (Read)	
M Giant Magneto resistive heads	M High areal density, low component count
M No-ID sector formatting	M More data stored per track, increased sustained data transfer rate
M PRML Data channel	
M 463KB segmented buffer with write cache	M Fast access to data and improved throughput
M Enhanced ECC on the fly	M High reliability
M Advanced power saving modes	M Low power for battery powered applications (0.65 watt at idle state)
M Load/unload heads	M Increased durability during power save modes and non-operation
M Spin up 2.8 sec (typical)	M Fast recovery from standby
M S.M.A.R.T. function	M Protection of user data

Electrical Connector Locations

Drive Address

Jumper positions are available at the interface connector to determine the drive address.

Using Cable Selection, the drive address depends on the condition of pin 28 of the AT interface cable. In the case when pin 28 is ground or low level, the drive is a Master. If pin 28 is open or high level, the drive is a Slave.

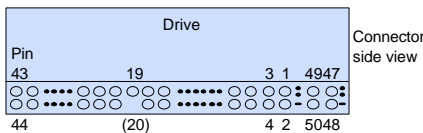


Cabling

The maximum cable length from the host system to the HDD plus circuit pattern in the host system shall not exceed 18 inches.

AT Signal Connector

The AT signal connector is designed to mate with Dupont part number 69764- 044 or equivalent.



Note:

Pin position 20 is left blank for secure connector insertion.

Warning: This disk drive can be damaged by Electrostatic Discharge, please follow recommended ESD procedures when unpacking or handling the drive. Ask your dealer for details if you need assistance.



Data Organization (Logical)

DKLA	22160	23240	24320
Head Number	16	16	15
Sectors/Track	63	63	63
Cylinder Number	4200	6304	8944
Sector Size	512	512	512
Total Customer Usable Data Sectors	4233600	6354432	8452080
Total Customer Usable Data Bytes	2167603200	3253469184	4327464960

DC Power Requirements

Nominal Supply	+ 5 volts
Power Supply Ripple (0-20Mhz) ¹	100mv p-p max
Tolerance ²	± 5%
Supply Current	Pop.Mean (Nominal Condition)
Low Power Idle ³	< 0.13A RMS Max (0.65W)
Active Idle	<0.17A RMS Max (0.85W)
Performance Idle	< 0.37A RMS Max (1.85W)
Read average ⁴	<0.40A RMS Max (2.0W)
Write average ⁴	< 0.42A RMS Max (2.1W)
Seek average ⁵	< 0.46A RMS Max (2.3W)
Standby	< 0.06A RMS Max (0.3W)
Sleep	< 0.02A RMS Max (0.1W)
Start up (max.) ⁶ (average from power on to ready) ⁶	< 0.94A RMS Max (4.7W) < 0.66A RMS Max (3.3W)
Supply Rise Time	7 -100 ms

Notes:

- ¹ The maximum supply ripple is measured at 5V input of the drive.
- ² The disk drive shall not incur damage for an over voltage condition of +25% (maximum duration of 20 ms) on the 5-volt nominal supply.
- ³ The Idle current is specified at an inner track.
- ⁴ The read/write current is specified based on three operations of 63 sector read/write per 100 msec.
- ⁵ The seek average current is specified based on three operations per 100 msec.
- ⁶ The worst case operating current includes motor surge.



PACKAGING: The drive must be protected against Electrostatic Discharge especially when being handled. The safest way to avoid damage is to put the drive in an anti static bag before ESD wrist straps etc. are removed.

Drives should only be shipped in approved containers, severe damage can be caused to the drive if the packaging does not adequately protect against the shock levels induced when a box is dropped. Consult your IBM marketing representative if you do not have an approved shipping container.

Command Description

The following Commands are supported by the Drive:

Commands	(Hex)	P
Check Power Mode	(E5)	3
Check Power Mode*	(98)	3
Execute Device Diagnostics	(90)	3
Flush Cache	(E7)	3
Format Track	(50)	2
Format Unit	(F7)	3+
Identify Device	(EC)	1
Identify Device DMA	(EE)	4
Idle	(E3)	3
Idle*	(97)	3
Idle Immediate	(E1)	3
Idle Immediate*	(95)	3
Initialise Drive Parameters	(91)	3
Read Buffer	(E4)	1
Read DMA (retry)	(C8)	4
Read DMA (no retry)	(C9)	4
Read Long (retry)	(22)	1
Read Long (no retry)	(23)	1
Read Multiple	(C4)	1
Read Native Max LBA/CYL	(F8)	3
Read Sectors (retry)	(20)	1
Read Sectors (no retry)	(21)	1
Read Verify Sectors (retry)	(40)	3
Read Verify Sectors (no retry)	(41)	3
Recalibrate	(1X)	3
Security Disable Password	(F6)	2
Security Erase Prepare	(F3)	3
Security Erase Unit	(F4)	2
Security Freeze Lock	(F5)	3
Security Set Password	(F1)	2
Security Unlock	(F2)	2
Seek	(7X)	3
Set Features	(EF)	3
Set Max LBA/CYL	(F9)	3+

Set Multiple Mode	(C6)	3
Sleep	(E6)	3
Sleep*	(99)	3
SMART Disable Operations	(B0)	3
SMART Enable/Disable Attribute Autosave	(B0)	3
SMART Enable Operations	(B0)	3
SMART Execute Off-Line Immediate	(B0)	3
SMART Read Attribute Values	(B0)	1
SMART Read Attribute Thresholds	(B0)	1
SMART Return Status	(B0)	3
SMART Save Attribute Values	(B0)	3
Standby	(E2)	3
Standby*	(96)	3
Standby Immediate	(EO)	3
Standby Immediate*	(94)	3
Write Buffer	(E8)	2
Write DMA (retry)	(CA)	4
Write DMA (no retry)	(CB)	4
Write Long (retry)	(32)	2
Write Long (no retry)	(33)	2
Write Multiple	(C5)	2
Write Sectors (retry)	(30)	2
Write Sectors (no retry)	(31)	2
Write Verify	(3C)	2

Protocol:

- 1 PIO data IN command
- 2 PIO data OUT command
- 3 Non data command
- 4 DMA command
- + Vendor specific command

*Alternate command codes for previously defined commands.

Signal Definition

The pin assignments of interface signals are listed as follows:

PIN Signal	I/O	PIN Signal	I/O
01 -RESET	I	02 GND	
03 DDO7	I/O	04 DDO8	I/O
05 DDO6	I/O	06 DDO9	I/O

07 DDO5	I/O	08 DD10	I/O
09 DDO4	I/O	10 DD11	I/O
11 DDO3	I/O	12 DD12	I/O
13 DDO2	I/O	14 DD13	I/O
15 DDO1	I/O	16 DD14	I/O
17 DDO0	I/O	18 DD15	I/O
19 GND		(20) Key	
21 DMARQ	O	22 GND	
23 -DIOW*	I	24 GND	
25 -DIOR*	I	26 GND	
27 IORDY*	O	28 CSEL	I
29 -DMACK	I	30 GND	
31 INTRQ	O	32 -HIOCS16	O
33 DAO1	I	34 -PDIAG	I/O
35 DAO0	I	36 DAO2	I
37 -CS0	I	38 -CS1	I
39 -DASP	I/O	40 GND	
41 +5V Logic	PWR	42 +5V Motor	PWR
43 GND		44 (Res)	

Note:

- “O” Designates an output from the Drive.
- “I” Designates an input to the Drive.
- “I/O” Designates an input/output common.
- “PWR” Designates a power supply to the Drive.
- “(Res)” Designates reserved pins which must be left unconnected.
- “**” These signal lines are redefined during the Ultra DMA protocol to provide special functions as detailed in the table below:

	Special Definition (Ultra DMA)	Conventional Definition
Write Operation	-DDMARDY -HSTROBE STOP	IORDY -DIOR -DIOW
Read Operation	-HDMARDY -DSTROBE STOP	-DIOR IORDY -DIOW

Note: There are two input pins for +5 Volt power supply, “+5V LOGIC” and “+5V MOTOR”. “+5V LOGIC” is connected to the internal logic circuits and “+5V MOTOR” is connected to the spindle motor and motor driver.

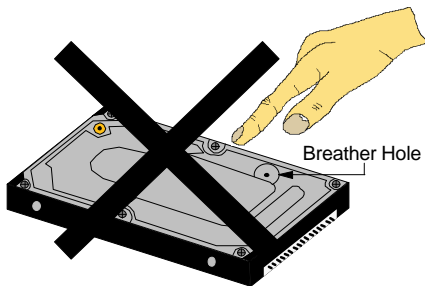
It is possible to turn on and off “+5V LOGIC” by an external switch circuit to reduce power consumption. In this mode, a voltage drop out due to the motor spin up current can be reduced by connecting “+5V MOTOR” line into the system power source directly.

If the above power management option is used, all signal lines that will be electrically active in the host system while the HDD is disconnected from the power line shall be isolated by Three-State line drivers. Internal leakage through the ESD protection circuit may pull down LPUL (Least Positive Up Level) of logic signal below specification.

Use both lines in parallel, for regular HDD applications.

Caution

DO NOT PRESS!



- M **Do not press when you take out the drive.**
- M **Do not press when you carry the drive.**
- M **Attach the drive free from pressing force.**
- M **Do not cover Breather Hole.**

Load / Unload Heads

One of the major advances in this generation of products is the Load/Unload mechanism. When properly used, it allows 300,000 start/stops, an 8-10x advancement. The heads are unloaded by invoking one of the following commands:

SOFT RESET
STANDBY
STANDBY IMMEDIATE
SLEEP

It is also invoked as one of the idle modes. After a short period of inactivity the

adaptive Battery Life Extender power management will unload the heads to conserve energy. When the heads are unloaded, they rest in a small detent. To prevent the heads from being thrown off the ramp during angular acceleration, a bi-directional, normally open, mechanical latch engages with the actuator to stop it turning in the head loading direction. This action causes a 'rattle' sound to be heard which can be mistaken for loose parts.

Adaptive Battery Life Extension

IBM Travelstar products incorporate software which automatically determines the correct time to start removing power from the drive electronics.

Most software and operating systems make use of a disk drive in bursts. The Travelstar drives monitor the commands which are sent from the host to detect patterns which indicate that a command sequence is active or has completed. The drive can then conserve power after each command sequence is finished by putting the drive into low overall power consumption and longer battery life with no loss in performance. If the host system changes the number or frequency of commands which it sends then the disk drive will adapt automatically to this new pattern.

Operating Models

To provide the greatest flexibility of operation with optimum performance and power consumption the drive has a number of operating modes. These are defined below.

Active Mode

The drive is performing a command, writing cached data to disk or filling a read ahead buffer.

Performance Idle

The drive is spinning but is not performing a command. It can respond immediately if a new command is received. The transition from active mode to performance idle mode is controlled by the arrival and completion of commands from the host system.

Active Idle

The drive is spinning but is not performing a command. Additionally the drive has determined that the previous command

sequence (group of associated commands) is complete. Some of the drive electronics have been powered down but it can still respond to a new command within 40 milliseconds. The transition from performance idle to active idle is controlled by IBM's patented Adaptive Battery Life Extender technology.

Low Power Idle

The drive is spinning but is not performing a command. Additionally the drive has determined that the previous command sequence (group of associated commands) is complete. Some of the drive electronics have been powered down but it can still respond to a new command within about 40 milliseconds. The transition from performance idle to low power idle is controlled by IBM's patented Adaptive Battery Life Extender technology.

Standby

The drive is not spinning and is not performing a command. All electronics except for the command interface are turned off. The transition to standby is controlled by a programmable timer which is set by the host system using standard ATA commands. After receiving a new command, the drive will start spinning again and perform the command within 2 to 3 seconds (typically).

Sleep

The drive is not spinning and is not performing commands. All of the electronics are turned off. The transition to sleep mode is controlled by a command which is sent by the host system. The transition from sleep can only be triggered by a reset.

Electromagnetic Compatibility

The drive meets the following EMC requirements when installed in a host system and exercised with a random accessing routine at maximum data rate:

United States Federal Communication Commission (FCC) Rules and Regulations Part 15, subject J - Computer Devices "Class B Limits".

European Economic Community (EEC) directive #76/889 related to the control of radio frequency interference and the Verband Deutscher Elektrotechniker (VDE) requirements of Germany (GOP).

The product is certified for compliance to EC directive 89/336/EEC.

C-Tick Mark complies with Australian EMC standard, AS/NZS 3348:1995 CLASS-B.

Operating Environment

Relative Humidity:

Operating	8% to 90% non-condensing
Non-Operating	5% to 95% non-condensing

Wet Bulb Temperature:

Maximum Wet Bulb:

Operating	29.4°C non-condensing
Non-Operating	40°C non-condensing

Elevation:

Operating Altitude	-300 to 3000m
Non Operating Altitude	-300 to 12000m

Temperature:

Operating	5° to 55°C
Non Operating	-40° to 65°C
Temperature Gradient	20°C per hour

Air Cooling Requirement

The host system must provide sufficient air flow across the drive to maintain the temperature at less than 60°C (measured at the centre of the files' top cover).

Operating Shock

The drive will withstand (with no hard error) a 150G half-sine wave shock pulse of 2ms duration or 10G for 11ms.

Non-Operating Shock

The drive will withstand (with no permanent damage or degradation in performance) a 120G half-sine wave shock pulse of 11ms duration or 700G for 1ms.

Operating and non Operating Vibration

Due to the complexity of this subject we recommend that users contact the Distributor to discuss how to perform the necessary measurements if they believe this to be an area which requires evaluation.

S.M.A.R.T. Function

The intent of self - monitoring, analysis and reporting technology (S.M.A.R.T.) is to protect user data and prevent unscheduled system downtime that may be caused by

predictable degradation and/ or fault of the device. By monitoring and storing critical performance and calibration parameters, S.M.A.R.T. devices employ sophisticated data analysis algorithms to predict the likelihood of near - term degradation or fault condition. By alerting the host system of a negative reliability status condition, the host system can warn the user of the impending risk of data loss and advise the user of appropriate action.

Since S.M.A.R.T. utilises the internal device microprocessor and other device's resources, there may be some small overhead associated with its operation. However, special care has been taken in the design of the S.M.A.R.T. algorithms to minimise the impact to host system performance. Actual impact of S.M.A.R.T. overhead is dependent on the specific device design and the usage patterns of the host system. To further ensure minimal impact to the user, S.M.A.R.T. capable devices are shipped from the device manufacturer's factory with the S.M.A.R.T. feature disabled. S.M.A.R.T. capable devices can be enabled by the system OEMs at time of system integration or in the field by after market products.

Note: For further details see drive specification.

Mechanical Data

**Dimensions
DKLA-22160/23240/24320**

Height (mm)	9.5 ± 0.2
Width (mm)	69.85 ± 0.25
Length (mm)	100.2 ± 0.25
Weight (grams)	99 Typical 101 Maximum

Drive Usage Condition

The Drive is designed to be used under the following conditions:

- Within specification of Shock, Vibration, Temperature, Humidity, Altitude and Magnetic Field.
- ESD protective handling.

Without covering breathing hole on top cover.

Without pressing top cover.

Less than 140 power-on hours per month.

Seeing/Writing/Reading operation to be less than 20% of power-on hours.

The power requirements to be satisfied.

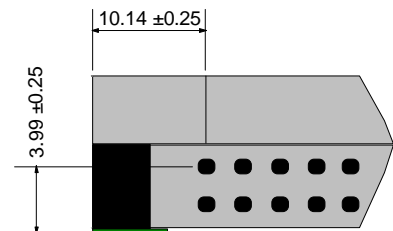
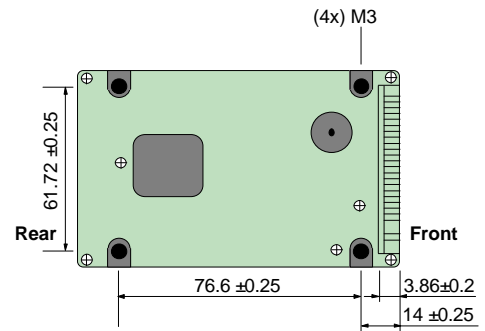
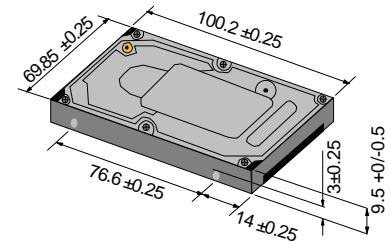
Drive frame be grounded electrically to the system through four screws.

Mounting with recommended screw depth and torque.

Interface physical and electrical requirements be satisfied per ATA-3.

Power off sequence (see Spec. for further details).

Mounting Orientation



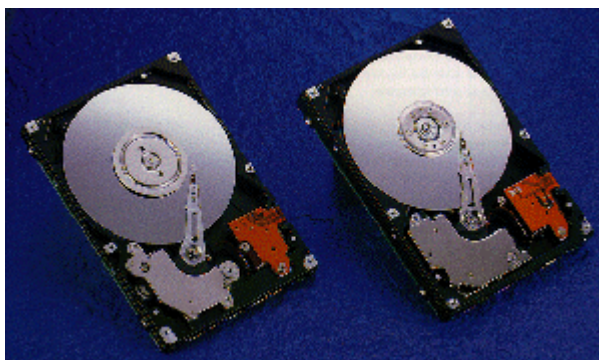
The recommended mounting screw torque is 3.0 ± 0.5 kgf.cm.

The recommended mounting screw depth is 3.0 ± 0.3mm for bottom and 3.5 ± 0.5mm for horizontal mounting.

Fujitsu Quality Storage Products

2.5-Inch Magnetic Disk Drives

MHG2102AT/MHH2064AT/MHH2048AT/MHH2032AT



Fujitsu's new generation of storage products includes three new 2.5-inch mobile hard drives with ATA-4 interface and a spindle speed of 4,200RPM. These drives are available in two profiles. Standard 12.5mm-profile drives have a formatted capacity of 10.0GB. Slim profile drives having formatted capacities of 3.2GB, 4.8GB and 6.4GB, weight only 98g. Each MHG2102AT and MHH20xxAT drive combines a Giant MR Head (GMR), Stiction-Free Trini-Slider (SFTS) and Cable-Patterned Suspension (CAPS). These drives are designed for a maximum available internal transfer rate of between 9.2MB and 15.8MB per second, as well as a 512KB write/readahead cache buffer that enables highly efficient processing and performance. Fujitsu's advanced design and technology realize advanced features resulting in excellent solutions even in adverse operating environments.

KEY FEATURES

- Available in 3.2GB, 4.8GB, 6.4GB (all 9.5mm z-height) and 10.0GB (12.5mm z-height)
- GMR-Spin Value Head
- Stiction-Free Trini-Slider
- Cable-Patterned Suspension

FUNCTIONAL SPECIFICATIONS

Model	MHG2102AT	MHH2064AT	MHH2048AT	MHH2032AT
Storage capacity (formatted)*1	10.0 GB	6.4 GB	4.8 GB	3.2 GB
Disks	3	2	2	1
Heads (read/write)	6	4	3	2
Track capacity (formatted)	107,008 to 185,856 bytes			
Bytes/sectors	512			
Track per cylinder	6	4	3	2
Cylinders*1	11,172			
Sectors/Track *6	209 to 363			
Seek time				
Track to track	1.5ms typ.			
Average	13ms typ.			
Maximum	23ms typ.			
Average latency time	7.14ms			
Rotational speed	4,200rpm			
Recording density	281,800 BPI			
Track density	18,200 TPI			
Data transfer rate				
(To/from media)	9.2 to 15.8 MB/s			
(To/from host)	33.3MB/s			
Recording code	EPR4ML			
Interface	ATA-4			
Head positioning method	ROTARY VCM (Embedded Servo)			
Start time	5sec.typ. *4			
Stop time	5sec.typ. *4			
Others	-			
Buffer size	512KB			

PHYSICAL SPECIFICATIONS

Model	MHG2102AT	MHH2064AT/MHH2048AT/MHH2032AT
Power requirements		
Voltage	5V +/- 5%	
Ripple	100mV P-P	
Spin-up	0.90A typ.	
Operating	2.15W typ.	
Idle	0.95W typ.	
Standby	0.35W typ.	
Sleep	0.10W typ.	
Dimensions		
Height	12.5mm (0.37 in)	9.5mm (0.49 in)
Width	70mm (2.8 in)	
Depth	100mm (3.9 in)	
Weight	145g (3.46 oz)	98g (5.11 oz)
Ambient temperature		
Operating	5 °C to 55°C (41°F to 131°F)	
Non-operating	-40 °C to 65 °C (-40 °F to 149 °F)	
Gradient	20 °C (68 °F)/H	
Relative humidity		
Operating	8% to 90% RH(non-condensing)	
Non-operating	5% to 95% RH(non-condensing)	
Max.wet bub	29 °C	
Vibration		
Operating	1.0G(5 to 500Hz)	1.0G(5 to 400Hz)
Non-operating	5.0G(5 to 500Hz)	5.0G(5 to 400Hz)
Shock		
Operating	125G 2ms	
Non-operating	600G,2ms	700G,1ms
Altitude		
Operating	-300 to 3,000m (-1,000 to 10,000 ft)	
Non-operating	-300 to 12,000m (-1,000 to 40,000 ft)	
Acoustic noise	30 dBA at 1m *5	

RELIABILITY SPECIFICATIONS

Model	MHG2102AT/MHH2064AT/MHH2048AT/MHH2032AT
MTBF *2	More than 300,000 power on hours
MTTR *3	Less than 30 min.
Component life	5 years or 20,000 power on hours
Error rates	
Unrecoverable errors	1 per 10x13 bits read
Seek errors	1 per 10x6 seek
Start/stop cycles	50,000 cycles

Notes

*1:Not including alternates, and typical sparing at 512 Bytes per sector.

*2:Mean-time-between-failures

*3:Mean-time-to-repair

*4:Start time indicates the time from power-on or start direction by command to HDD READY. Stop time indicates the time from stop direction by standby command to complete stop of the disk.

*5:HDD READY

*6:Typical sparing



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FD1238H

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FD1238H
1.44 MB, 3.5 Inch (1/2 inch high)

1.44 MB, 3.5" (1/2" high) Application: Notebook computers and other battery-powered systems. Provides 1.44 MB formatted storage, Weighs only 5.7 ounces, Measures only 0.5 inches high, Consumes only .015 watts in standby mode 30,000 Hr MTBF.

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Dimensions

Height: 0.5 in/12.7 mm

[Top](#)

Width: 3.75 in/96 mm

[Top](#)

Depth: 5.0 in/126 mm

[Top](#)

Weight: 5.7 oz/160 g

[Top](#)

Disk Configuration

Disk Size: 3.5"

[Top](#)

Track Density: 135 tpi

[Top](#)

Bit Density: 720kb Mode = 8,717 bpi
1.44MB Mode = 17,434 bpi

[Top](#)

Rotational Rate: 300 RPM

[Top](#)

Environmental

Temperature: Operating = 4 deg to 46 deg C
Non-operating = -20

[Top](#)

Humidity: Operating = 4 deg to 46 deg C
Non-operating = -20

[Top](#)

Shock: Operating = 5 G
Non-Operating = 100 G

[Top](#)

Vibration: Operating = 0.5 G, 5-500 Hz
Non-Operating = 2.0 G,

[Top](#)

Performance Specifications

Seek Times: track to track = 3ms

[Top](#)



Settle Time: 15 ms
[Top](#)

Interface: 26 pin CMOS
[Top](#)

Data Transfer: 720 KB Mode = 250 KB/s
1.44 MB Mode = 500 KB/s
[Top](#)

Power

Voltage Req'd: +5V
[Top](#)

Pwr Dissipation: Read/write mode = 1.1 watts
Stand-by mode = .015
[Top](#)

Reliability

MTBF: 30,000 POH
[Top](#)

MTTR: <30 minutes
[Top](#)

Device Life: 15,000 POH or 5 yrs
[Top](#)

Specifications

Capacity: Formatted:
720 KB mode = 720 KB
1.44 MB mode = 1.44 MB
Unformatted:
720 KB Mode = 1 MB
1.44 MB Mode = 2MB

[Product Info](#)

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TESTING / INSPECTION REPORT

TESTING EQUIPMENT :

1. Shock Testing System : (KD-DP-1200-60, S/N:KDS11054983)
2. Controller : (KD-1200-03C, S/N:KD674)
3. Accelerometer : (WR-732AT, S/N:869)

TEST ENVIRONMENT :

- Temperature : $24 \pm 2^{\circ}\text{C}$
Humidity : $60 \pm 20\% \text{ RH}$

SPECIMEN :

- Model : TOP 2000
Quantity : 1 piece

SHOCK TEST SPECIFICATION :

- Wave Form : Half Sine wave
Acceleration : 20 G
Duration Time : 11 ms
No. of Shock : Each axis 1 time
Shock Direction : 6 axis

TEST RESULT :

- Appearance check : No damage
Function check : Normal



TESTING / INSPECTION REPORT

TESTING EQUIPMENT:

- | | |
|---|--|
| 1.Vibration Tester : KING DESIGN | (KD-9363-600F2K-50N120,
S/N: KDS11054986) |
| 2.Controller : Data Physics | (DP-540-03C, S/N:DP1326) |
| 3.Control Accelerometer : Wilcoxon Research | (WR-777 , S/N:3425) |
| 4.Accelerometer Power Supply : | (KD-ACC-01PS, S/N:J001) |

TEST ENVIRONMENT :

- Temperature : $23 \pm 2^{\circ}\text{C}$
Humidity : $60 \pm 20\% \text{ RH}$

SPECIMEN :

- Model : TOP 2000
Quantity : 1 piece

VIBRATION TEST SPECIFICATION :

- Sine vibration test
Frequency : 5 ~ 500 Hz
Acceleration : 1 G
Sweep Rate : 0.5 oct/min
Test Axis : X, Y, Z axis
Test Time : 13 min 16 sec (Each axis)
Total Test Time : 39 min 48 sec

TEST RESULT :

- Appearance check : No damage
Function check : Normal



Spare Parts Maintenance Schedule

Item	MTBF (hrs)
System FAN	50,000
CPU FAN	50,000
Backlight tubes	
Toshiba 15" LTM15C151A	25,000
Toshiba 12" LTM12C275A	25,000
Toshiba 10.4" LTM10C209A	25,000
Samsung 15" LT150X1-151	25,000
Sharp 12.1" LQ12S41	30,000
Sharp 10.4" LQ10D421	25,000
Battery on Main Board	26,100
IBM HDD	300,000
FUJITSU HDD	300,000
NEC FDD	30,000
AC Power Supply	100,000
DC Power Supply(Module)	100,000
Citron Infrared Touch Screen	500,000
MicroTouch Resistive Touch Screen	> 35 million touches in a single location